THE EFFECTS OF INSECTICIDES ON ALFALFA WEEVIL (HYPERA POSTICA GYLL.) WHEN SPRAYED BY TURBAIR X AND A HAND SPRAYER

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SUMMARY

Dursban, Malathion and Bromophos was applied against alfalfa weevil by conventional and waterless spraying methods. Dursban EC 40.5 was the most effective insecticide when applied at the rate of one litre per hectar in a conventional method. Waterless spraying of Dursban was less effective at the same rate. Malathion in both methods reduced the pest population considerably but was not as effective as Dursban. Bromophos had no effect. The bioassay of insecticides against *H. postica* Gyll. in the laboratory confirmed the results obtained in the field experiments.

INTRODUCTION

Alfalfa weevil, *Hypera postica* Gyll. (Col. Curculionidae), is a notorious pest in Iran attacking alfalfa mainly in the spring. The larvae feed on the leaves or burrow into the young shoots of the plant. In the warmer regions of Iran such as Khuzestan and Baluchestan damage appears in February and continues until April. In high altitudes of Northern and Central parts of Iran according to the prevailing temperature in spring the attack starts in March or April and continues until June or July. The biology and control methods of this pest were studied by Vojdani and Daftari (1963) in Karaj (30 Km. S.W. of Tehran).

One of the control practices in Iran is to cut the crop or graze it early in the spring when the larval population is at its peak and spray the land with aldrin. This method will to some extent limit the damage of alfalfa weevil. However when the density of larvae per bush is high the damage will be continued in the harvested crop for several days and the pest may spread. Aldrin spraying on the standing crop is not recommended because of the residual effects on the crop and high toxicity to the natural enemies of aphids which may result in an aphid outbreak.

The following experiment is an attempt to contol standing alfalfa crop using insecticides which have low toxicity to mammals a few days after spraying. Since Turbair X can spray the ULV and concentrated insecticide in a shorter period of time comparison was made in the efficiency of Dursban, Bromophos and Malathion sprayed against alfalfa weevil either diluted or in their concentrated forms.

Further experiments were carried out in the laboratory to measure the effects of these insecticides on the larvae and adults of alfalfa weevil.

METHODS

A total of six plots were used for each insecticide treatment, two for insecticide application by Turbair X, two for conventional spraying and two unsprayed as control. Each plot was approximately one hundred square meters (25 X 4 m). The number of larvae was counted on each stem for 10 to 30 replicated in each plot before and 24 hours after spraying. Insecticides used were Dursban EC 40.5 Bromphos (Nexion EC 40) and Malathion (Maladrex, EC 90 and Malathion ULV 95).

Turbair X is a small portable spinning disc rotary atomiser powered by a 12–volt dry battery. The speed of revolution of the disc is about 6,000 r.p.m. and the droplets produced are 50–100 u in diameter. Malathion ULV was sprayed at the rate of 10cc per plot; Dursban and Bromophos at 20 cc concentrated form per plot. Wind speed at the time of spraying was about 5 Km per hour. The insecticide was drifted into the plots by walking along the length of each plot. For conventional spraying a small hand sprayer was used. 10 cc Maladrex diluted in 20 litres of water and 20 cc of Dursban and Bromophes diluted in 20 litres of water was sprayed in each plot.

In the laboratory on cubic centimeter of 1% and 0.5% Dursban Bromophos and Malathion emulsions in water was sprayed on filter paper 9 centimeter in diameter. The number of deaths of larvae and adults walking on the poisoned surface was recorded at various intervals.

RESULTS

(a) FIELD EXPERIMENTS

i) Effects of conventional spraying on weevil larvae:

Bromophos had no effect on the larvae and 24 hours after spraying only 3 larvae were killed from 20 samples. Malathion was very effective and a significant reduction in population of living larvae was observed 24 hours after spraying though up to 14 larvae were found that had not been affected by the insecticide. Dursban was the most effective insecticide and inspection of 20 stems 24 hours after spraying showed that none of them were infested by living larvae (Table 1).

