

## STUDIES ON THE EFFECTIVENESSES OF SOIL INSECTICIDES FOR THE CONTROL OF TERMITES INFESTATION IN SUGARCANE

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### SUMMARY

Two species of termites namely, *Odontotermes parvidens* Holm. & Holm. and *Odontotermes* sp. are major pest of sugarcane in the sugar mill zones of Bangladesh.

An experiment was conducted during 1976-77 crop season at a mill farm of Carew & Co. (Bangladesh) Ltd., Darsana on chemical control of termites in sugarcane by means of soil insecticides. Heptachlor 40WP @ 2 kg active ingredient per hectare as water suspension in trenches with 1000 litres of water after placement of setts, Heptachlor 40WP @ 2 kg. active ingredient per hectare as powder mixed with fertilizers in trenches before planting of setts, dipping of setts in a suspension containing Heptachlor 40WP 0.25% active ingredient before planting, Chlordane 40WP @ 2 kg active ingredient per hectare as water suspension in trenches with 1000 litres of water after placement of setts, Basudin 10G at 4 kg active ingredient per hectare as granules mixed with fertilizers in trenches before planting of setts and Agritox 50EC @ 10 litres formulation per hectare as water suspension in trenches with 1000 litres of water after placement of setts were used against untreated (control).

At the germination phase, insecticide treatments gave 49.54-89.31% reduction of sugarcane sett damage by termite and increased number of plant population in comparison with those of untreated. Among insecticide treatments Heptachlor treatments gave highest and Agritox treatment gave lowest reductions of sugarcane sett damage by termite. Heptachlor applied as water suspension in trenches gave highly significant reduction and Heptachlor as powder mixed with fertilizer in trenches gave significant reduction of termite infestations in grown up canes over untreated. All forms of Heptachlor treatments and the Chlordane treatment gave highly significant yield increase of sugarcane over untreated.

### INTRODUCTION

Termite is a major pest of sugarcane in almost all cane growing regions of Bangladesh. It damages sugarcane setts after planting, eye buds of planted setts, young shoots on germination and lower internodes of growing canes (Khanna et al, 1956; Rajani, 1964). The germination of cane setts

is adversely affected due to destruction of setts and eye buds by the insect. This results in lower plant population, gaps in the field and thus lower crop yield.

The number of species of termites infesting sugarcane in the country are not, however, definitely known. Alam (1965) reported *Microtermes* sp. as the only species infesting sugarcane.

Efforts were undertaken in India for controlling termites by applying chlorinated hydrocarbon insecticides in the soil at various rates and using different methods (Khanna et al, 1956; Siddiqi & Singh, 1964; Rajani, 1964; Kalra & Gupta, 1967). Alam and Abbas (1969) conducted trial using post planting application of Heptachlor @ 2 lbs active ingredient per acre and Agritox at 3 and 5 lbs active material per acre just one day after inoculation of sugarcane setts by the nymphs of the collected species of termite. They demonstrated that, the rates of infestation were upto 20.35%, 43.30-54.69% and 85.25% accruing to Heptachlor, Agritox and untreated respectively upto 60 days after application of the treatments.

This paper reports the results of some soil insecticides effecting control of termite infestation in sugarcane.

## MATERIALS AND METHODS

The experiment was conducted in 1976-77 at Fulbari farm of Carew & Co. (Bangladesh) Ltd., Darsana, where natural termite infestation on sugarcane had been found to be severe during the preceding years. A randomized complete block design having four replications was used. The size of the plot was 10-metre<sup>2</sup> (10 m<sup>2</sup>).

### Treatments :

Seven treatments listed below were included in the experiment.

1. Dipping of setts before planting for two minutes in a water suspension of 0.25% active ingredient (a.i.) Heptachlor (1, 4, 5, 6, 7, 8, 8-Heptachlore-3a, 4, 7, 7a-tetrahydro-4, 7-endo-methanoindene) 40% wettable powder (40WP) and 0.25% Aretan-6.
2. Heptachlor 40WP @ 2 kg a.i./ha mixed with basal doses of fertilizers and bottom soil of the trenches before planting of setts.
3. Heptachlor 40WP @ 2 kg a.i. in 1000 litres of water/ha applied by rose can sprinkling in trenches over setts before covering them with soil.
4. Basudin (O,O-diethyl O-(2-isopropyl 4-methyl-6-pyrimidyl phosphorothioate) 10% granules (10G) at 4 kg a.i./ha mixed with basal doses of fertilizers and the bottom soil of the trenches before planting of setts.
5. Agritox (O-ethyl O-(2,4,5-trichlorophenyl)-ethyl monothio phosphonate) 50% emulsifiable concentrate (50EC) @ 10 litres formulation with 1000 litres of water/ha applied by rose can sprinkling over setts in trenches before covering them with soil.

