QUEENSLAND DEPARTMENT OF PRIMARY INDUSTRIES

DIVISION OF PLANT INDUSTRY BULLETIN No. 806

PHYTOTOXICITY TESTS WITH PYRETHROID INSECTICIDES ON GLASSHOUSE GROWN TOMATO SEEDLINGS

BY J. R. HARGREAVES, B.SC., AND L. P. COOPER

SUMMARY

A commercial formulation of the pyrethroid insecticide fenvalerate caused leaf chlorosis when sprayed on seedlings of four commercial tomato cultivars. Phytotoxic symptoms were noted as low as 25 ppm fenvalerate. Commercial formulations of the other pyrethroid insecticides, cypermethrin, decamethrin and permethrin, at their expected usage rates for tomatoes, were not phytotoxic.

I. INTRODUCTION

Routine spraying with insecticides is essential to prevent damage to tomato seedlings by the potato moth, *Phthorimaea operculella* (Zeller) in south-east Queensland. The pyrethroid insecticides, cypermethrin, decamethrin, fenvalerate and permethrin, have been shown to be effective in protecting field plants from insect attack (J. R. Hargreaves; R. Thompson, unpublished data), and caused no obvious damage to such plants.

It is anticipated such insecticides will be used commercially not only on field plants, but also on seedlings. However, previous authors have shown that some insecticides, notably chlordimeform (Poe 1974), and methomyl (Schuster 1978), may damage tomato seedlings even though they do not damage field plants. In view of this it was decided to test the above-mentioned pyrethroid insecticides for phytotoxicity of the commercial formulations to seedling tomatoes.

II. MATERIALS AND METHODS

The insecticides used, percentages of active constituent and types of formulations were as follows:

cypermethrin	20%	w/v emulsifiable concentrate
decamethrin	2·5%	w/v emulsifiable concentrate
fenvalerate	7·5%	w/v emulsifiable concentrate
methamidophos	58%	w/v emulsifiable concentrate
permethrin	50%	w/v emulsifiable concentrate

Because of its current usage in tomato seedling nurseries without any apparent phytotoxicity, 0·11% methamidophos was included for comparison. A non-ionic wetting agent ("Agal 60") at 0·01% w/v was used with all treatments.

Five trials were carried out in a glasshouse at the Redlands Horticultural Research Station, Ormiston, using seedlings of the most commonly used commercial cultivars. All trials were undertaken in summer (trial 1, October–November 1978; trial 2, November–December 1978; trial 3, December 1978–January 1979; trials 4 and 5, January–February 1979).

Seedlings from each trial were produced from certified seed sown in 4-*l* polythene pots filled with a red acid krasnozem soil (a typical Redlands district soil). Each treatment was replicated four times in a totally randomised design (details of the treatments in each trial are given in the tabulated results). A single pot constituted a plot.

Insecticides were applied by a "Rega" continuous pressure atomiser. Plants were sprayed to runoff and the first application was made 3 weeks after plant emergence. A second spray was applied 7 days later.

Damage (leaf chlorosis—figure 1) was assessed 3 days after the second spray. A plant was considered damaged when one or more leaves showed damage. The number of damaged and undamaged plants and leaves was recorded separately.

