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Crop & Food Research Confidential Report No. 217

Insecticides for control of onion thrips—baseline data
TBG milestone: 2.7 (modified)

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July 2000

A report prepared for the
New Zealand Onion Exporters Association

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2 Introduction

In 1997, onion thrips from South Auckland onion crops were demonstrated to be resistant to synthetic pyrethroid insecticides. Onion thrips in other countries are reported to be resistant to many other insecticides. Resistance to an insecticide can be determined by comparing the dose-mortality response of known susceptible and suspected resistant thrips in a standard bioassay. If the dose-mortality responses of susceptible populations are already known, the suspect population can be tested with just one to three diagnostic doses of insecticides. This is a quicker procedure and requires relatively few insects.

It was decided to determine the baseline dose-mortality of onion thrips to the insecticides registered for thrips control on onion crops before testing populations from crops in South Auckland and other regions. The bioassay chosen assesses onion thrips mortality after 24 hours' exposure to a disc of leek leaf dipped in insecticide solution.

3 Objective

- To determine for onion thrips the dose-mortality relationship for five insecticides registered for onion thrips control in onion crops.

4 Methods

4.1 Onion thrips

Onion thrips (*Thrips tabaci*) from a conservatory in Wellington and a susceptible population from an onion crop in Pukekohe were reared separately on segments of leek leaves in Agee jars (500 ml) at 25°C and in 16 h light : 8 h dark in order to determine diagnostic doses. Both populations were susceptible to synthetic pyrethroid insecticides.

4.2 Insecticide treatment

4.2.1 Insecticides

The insecticides tested and the recommended concentrations (assuming 500 litres spray per hectare) for field crop application are presented in Table 2.

Table 2: Insecticides tested and recommended concentrations for field crop application.

Treatment (common name and recommended concentration)	Product	Recommended concentration
deltamethrin 19.8 mg ai/1 litre	Decis Forte (27.5 g deltamethrin/litre)	72 ml/100 litres
diazinon 500 mg ai/1 litre	Diazinon 50 W (500 g diazinon/kg)	150 g/100 litres
dichlovos 1000 mg ai/1 litre	Nuvan (1000 g dichlorvos/litre)	100 ml/100 litres
endosulfan 700 mg ai/1 litre	Thiodan (350 ml endosulfan/litre)	200 ml/100 litres
parathion-methyl 480 mg ai/1 litre	Folidol M 50 (600 g parathion-methyl/litre)	80 ml/100 litres
water control		

Note: all treatments, including the water control, contained Citowet (0.25 ml/litre water).

4.2.2 *Insecticide treatment*

Discs, 24 mm in diameter, were cut from the white part of leek leaves. Each disc was dipped for 5 seconds in an insecticide solution or water control and allowed to dry. Five or six concentrations of each insecticide were used.

4.3 *Bioassay*

When dry, the leaf discs were placed, one each, in small plastic Petri dishes (50 mm in diameter). Ten live onion thrips collected from lab colonies were transferred to each dish which was closed with a ventilated lid. Ventilation was provided by a hole 12 mm in diameter. The dishes were kept at 25°C in 16 h light : 8 h dark for 24 hours. The numbers of live and dead thrips in each dish were recorded and percentage mortality calculated. Thrips were considered to be dead if they failed to move when they were gently touched with a fine camel hair brush.

In each experiment 5 dishes of 10 thrips (50 thrips) were used for each concentration of insecticide.

4.4 *Data analysis*

The percentage mortality was calculated using Abbots' correction and data were graphed.

5 *Results*

Although some of the dose-mortality data were variable, some doses gave 100% mortality and were used to define diagnostic doses for insecticide resistance testing (Figs 1-4, Table 3). The response of the onion thrips was too variable to estimate a dose-mortality response and diagnostic dose for parathion-methyl.

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1 Executive summary

Some populations of onion thrips have been found to be resistant to synthetic pyrethroid insecticides. A quick test to determine resistance to insecticides in onion thrips populations is needed. Ideally the test should generate dose-mortality data in a standard bioassay before field populations of thrips are tested.

The objective of the present study was to determine for onion thrips the dose-mortality data for five insecticides registered for control of these insects in onion crops.

Discs, 24 mm in diameter, cut from leek leaves were dipped in insecticide solutions. Five or six concentrations of each insecticide were used. The dry leaf discs were placed in small ventilated plastic dishes. After thrips were added to dishes, they were closed and kept at 25°C for 24 h. Mortality of the insects was then assessed. The bioassay was repeated at least three times and a diagnostic insecticide dose was determined.

Baseline data were determined for four of five insecticides listed. The formulations tested, the diagnostic dose and the recommended application rate are listed in Table 1.

Table 1: Diagnostic doses and recommended concentrations of five insecticides tested for the control of onion thrips.

Insecticide (product)	Diagnostic dose (mg ai/litre)	Recommended concentration (mg ai/1 litre)
Deltamethrin (Decis Forte)	19.8	19.8
Diazinon (Diazinon 50 W)	100	500
Dichlovos (Nuvan)	2500	1000
Endosulfan (Thiodan)	700	700
Parathion-methyl (Folidol M 50)	not available	480

Variability in the response of the thrips to parathion-methyl meant that baseline data were not obtained for this insecticide. Another attempt should be made at a later date.

