# EFFECTS OF INSECTICIDE APPLICATION ON SELECTED ARTHROPOD POPULATIONS IN SUGARCANE CROP

In the course of field trials with insecticides for control of the sugarcane shoot borer, *Chilo infuscatellus* during 1975, plots sprayed with a number of promising insecticides recorded greater cumulative infestation than the untreated check. Such a paradoxical trend of results prompted an examination of the possible influence of the insecticides on predatory arthropod populations and the results of some preliminary observations are presented in this note.

Two field experiments were laid out at the Sugarcane Breeding Institute, Coimbatore during 1975-76. In both the experiments, the population of arthropods was assessed by employing 'pitfall' traps based on the design used by Reagen *et. al.* (1972). The trap consisted of a 500 ml glass jar embedded in the soil so its top was at ground level. A polythene hood, supported by a wooden stand was fixed with a clearance of 2 cm above the jar to exclude rain, debris and other animals. The jar was filled to one-thirds with ethaonl (80%) as killing and preserving agent, with a thin layer of kerosene above to curtail evaporation. Four groups of arthropods viz., ants, spiders, earwigs, and coccinellids were scored for in each trap.

In the first experiment, 3 insecticides viz., gamma BHC (soil application), leptophos and phosalone (foliar sprays) were studied. Each treatment was assigned to a 6 x 4 m block of sugarcane crop (cultivar Co. 419) consisting of 6 rows at 1 m. space between rows. One block was maintained as control without any insecticidal application. The insecticides were applied 3 times, at triweekly intervals, commencing from 35 days after planting. Soil application of lindane, at 0.5 kg a.i /ha was effected by diluting the 20 percent emulsifiable concentrate with 250 litres of water/ha and distributing on both sides of the crop row as a 10 cm band using a rose can, followed by covering up with a thin layer of soil. Foliar sprays of 0.1 percent concentration were applied with manually operated knapsack equipment at spray volumes of 250, 375 and 500 litres/ha for the 3 applications. In each block, 2 traps were fixed, one within the crop row and the other between the crop rows on the top of the ridge. Trap collections of arthrodods were examined at weekly intervals commencing form one week after the first application of insecticides and continuing up to 3 weeks following the final application.

The second experiment involved comparing lindane and mephosfolan as soil application (granules at 0.5 kg a.i./ha) along with endosulfan and phosalone as 0.1 percent foliar sprays. Each method of application had a separate control. The treatments were applied in plots of 40 sq. m each. While soil application was made twice viz., at planting

and 45 days later, foliar sprays were made at 30 and 60 days after planting. Sampling for arthropod collecttons was made at 30, 45, 60, 75 and 90 days after planting in traps maintained within the crop row in each plot.

Among the arthropods collected, ants were the predominant group (table 1).

Table 1 Effect of insecticides on arthropod collections, 1975

| Treatment | Weeks after application | Number of Individuals collected/trap/week | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Ants | | Spiders | | Earwigs | | Coccinellids | |
| | | A | B | A | B | A | B | A | B |
| Control | 1 | 16 | 6 | 1 | 4 | 2 | 1 | — | — |
| | 2 | 13 | 9 | 2 | 4 | — | — | 1 | 1 |
| | 3 | 6 | 10 | 2 | 4 | — | — | — | 1 |
| Total | | 35 | 25 | 5 | 12 | 2 | 1 | 1 | 2 |
| Gamma BHC | 1 | 4 | 4 | 3 | 2 | — | — | — | — |
| | 2 | 10 | 22 | 3 | 2 | 1 | 2 | — | 1 |
| | 3 | 6 | 24 | 3 | 6 | — | — | 1 | 1 |
| Total | | 20 | 50 | 9 | 10 | 1 | 2 | 1 | 2 |
| Leptophos | 1 | 31 | 23 | 4 | 4 | — | 1 | 1 | 1 |
| | 2 | 12 | 14 | 3 | 3 | 1 | — | — | — |
| | 3 | 28 | 28 | 3 | 3 | — | 1 | 1 | 1 |
| Total | | 71 | 65 | 10 | 10 | 1 | 1 | 2 | 2 |
| Phosalone | 1 | 5 | 7 | 1 | 1 | 2 | — | — | — |
| | 2 | 7 | 15 | 4 | 6 | — | 1 | — | — |
| | 3 | 3 | 17 | 1 | 4 | — | 1 | — | — |
| Total | | 15 | 39 | 6 | 11 | 2 | 2 | — | — |