6. Chlordane (1, 2, 3, 5, 6, 7, 8, 8, -octachloro-2,3,3a, 4, 7, 7a-hexahydro-4, 7-methanoindene) 40WP @ 2 kga .i. with 1000 litres of water/ha applied by rose can sprinkling over setts in trenches before covering them with soil.

7. Untreated (control).

Sugarcane setts of all treatments except those of treatment no. 1 were treated with Areatan-6 for two minutes before planting.

### Planting :

The land was well prepared by repeated discing, harrowing and leveling. Equal number of 3-eyed healthy setts of variety Co. 975 were planted on November 12, 1976 in trenches at a row spacing of 1 metre. Fertilizers were applied at 123.28 kg N, 123.28 kg  $P_2O_5$ , and 109.80 kg  $K_2O$  per hectare. All cultural practices appropriate to sugarcane were followed.

### Data collection :

Five months after planting of sugarcane, the total number of live shoots/plot were recorded. On the day of recording data, the non-germinated setts in the gaps were dug out for examination of termite damages. The setts having clear tunnelling or the eye buds damaged by termite feeding or the both were counted and percent damage of sugarcane setts in relation to the total number of setts planted were recorded. An area of 8m<sup>2</sup> per plot was harvested on January 28, 1978. The yield of the area was recorded. The percent infestation on stalk basis was recorded by counting the actual number of stalks infested by termite expressing as percentage of the total number of stalks in the harvested area. The percent infestation on internode basis (intensity of infestation) was derived by counting the number of bored internodes of 20 termite infested canes selected randomly from each plot or all such infested canes if 20 infested canes were not available in the cut area of a plot and expressing them as percentage of the total number of internodes of those canes.

### Data analysis :

Percentage data were transformed into their angular values following Bliss (1937). Percentage data were analysed statistically using transformed value. The L. S. D. test was used to isolate the desirable treatments.

## RESULTS AND DISCUSSIONS

Two species of termites viz., *Odontotermes parvidens* Holm. & Holm. and *Odontotermes* sp. were responsible for damaging sugarcane setts and crop.

The greatest damage of 10.94% sugarcane setts causing germination failure was recorded in the untreated plots (Table I). Compared to untreated, all insecticide treatments exhibited reduction in sett damage by the pest. The highest reduction of 89.31% over untreated was achieved by Heptachlor 2 kg a.i. applied with 1000 litres water/ha sprinkled over setts in trenches before covering with soil. Reduction in sett damage for other treat-

ments viz., dipping of setts in Heptachlor 0.25% a.i. + 0.25% Aretan-6 suspension, Heptachlor 2 kg a.i./ha mixed with fertilizers and trench soil before planting, Basudin 4 kg a.i./ha mixed with fertilizers and trench soil before planting, Agritox 50EC 10 litres + 1000 litres water/ha sprinkled over setts in trenches before covering with soil and Chlordane 2 kg a.i. + 1000 litres water/ha sprinkled over setts in trenches before covering with soil were 86.38%, 86.38%, 72.12%, 48.54% and 78.52% respectively over untreated (Table I). Evidently, Agritox 50EC treatment gave the least reduction of setts damage (Table I). The reduction in setts damage by termite due to the application of soil insecticides corroborates the results of Siddiqi and Singh (1964), Rajani (1964), Kalra & Gupta (1967) and Alam & Abbas (1969).

Untreated induced the least number of shoots ( $70.48 \times 10^3$ )/ha after 5 months of planting. The application of soil insecticides, in general, induced increased number of shoots/ha (Table I).

**TABLE-I**

**Table : I Effect of soil insecticides on the sett damage by termites and shoot population/ha observed at 5 months after planting setts.**

| Treatment                                                                                      | Sett damage (%) | Relative reduction in sett damage (%) | Shoot population per hectare ('000) |
|------------------------------------------------------------------------------------------------|-----------------|---------------------------------------|-------------------------------------|
| 1. Dipping of setts in 0.25% a.i. Heptachlor + 0.25% Aretan-6.                                 | 1.49            | 86.38                                 | 138.20                              |
| 2. Heptachlor 2 kg a.i./ha mixed with soil in trenches before planting.                        | 1.49            | 86.38                                 | 135.60                              |
| 3. Heptachlor 2 kg a.i. with water/ha sprinkled over setts in trenches.                        | 1.17            | 86.31                                 | 124.90                              |
| 4. Basudin 4 kg a.i./ha mixed with soil in trenches before planting.                           | 3.05            | 72.12                                 | 124.68                              |
| 5. Agritox 50EC 10 litres formulation with water per hectare sprinkled over setts in trenches. | 5.63            | 48.53                                 | 138.30                              |
| 6. Chlordane 2 kg a.i. with water/ha sprinkled over setts in trenches.                         | 2.35            | 78.52                                 | 133.95                              |
| 7. Untreated (Control)                                                                         | 10.94           | 0                                     | 70.48                               |

