THRIPS CONTROL ON STONEFRUIT AT FLOWERING IN CANTERBURY

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SUMMARY

Protection of nectarines (*Prunus persica*) from thrips infestation and damage at flowering was investigated using the insecticides fluvalinate or phosalone (low toxicity to bees) applied at full bloom as supplements to the current recommended spray programme. Thrips were sampled by various methods from pink to shuck fall. The New Zealand flower thrips (*Thrips obscuratus*) was found to be the predominant species present. Thrips numbers were reduced on trees treated at full bloom. Export packout, based on russet only, was 10% higher from trees treated at full bloom than from those treated only with the recommended spray programme.

INTRODUCTION

Worldwide, several species of thrips have been associated with damage to stonefruit (e.g., Bailey 1938; Allman 1948; Bournier 1983). Thrips adults invade the flowers from the pink stage and lay eggs until petal fall. Adults and larvae feed on the succulent tissues of the flower until shuck fall. Feeding damage on the ovaries and small fruits result in irregularly shaped blocks of russet, sometimes associated with fine scar lines, and, in severe cases, distortion of the fruit. Nectarines are more susceptible to injury than other stonefruit as they have smooth skin and the calyx sticks tightly to the developing fruit providing protection for the thrips larvae (Bailey 1938). In New Zealand damage of this type had been erroneously attributed to the peach silver mite (*Aculus cornutus*) (Anon. 1979) until G.F. McLaren identified thrips as one of the main causes of russet on nectarines in Central Otago, where export packout from russetting can be reduced by up to 40% (McLaren, unpubl.). Russet is the most important defect of export nectarines in Canterbury (Brooks 1985).

The current recommended spray programme for thrips control at flowering involves insecticide applications at bud movement and petal fall followed by two further sprays at 10 day intervals. Insecticides are not applied when the trees are in bloom to minimise bee poisoning, although experimentation has shown that spraying at this time reduces the level of russetting (McLaren, unpubl.). McLaren found that the most severe russetting by thrips occurred between full bloom and petal fall by confining and excluding thrips from nectarine flowers and fruits with bagging experiments (Nuzum and O'Donnell 1986). A treatment at full bloom was recommended for nectarines by McLaren (unpubl.) as soon as an insecticide could be registered for use at this time.

This paper describes a field investigation of the effectiveness of two insecticides of minimal hazard to bees, phosalone and fluvalinate (Johansen *et al* 1983), applied at full bloom to control thrips and reduce russetting on nectarines in Canterbury, New Zealand.

MATERIALS AND METHODS

A nectarine (var. 'Fantasia') block of 16 rows x 37 trees at the Lincoln Springs Orchard, Canterbury, was used for the trial. Trees were about 2m high and in the second season of fruiting. The block was subject to current recommended pesticide applications including insecticides for thrips control at bud movement (lindane 50% WP, 50 g ai/100 litres; 1000 litres/ha, 19/8/86), 100% petal fall (chlorpyrifos, 50% WP, 25 g ai/100 litres; 1000 litres/ha 14/10/86) and chlorpyrifos as before (4/11/86) 21 days later. In each alternate row, three blocks of five trees were selected and randomly assigned to one of the following treatments with eight replicates of each:

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1. untreated, no additional insecticide application.
2. phosalone (Zolone 30% WP) applied at full bloom (1/10/86) (45 g ai/100 litres).
3. fluvalinate (Mavrick Aquaflow 22.3% FC) (4.46 ml ai/100 litres and Citowett (alkylaryl polyglycol ether) 25 ml/100 litres)

Treatments were applied at full bloom (1/10/86) with a motorised back-pack sprayer (Solo, Model 423). Trees were sprayed to runoff (approximately 1 litre per tree or 700 litres per ha).

Thrips were sampled nine times from pink (22/9/86) until 50% split calyx (5/11/86). Fifteen flowers were picked from one randomly selected tree of each five-tree block. The flowers were placed in an enclosed plastic cylinder and transferred to the laboratory. Thrips were extracted from the flowers by heat (50 °C for 24 h) in modified Berlese-Tullgren funnels (Teulon, unpubl.).

At 100% petal fall (14/10/86) one tree was randomly selected from each five-tree block. All branches were hand-beaten over a white plastic dish (320 mm x 280 mm), and thrips were quickly caught by aspirator and killed. Friedman's test (Hettmansperger 1984) was used to test significant differences in adult counts between treatments.

Six baited water traps were placed at regular intervals throughout the block on 25/9/86 to monitor thrips flights. These were white plastic 2 litre ice-cream containers (170 mm x 170 mm x 85 mm) placed on 1.7 m poles. A small vial (38 mm long x 15 mm dia.), containing approximately 2.5 mls of the attractant ethyl nicotinate (Penman *et al* 1982) with a cotton wool dental roll acting as a wick inside the vial, was hung over the mouth of the traps with wire. Each trap contained approximately one litre of water and a few drops of formaldehyde and detergent. Thrips were removed weekly and the fluids renewed. Trapping ceased on 29/10/86. Adult thrips from all sampling methods were identified to species.

At full bloom (2/10/86) 10 trees were randomly selected from the entire block and the total number of flowers on each was counted.