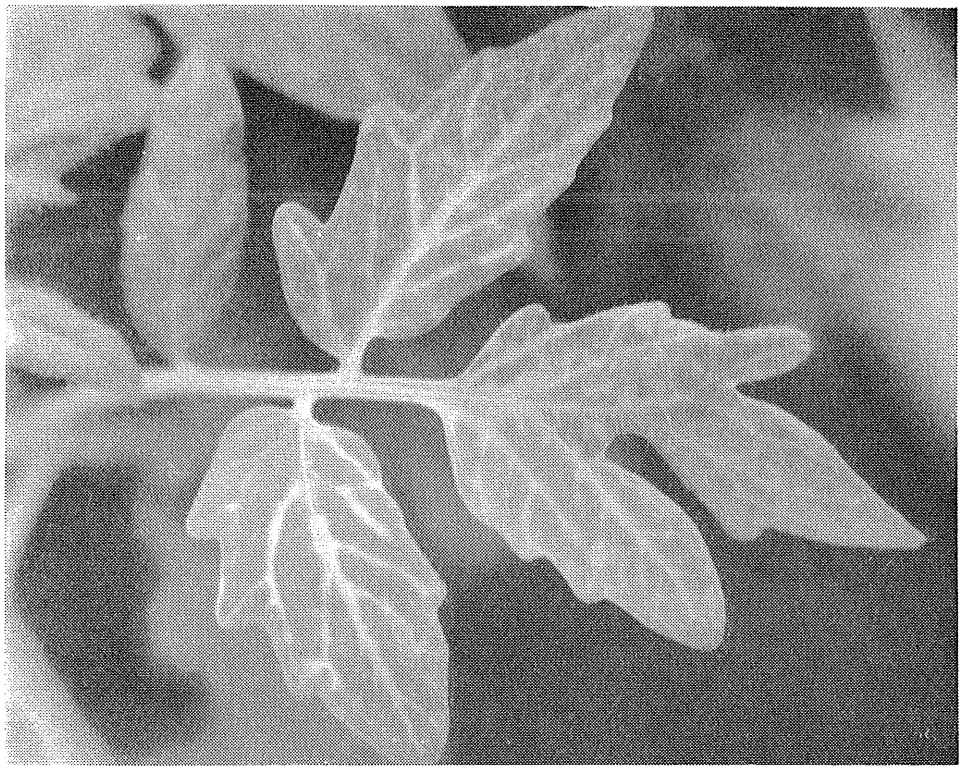

Figure 1. Symptoms of fenvalerate toxicity.

TABLE 1

PERCENTAGE OF PLANTS AND LEAVES SHOWING FENVALERATE PHYTOTOXICITY SYMPTOMS IN GLASSHOUSE TRIALS FROM OCTOBER 1978 TO FEBRUARY 1979

Treatments	Percentage with Symptoms									
	Trial 1* cv. Strobelee		Trial 2 cv. Strobelee		Trial 3 cv. Flora-dade		Trial 4 cv. Tropic		Trial 5 cv. Walter	
	Plants	Leaves	Plants	Leaves	Plants	Leaves	Plants	Leaves	Plants	Leaves
cypermethrin 50 ppm	0	0	..	..	..	..	..	..	..	..
decamethrin 50 ppm	0	0	..	..	..	..	..	..	..	..
decamethrin 12·5 ppm	0	0	..	..	..	..	..	..	..	..
fenvalerate 150 ppm	..	..	97·9a	59·8a	..	..	..	..	..	..
fenvalerate 100 ppm	..	..	81·9ab	39·3b	..	..	..	..	..	..
fenvalerate 75 ppm	..	..	76·4bc	32·4bc	98·5a	74·3a	..	..	..	..
fenvalerate 50 ppm	83·6	54·5	62·4c	25·7c	80·2b	56·3b	98·4a	79·8a	100·0a	80·4a
fenvalerate 25 ppm	..	..	..	..	47·5c	28·7c	92·6a	59·3b	99·0a	73·5b
permethrin 50 ppm	0	0	..	..	0d	0d	0b	0c	0b	0c
no treatment	0	0	4·6d	0·9d	0d	0d	..	..	..	..
methamidophos 0·11%	..	..	2·7d	0·7d	..	..	..	..	..	..

* No analysis done due to number of zero values.

Values followed by the same letter do not differ at the P=0·05 level of probability.

III. RESULTS AND DISCUSSION

The results are summarised in table 1. At the expected rate of usage on tomatoes (50 ppm), only the fenvalerate formulation showed phytotoxicity (trial 1) and this damage was still evident at 25 ppm. As the concentration increased from 25 to 75 ppm fenvalerate caused damage to progressively more leaves per plant (trials 2 to 5). All cultivars tested were sensitive to the fenvalerate formulation.

Very slight chlorosis was recorded on cultivar Strobelee in both the untreated and 0·11% methamidophos spray treatment (table 1, trial 2) but the differences between these two treatments were not significant.

IV. ACKNOWLEDGEMENTS

The assistance of Biometry Branch with statistical analysis and Mr G. Swaine, Entomology Branch, for helpful criticism of the manuscript, is acknowledged.

REFERENCES

POE, S. L. and EVERETT, P. H. (1974).—Comparison of single and combined insecticides for the control of the tomato pinworm in Florida. *Journal Economic Entomology.* 67:671-674.

SCHUSTER, D. J. (1978).—Tomato pinworm: chemical control on tomato seedlings for transplants. *Journal Economic Entomology.* 71:195-196.

(Received for publication 26 April 1979)

The authors are officers of Entomology Branch, Queensland Department of Primary Industries, and are stationed at the Redlands Horticultural Research Station, Ormiston, Q. 4163.