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LABORATORY AND FIELD EVALUATION OF SEVEN INSECTICIDES FOR CONTROL OF THE ALFALFA STEM NEMATODE, *DITYLENCHUS DIPSACI* (KÜHN 1857) FILIPJEV 1936 [1] [2]

by
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The production of lucerne, which is important for the expansion of the dairy industry in Iran is seriously threatened by stem nematode attack (Abivardi and Sharafeh, 1973).

Control of stem nematode attack by treating plants with various organic phosphorus compounds has proved moderately successful (Bergeson, 1955; Feder, 1952; Gostick, 1963; Griffin, 1967; Henderson and Williams, 1955; Pitcher, 1959; Oliff *et al.*, 1969). More recently developed compounds like thionazin, aldicarb and trichloronate were equally or more effective.

To investigate whether insect and nematode control could be obtained by the same treatment, the effect of several organic phosphorus compounds on attack of lucerne by stem nematodes was investigated in laboratory and field experiments.

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[1] This investigation was supported by Grant No. 51-AG-10 from the Research Council and the Agricultural Research Center, of Pahlavi University, Shiraz, Iran.

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Materials and methods

A) *Pot trials*:

Infested plants were collected in an alfalfa field and transferred to pots (25 cm in diameter) with the surrounding soil, and watered immediately. The pots were transported to laboratory and randomly selected for different treatments which were replicated four times in a completely randomized design.

The plants were sprayed to the point of run off, with the following formulated materials: Azodrin (monocrotophos) 24% EC, parathion 25% EC, dimecron (phosphamidon) 20% EC, dimethoate 40% EC, metasystox 20% EC, dichlorovos (DDVP) 50% EC, and gusathion (guthion) 20% EC, with concentrations of 1/4000, 1/8000, 1/2500, 1/2500, 1/2500, 1/1000, and 1/2500, of active material in water (V/V). Checks were sprayed with water alone.

The pots were kept at room temperature ($23\pm3^{o}C$) for three days, after which numbers of stem nematodes in the buds were determined. One gram of infested buds was taken at random from each replicate and processed by a combination of blender and Cobb sieving technique. The nematodes were recovered from 100, 200 and 325 mesh sieves and then passed through paper tissues. The tissues containing the nematodes were folded carefully and put in Petri dishes containing 20 ml tap water. Then, the Petri dishes were placed at a temperature of $27\pm3^{o}C$.

The nematodes passed through the tissues into the tap water, after 24 hours, were counted by taking 1-ml aliquots of the suspension of each Petri dish, amplified by the total volume.

The results of the experiment were evaluated by Duncan's multiple range test (Duncan, 1951).

B) *Field trials*:

All insecticides, except DDVP that did not show promising results in the former experiment, were tested in April in the field using randomized block design with four replicates. To do this, 100 square meter sections of an infested field, isolated by 50 cm-wide borders, were randomly chosen for treatments, with concentrations similar to those in the pot treatments. Ten liters of the solutions,

corresponding to 125, 250, 400, 400, 400 and 400 grams of parathion, monocrotophos, phosphamidon, dimethoate, guthion, and metasystox, respectively, per hectar (based on active material), were used for each replicate. A negligible amount of precipitation was recorded two weeks after the treatments.

Observations on growth and the nematode control were made one month later. The rate of growth was determined by measuring plant height, and the nematode control was evaluated by dissecting infested buds.

Results and discussion

The results (Table I) indicate that all insecticides, except DDVP, have significantly reduced the number of nematodes that could be extracted from infested buds. There was no difference in effect between monocrotophos, phosphamidon, dimethoate, guthion, metasystox, and parathion, while there was a highly significant difference between DDVP and other insecticides. Microscopical studies on the nematodes recovered from the dissected buds revealed the presence of inactivated nematodes in insecticide treated buds (except those treated with DDVP) which were activated after a short period of aeration.

Table 1 *Effect of spraying alfalfa plants infested with* Ditylenchus dipsaci, *with various insecticides on the numbers of the nematodes that could be extracted from the tissues* (1).

Treatments	Nematodes/g foliage (2)
Control	3500 A (3)
DDVP (dichlorophos)	2800 A
Gusathion (guthion)	850 B
Dimecron (phosphamidon)	550 B
Azodrin (monocrotophos)	430 B
Parathion	375 B
Metasystox	350 B
Dimethoate	250 B

(1) Determined by the rate of penetration of the nematodes through paper tissues.

(2) Means of four replicates.

(3) Means followed by the same letter are not significantly different at the 1% level; determined by Duncan's multiple range test.