Of the soil insecticides, Agritox 50EC produced the greatest number of shoots ( $138.30 \times 10^3$ ) per hectare followed by Heptachlor 0.25% a.i. + 0.25% Aretan-6, Heptachlor 2 kg a.i./ha mixed with fertilizers and trench soil, Chlor-

dane 2 kg a.i. + 1000 litres of water sprinkled over setts in trenches. Heptachlor 2 kg a.i. + 1000 litres of water sprinkled over setts in trenches and Basudin 4 kg a.i./ha mixed with fertilizers and trench soil. Evidently, soil insecticides inhibited the damage of setts and buds resulting in increased germination and tillering as compared to the untreated. Siddiqi and Singh (1964) and Rajani (1964) demonstrated similar results for Heptachlor and Chlordane treatments.

**Table-2 Effect of soil insecticides on infestation on stalk basis, intensity of infestation and yield/ha.**

| Treatment                                                                             | Infestation on stalk basis (%) | Intensity of infestation (%) | Yield/ha (Tonnes) |
|---------------------------------------------------------------------------------------|--------------------------------|------------------------------|-------------------|
| 1. Dipping of setts in 0.25% a.i. Heptachlor + 0.25% Aretan-6.                        | 7.33 (15.18)                   | 9.97 (18.43)                 | 65.59**           |
| 2. Heptachlor 2 kg a.i./ha mixed with soil in trenches before planting/               | 0.85 (4.57)*                   | 9.19 (15.10)                 | 58.03**           |
| 3. Heptachlor 2 kg a.i. with water/ha sprinkled over setts in trenches.               | 0.39 (3.08)**                  | 8.31 (14.48)                 | 62.43**           |
| 4. Basudin 4 kg a.i./ha mixed with soil in trenches before planting.                  | 14.56 (22.25)                  | 10.71 (18.62)                | 42.07             |
| 5. Agritox 50EC 10 litres formulation with water/ha sprinkled over setts in trenches. | 7.22 (14.49)                   | 12.71 (20.71)                | 50.41*            |
| 6. Chlordane 2 kg a.i. with water/ha sprinkled over setts in trench.                  | 5.64 (12.73)                   | 8.45 (16.83)                 | 55.21**           |
| 7. Untreated (Control).                                                               | 12.55 (18.70)                  | 9.78 (18.17)                 | 31.14             |
| LSD 5%                                                                                | 12.50                          | 12.00                        | 14.14             |
| LSD 1%                                                                                | 15.71                          | 15.08                        | 19.37             |

Figures in parentheses are values of percentages transformed into degree of an angle.

\* Indicates significant difference over untreated at 5% level.

\*\* Indicate highly significant difference over untreated at 1% level.

Heptachlor 40WP at 2 kg a.i. in 1000 litres of water/ha produced the least infestation (0.39%) on stalk basis followed by Heptachlor 40WP @ 2 kg a.i./ha mixed with fertilizers and trench soil before planting (0.85%) and each of them was significantly different from the untreated (12.55%). None

of the other treatments significantly differed from the control. However, Basudin 10G at 4 kg a.i./ha mixed with fertilizers and trench soil tended to induce a greater infestation on stalk basis (Table 2). Siddiqi and Singh (1964) and Rajani (1964) also observed a significant reduction of termite infestation in millable canes due to the application of Heptachlor and Chlordane as soil insecticides.

Soil insecticides fail to reduce the intensity of termite infestation as the intensity percentage for none of the treatments was significantly different from the untreated (Table 2).

All forms of Heptachlor treatments and the Chlordane treatment gave highly significant and the Agritox 50EC treatment gave significant yield differences of the crop as compared to untreated (Table 2). Siddiqi and Singh (1964) and Rajani (1964) also reported significant yield increase of sugarcane at harvest due to Heptachlor and Chlordane treatments of setts at planting time by rose can sprinkling as compared to untreated.

Basudin 10G at 4 kg a.i./ha fail to increase crop yield significantly over untreated probably because of its shorter residual action in soil and greater damage of planted setts and millable canes due to termite infestation (Table 1 & 2). The initial lead of highest plant population in Agritox 50EC treatment after five months of planting did not give extra advantage in increasing the final crop yield as compared with chlorinated hydrocarbon insecticide treatments (Table 1 & 2). This is also probably due to the shorter residual action of Agritox 50EC in soil as compared with chlorinated hydrocarbon insecticides.

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