These diagnostic doses were used to screen onion thrips for resistance to four of the five insecticides. In future, it should be possible to very quickly assess the status of field populations and assist growers to select insecticides that will give effective thrips control on their crops.

Baseline dose-mortality data and diagnostic doses should be similarly determined for new insecticides registered for onion thrips control.

2 Introduction

In 1997, onion thrips from South Auckland onion crops were demonstrated to be resistant to synthetic pyrethroid insecticides. Onion thrips in other countries are reported to be resistant to many other insecticides. Resistance to an insecticide can be determined by comparing the dose-mortality response of known susceptible and suspected resistant thrips in a standard bioassay. If the dose-mortality responses of susceptible populations are already known, the suspect population can be tested with just one to three diagnostic doses of insecticide. This is a quicker procedure and requires relatively few insects.

It was decided to determine the baseline dose-mortality of onion thrips to the insecticides registered for thrips control on onion crops before testing populations from crops in South Auckland and other regions. The bioassay chosen assesses onion thrips mortality after 24 hours' exposure to a disc of leek leaf dipped in insecticide solution.

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4.4 *Data analysis*

The percentage mortality was calculated using Abbots' correction and data were graphed.

5 *Results*

Although some of the dose-mortality data were variable, some doses gave 100% mortality and were used to define diagnostic doses for insecticide resistance testing (Figs 1-4, Table 3). The response of the onion thrips was too variable to estimate a dose-mortality response and diagnostic dose for parathion-methyl.

Table 3: The diagnostic doses for onion thrips populations and recommended concentrations for five insecticides with label claims for onion thrips control on onion crops.

Insecticide	Diagnostic dose (mg ai/litre)	Recommended concentration (mg ai/1 litre)
Deltamethrin	19.8	19.8
Diazinon	100	500
Dichlovos	2500	1000
Endosulfan	700	700
Parathion-methyl	not available	480

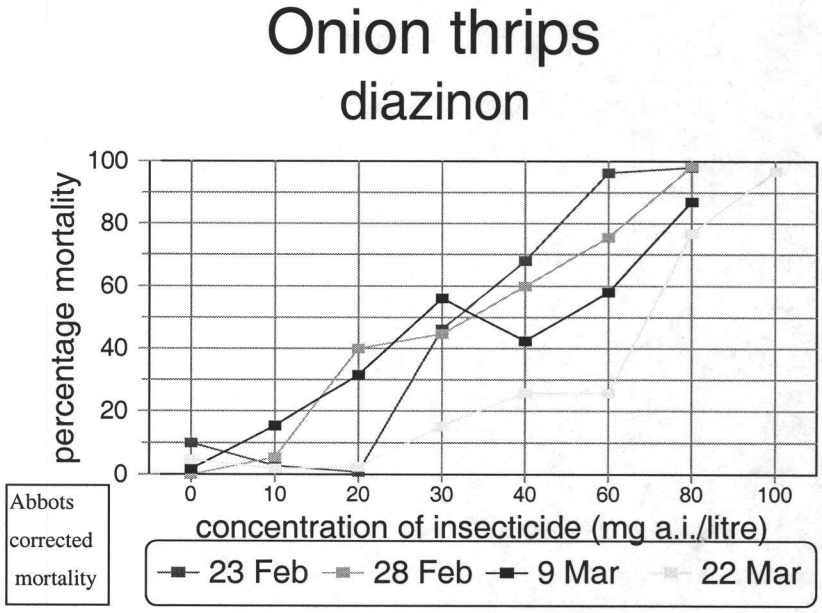

Figure 1: Dose-mortality data for susceptible onion thrips.

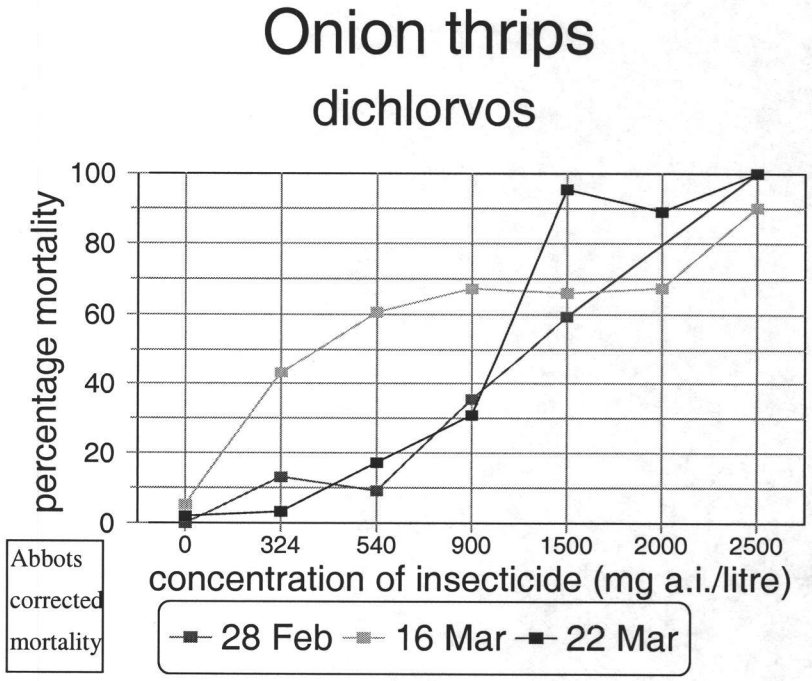

Figure 2: Dose-mortality data for susceptible onion thrips.