A = within the crop B = between crop rows

The number of ants collected within the crop row were distinctly low in plots applied with gamma BHC or phosalone, whereas leptophos recorded more numbers than in the untreated plots. Further, there was a drop in the numbers of ants collected during the first week after each soil application, while no such effect was observed in plots receiving foliar sprays. More numbers of ants were collected between the crop rows in the plots applied with insecticides as compared to the untreated ones. The traps laid between the crop rows recorded higher collection of ants than those within the row in plots applied with gamma BHC or phosalone Leptophos treatment resulted in greater collection of ants among the insecticides, in traps both within and between the crop rows. The spiders collected in the different treatments numbered only 5 to 10 in the row and 10 to 12 between the rows for the entire period with no appreciable difference between the treatments in the numbers collected. Earwings and coccinellids were also negligible in their proportion to the other predators collected in each trap.

In the second experiment, soil-applied insecticides viz., gamma BHC and mephosfolan did not seem to have adverse effect on ants or spiders within the crop row. The numbers of spiders collected over 75 days in gamma BHC, mephiosfolan and control were 10, 20, 9 and those of ants were 33, 33 and 70 respectively. Thus, about 100 percent greater numbers of spiders were trapped, in gamma BHC treatment and of ants in the case of mephosfolan application, as compared to collections in untreated plots. In the trial of foliar sprays also, the collections of spiders exhibited on apparent differences between the treatments The number of ants collected was reduced under phosalone treatment, but no such reduction occurred in endosulfan applied plots.

These results suggest that ants are the dominant of possible predatory arthropds in the ecosystem studied presently. Negm and Hensley (1972) have shown earlier that ants constitute a source of predation of egg, larval and pupal stages of the sugarcane borer, *Diatraea saccharalis*. The populations of ants within the crop are at least temporarily disturbed by the application of gamma BHC to the soil or by foliar application of phosalone. Gamma BHC might deter the activity of ants within the crop row due to its contact- cum-fumigant action Such an adverse effect being not evident in the second experiment could well be due to the increased interval of 45 days, compared to only a three week interval for each application in the first experiment, Phosalone also exhibited some adverse effect only in the first experiment. probably due to the same reason as was observed for gamma BHC. However, the present recommendation being in favour of spray application at a three week interval rather than one month interval as tried in the second experiment, the adverse effects of phosalone need be considered relevant.

Mephosfolan as soil application appears to have less adverse effects on ants or spiders. In the case of foliar sprays, leptophos and endosulfan appear to be safe, at

least to ant populations within the crop rows. Among these 3 insecticides, there are reports acknowledging the relative safety of endosulfan to a variety of beneficial insects (Rattan Lal and Prakash Sarup, 1970). Further, this insecticide has been reported to be effective against important pests of sugarcane such as top borer, *Tryporyza nivella* (F.) (Kalra, 1970) the pyrilla, *Pyrilla perpusilla* Walk. (Sandhu and Madan, 1970) and the shoot borer, *Chilo infuscatellus* Snell (Sithanantham, 1972). Therefore, endosulfan seems preferable for use in sugarcane, with least disturbance to predatory ant populations Mephosfolan and leptophos are to be further studied for their possible safety to such arthropods of importance to sugarcane.

It is concluded that application of gamma BHC at 0 5 kg a. i./ha might deter the activity of ants in the crop row when applied at triweekly interval. Mephosfolan at the above dose. but applied at 45 days intervals may have less adverse effects on ants. As sprays (0.1%) endosulfan and leptophos were found safer to ants than phosalone which tended to deter the ant activity when applied at triweekly interval.

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