TABLE 1: Effects of conventional spraying in controlling the larvae of *Hypera postica.*

	Mean number of larvae and range per stem		
	Before	24 hours after spraying	
Insecticide	spraying	Living larvae	Killed larvae
Dursban	8.9 (0–21)	0	21.6 (4–52)
Control	14.0 (6–26)	25.5 (10–38)	1.1 (0–5)
Malathion	17.0 (2–38)	2.0 (0–12)	3.7 (0–14)
Control	13.3 (1–33)	13.1 (8–19)	0
Bromophos	11.7 (5–29)	15.4 (6–46)	0.2 (0 – 3)
Control	17.0 (7–38)	18.9 (8–35)	0

ii) **Effects of waterless spraying by Turbair X;**

Comparatively less larval mortality occurred when concentrated insecticide of the same dosage per unit area was applied by Turbair X. Again, larvae in plots sprayed by Bromophos showed no poisoning symptoms and insecticide had no effect on the larvae. The number of larvae in plots where Malathion ULV had been sprayed was significantly decreased. However, the ULV insecticide had not affected all larvae and as many as 12 live larvae per stem were found 24 hours after spraying (20 stems were examined). Dursban when sprayed by Turbair X was less effective than when sprayed by the conventional method. Application of Dursban by Turbair X significantly reduced the infestation and was more effective than Malathion ULV (Table, 2).

Table 2: Effects of spraying by Turbair X in controlling the larvae of *H. postica.*

Insecticide	Mean number and range of larvae per stem		
	Before spraying	24 hours after spraying	
		Living larvae	Killed larvae
Dursban	14.6 (1–35)	2.2 (0–10)	11.8 (0–19)
Control	14.0 (6–26)	25.5 (10–38)	1.1 (0–5)
Malathion	15.6 (3–30)	4.8 (0–12)	3.8 (0–9)
Control	13.3 (1–33)	13.1 (8–19)	0
Bromophos	14.0 (2–28)	11.5 (2–30)	0.1 (0–1)
Control	17.0 (7–38)	18.9 (8–35)	0

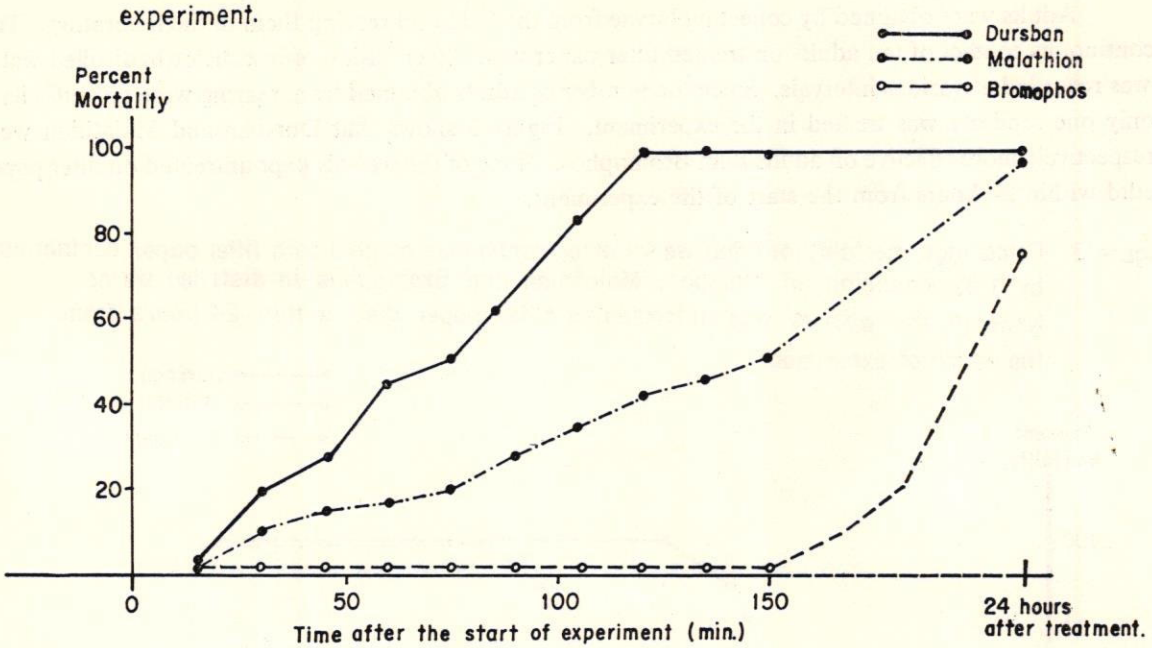
(b) LABORATORY EXPERIMENTS

i) **Effects of insecticides on weevil larvae**

Fully grown last instar larvae were collected from the field. The concentration of Malathion (Maladrex EC 90) was adjusted so that the percentage of insecticide in water emulsions had similar active ingredients. Filter paper was contaminated with one cubic centimeter of insecticide with 40 to 40.5 % active ingredients at the dosage of 1% and 5% emulsions in water. Mortality of the larvae was recorded in three replicates within 24 hours. Two hours continuous larval contact with filter paper contaminated by 1% Dursban produced 100% mortality while Malathion treatment for the same period gave 43% mortality but Bromophos had no effect within this period.