Figure 1 shows the effects of dimethoate on growth of the infested alfalfa plots, under the natural conditions. According to this figure, application of dimethoate resulted in a considerable improvement of the growth of the plants which in the treated plots reached an average height of 70 cm one month after treatment, while control plants were only 20 cm high. According to our observations parathion damaged the plants. Phosphamidon resulted in an average plants height of 50 cm. Figure 2, shows plant sizes in untreated plots, and plots treated with phosphamidon and dimethoate, respectively.

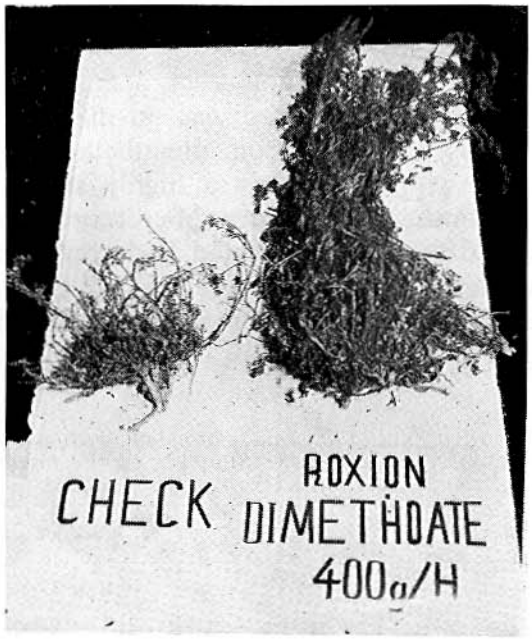

Fig. 1 - The rate of growth in an infested alfalfa plant treated with dimethoate compared with the untreated one.

Application of dimethoate at a rate of 400 g active material per hectar in a 10-hectar alfalfa field severely suffering from stem nematode attack, also gave a promising result.

Considering the insecticidal properties of dimethoate, and the

results obtained from our experiments, the chemical is believed to be a promising candidate nematicide for control of the alfalfa stem nematode as it also controls alfalfa insects.

Fig. 2 - Comparative growth of alfalfa plots highly infested with *Ditylenchus dipsaci* in control (A), and those treated with dimethoate (B), and phosphamidon (C), one month after the treatments.

We gratefully acknowledge the Research Council and the Agricultural Research Center of Pahlavi University for their financial supports, Eng. A. Kashkouli for his facilities, Mr. A. Ravanbod for technical assistance, Mrs. N. Yazdani (Ghavi), and Miss E. Sedighi-Nedjad for typing the manuscript, and Mr. M. Ghanooni for photography.

SUMMARY

The nematicidal effect of seven insecticides against the alfalfa stem nematode, *Ditylenchus dipsaci* (Kühn 1857) Filipjev 1936, was evaluated under laboratory and field conditions. All insecticides except dichlorophos (DDVP) showed promising results in inhibition of the nematode movement through paper tissues, while only dimethoate controlled the nematode injury effectively, under the field conditions. Considering the efficiency of dimethoate application with a rate of 400g/ha, this chemical is considered to be a promising candidate nematicide for control of the alfalfa race of *Ditylenchus dispaci.*

RIASSUNTO

Valutazione in laboratorio ed in campo di sette insetticidi per la lotta contro Ditylenchus dipsaci *(Kühn 1857) Filipjev 1936 su Erba medica.*

È stato saggiato in laboratorio ed in campo l'effetto nematocida di sette insetticidi contro *Ditylenchus dipsaci* (Kühn 1857) Filipjev 1936 su Erba medica. Tutti gli insetticidi, eccetto il diclorofos (DDVP), hanno inibito in maniera promettente i movimenti del nematode attraverso tessuti di carta, mentre il solo dimetoato, alla dose di 400 g/ha, ha ridotto soddisfacentemente il danno del parassita in campo.

RESUMÉ

Action de sept insecticides dans la lutte contre Ditylenchus dipsaci *(Kühn 1857) Filipjev 1936 sur luzerne en laboratoire et au champ.*

L'effet nématicide de sept insecticides contre *Ditylenchus dipsaci* (Kühn 1857) Filipjev 1936 sur luzerne a été essayé en laboratoire et au champ. Tous les insecticides, excepté le dichlorophos (DDVP), ont inhibé en façon prometteuse le mouvement des nématodes à travers des tissus de papier. Le dimethoate seul, à la dose de 400 g/ha, a réduit d'une manière satisfaisante les dommages du parasite au champ.

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Accepted for publication on 15 February 1975.