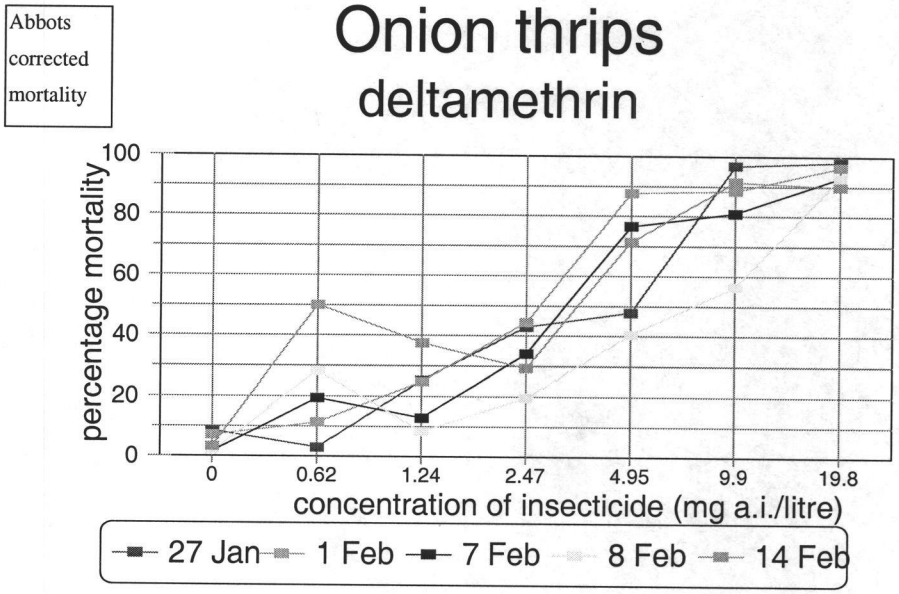

Figure 3: Dose-mortality data for susceptible onion thrips.

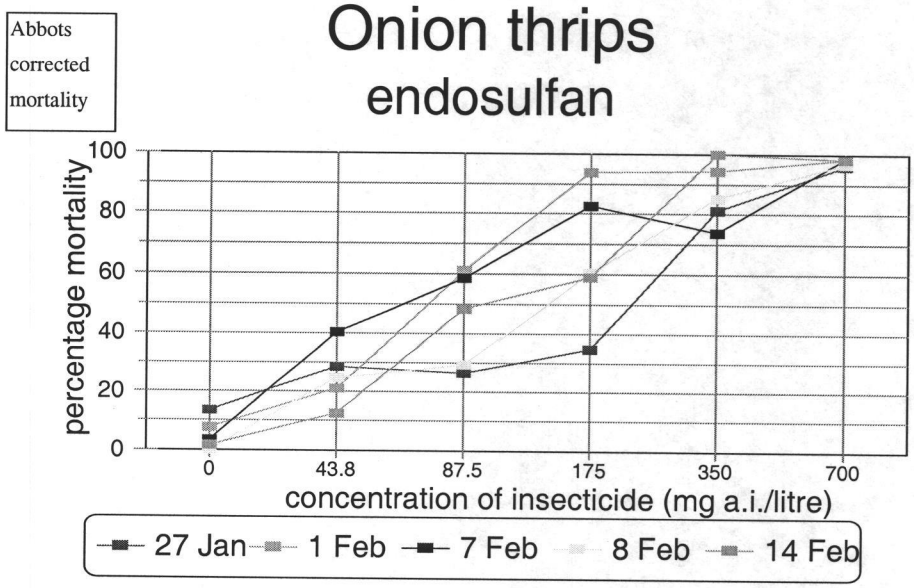

Figure 4: Dose-mortality data for susceptible onion thrips.

6 Discussion

Diagnostic doses have been determined for four of the five insecticides and have been used to screen four populations of onion thrips for resistance. In future, it should be possible to provide very quick assessments of the extent of resistance in field populations and to assist growers to select insecticides that will give effective control of thrips in their crops.

Baseline data and diagnostic doses should be determined for new insecticides registered for onion thrips control and for parathion-methyl.

7 Reference

Martin, N.A. 2000: Insecticides for the control of onion thrips—screening for resistance. *Crop & Food Confidential Report No. 218.* New Zealand Institute for Crop & Food Research Ltd, Christchurch.

8 Acknowledgements

Peter Workman and Rebecca Bush are thanked for helping to rear the thrips and conducting the insecticide experiments.