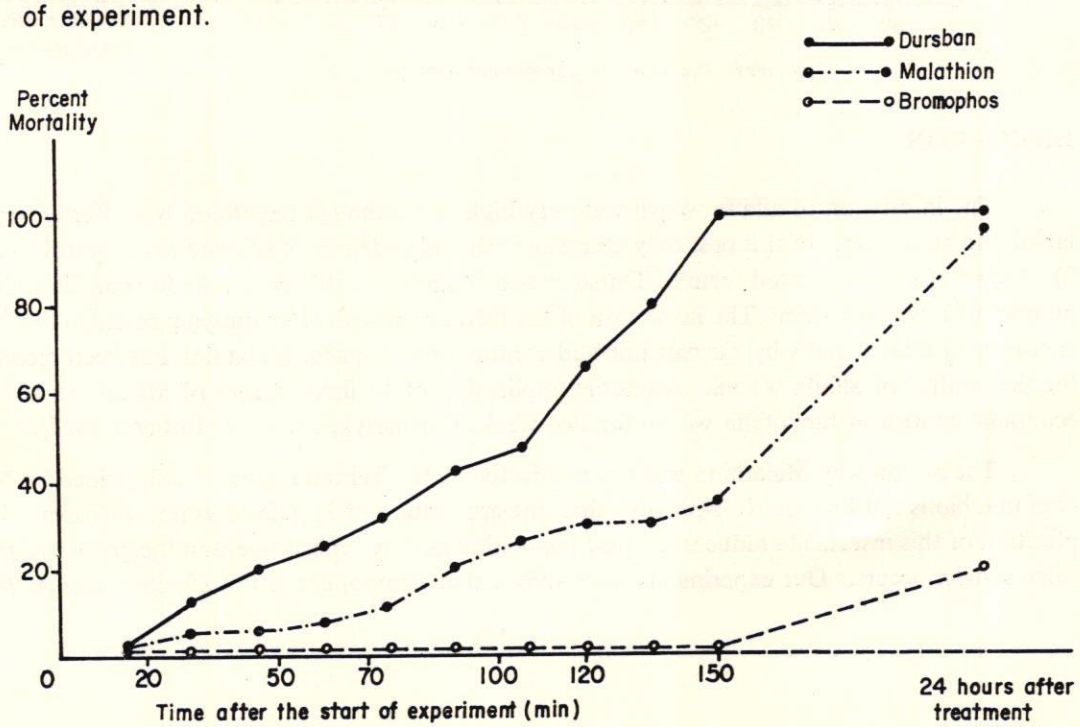
Twenty four hours of larval contact with filter paper contaminated by Malathion and Bromophos produced 100 and 71 % mortality respectively. All untreated insects kept as control for 24 hours in petri dishes were alive (Fig. 1).

Figure 1: Percentage mortality of latest larval instars of H. postica after continuous contact with filter paper Impregnated by 1% emulsion of Dursban, Malathion and Bromophos. None of the insects kept untreated died within the 24 hours after the start of experiment.



The same experiment was repeated with the dose of 0.5% emulsion of insecticides in water. Figure 2 shows that 2.5 hours continuous contact of larvae with Dursban produced 100% mortality and with Malathion 35% mortality was obtained but Bromophos had no effect in this period. Twenty four hours after larval contact by O.5 % Malathion and Bromophos produced 100 and 20 % mortality respectively. All insects kept in untreated petri dish as control were alive (Fig, 2).

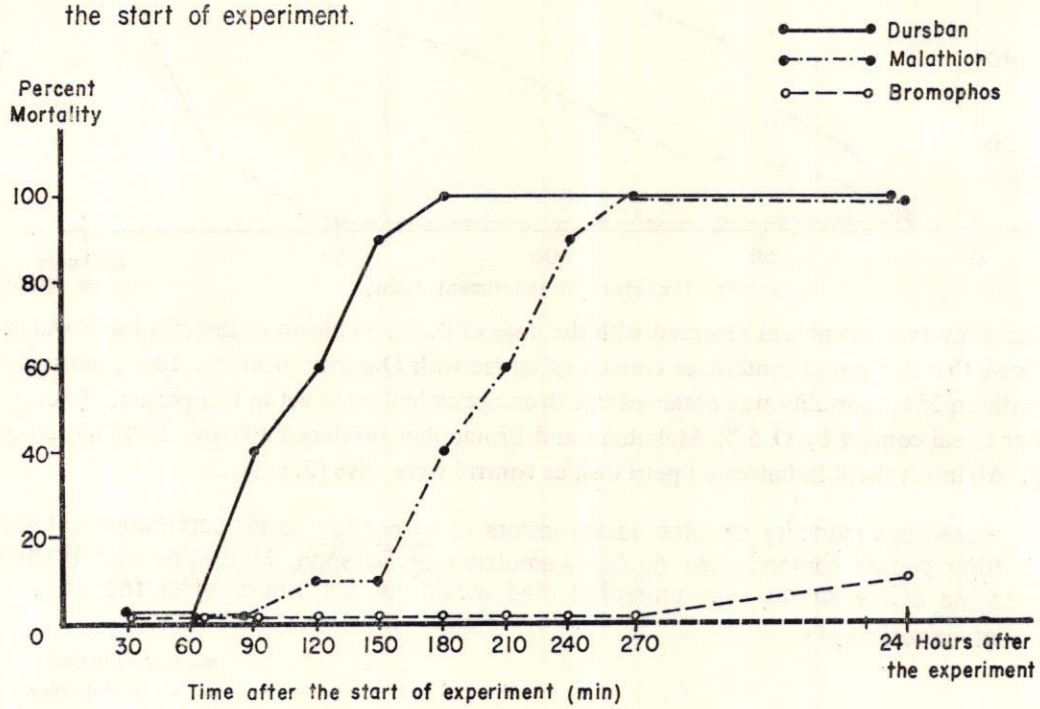
Figure 2: Percentage mortality of latest larval instars of H. postica after continuous contact with filter papers contaminated by 0,5% emulsion of Dursban, Malathion and Bromophos. None of the larvae kept untreated died within the 24 hours after the start of experiment.



ii) Effects of insecticides on adults:

Adults were obtained by collecting larvae from the field and rearing them in the laboratory. The continouus contact of ten adults on treated filter paper with 1% emulsion of insecticide in distilled water was recorded at various intervals. Since the number of adults obtained from rearing were not sufficient, only one replicate was treated in the experiment. Figure 3 shows that Dursban and Malathion were respectively more effective on adults than Bromophos. None of the weevils kept untreated on filter paper edid within 24 hours from the start of the experiment.

Figure 3: Percentage mortality of adult weevil after continuous contact with filter paper contaminated by 1 % emulsion of Dursban, Malathion and Bromophos in distilled water. None of the weevils kept untreated on filter paper died within 24 hours from the start of experiment.



DISCUSSION

The infestation of alfalfa weevil was very high and although malathion was effective against the larval and adult stages of this pest only Dursban with a high degree of efficacy gave control (Tables 1 & 2). Spraying a concentrated form of Dursban and Malathion ULV gave a good result in reducing the number of larvae per stem. The inspection of the field one month after spraying revealed that the insect survivors of treated plots by Turbair inflicted considerable damage. Malathion has been recommended for the control of alfalfa weevil. An aerial application of 16 fluid oz/acre of Malathion LV will give economic control of the alfalfa weevil for two weeks (Niemczyk, Henry & Roberts, 1967).

The reason why Malathion was not as effective in the Tehran region as is described by Niemczyk *et al* in Ohio is not known. It is possible that one application of Malathion is not sufficient. Single application of this insecticide reduces the pest population and by improvement in the growth of the plants reinfestation occurs. Our experiments have shown that Bromophos is not effective against *H. postica*

and within a few weeks all alfalfa plants were destroyed in plots sprayed by Bromophos and those kept untreated as control. Dursban gave better control than Malathion and considering that 75% of this insecticide is lost from the leaf surface by volatization within the first 48 hours of application (Brust, 1966; Gray, 1965), Dursban can be recommended for the control of *H. postica* on standing crops in Iran.

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