All fruit from the three treatments were assessed for russetting between 11-16/2/87 while still on the tree. Fruit was categorised as to the amount of russet using the Export Summerfruit Grade Standards 1986-87: 0-clean; 1-acceptable for export; 2-rejected for export; 3-rejected for local market. Fruit was harvested on 25/2/87 and 2/3/87. ANOVA and Duncan's new multiple-range test (Steel and Torrie 1960) were used to test significant differences in percent export packout (i.e. grades 0 and 1) between treatments.

RESULTS AND DISCUSSION

The number of adult thrips extracted from flower samples was consistently low over the period of sampling for all treatments (Table 1). Flower numbers per tree averaged 700.4 at full bloom. Therefore an average of 0.125 thrips per 15 flowers represented about six thrips per tree. However numbers were variable and standard deviations were twice the mean in some cases. Adult thrips extracted from flowers included: the New Zealand flower thrips 14 females, 3 males; the onion thrips (*Thrips tabaci*) 5 females, and the cereal thrips (*Limothrips cerealium*) 3 females. Nymph numbers on the control trees at 100% petal fall were higher than those on the treated trees and tended to remain higher after that time (Table 1). At 100% petal fall an average of 2.88 nymphs per 15 flowers were found on the control trees, or about 134 nymphs per tree. The small numbers of nymphs found on the treated trees indicated the effectiveness of the insecticide treatments in reducing oviposition by adults visiting the flowers earlier, and/or killing nymphs once they emerged.

Significant ($P < 0.25$) differences between treatments were shown by the Friedman's test. Pairwise multiple comparisons in which adult numbers were ranked (Hettmansperger 1984) showed significant differences between the untreated control and both treatments (Table 2). Both phosalone and fluvalinate applied at full bloom were effective in reducing thrips adults and nymphs during flowering when feeding damage to the small fruitlets occurs.

Several species of thrips were collected in water traps throughout the trapping period. After petal fall the New Zealand flower thrips was the most abundant species

TABLE 1: Mean numbers of adult and larval thrips on nectarine, Lincoln Springs Orchard, 1986.

Graham, 1988.							
Date	untreated		Treatment		phosalone		Remarks
	adults	larvae	adults	larvae	adults	larvae	
A. Thrips per 15 flowers (flower sample)							
19/8/86							bud movement lindane
22/ 9/86	0.0	0.0	0.0	0.0	0.0	0.0	
29/ 9/86	0.125	0.0	0.125	0.0	0.0	0.0	
1/10/86							full bloom phosalone or fluvalinate
3/10/86	0.125	0.0	0.0	0.0	0.125	0.0	
9/10/86	0.0	0.0	0.0	0.0	0.0	0.0	
13/10/86	0.5	2.88	0.125	0.0	0.0	0.625	100% petal fall
14/10/86							chlorpyrifos
16/10/86	0.0	0.625	0.0	0.0	0.0	0.0	
23/10/86	0.25	0.25	0.0	0.0	0.0	0.125	
29/10/86	0.25	0.5	0.125	0.125	0.875	0.5	
4/11/86							chlorpyrifos
5/11/86	0.25	0.0	0.25	0.0	0.0	0.0	
B. Thrips per tree (beat sample)							
14/10/86	4.13		0.5		1.13		100% petal fall

TABLE 2: Ranks of adult thrips numbers at 100% petal fall and percentage of export grade nectarines at harvest.

Treatment	Ranks of adult No's	Mean percentage export packout
untreated	22.5a ⁽¹⁾	48.2a ⁽²⁾
fluvalinate	12.5b	59.3b
phosalone	13 b	57.4b

(1) Pairwise multiple comparisons.

(2) Duncans new multiple-range test.

and the onion thrips was also trapped frequently. Of the species caught, these are the only ones though to be associated with russet in nectarines (McLaren, unpubl.). McLaren (unpubl.) also found the New Zealand flower thrips to be the predominant species of thrips on nectarine trees in beating samples from several seasons.

Both insecticides applied at full bloom produced significantly higher packout rates ($P < 0.0016$) than the untreated but were not different from each other (Table 2). The increase in percentage packout was approximately 10%. Lower russet levels on the treated trees was correlated with the reduction in number of thrips, both adults and nymphs, during flowering.

These results are comparable to a similar trial carried out in the 1985-86 season (Teulon, unpubl.) in which phosalone was also applied at full bloom. Export packout of ripe fruit was also increased by 10% in the phosalone treatment. A similar trial by McLaren (pers. comm.) in Central Otago found much lower thrips numbers and higher export packouts (83%) in the untreated controls than in this trial (48%). High thrips numbers in Canterbury may be influenced by the availability of more suitable overwintering hosts (e.g. gorse) or by the amount of warm weather prior to and during bloom. Better control of thrips can be achieved if oil is used with lindane at bud movement (McLaren, pers. comm.). In this trial only one insecticide was applied after petal fall but the effectiveness, in terms of increasing export packout, of sprays after petal fall is questionable (Rhodes and O'Donnell 1987).

CONCLUSION

Application of 'bee-safe' insecticides to nectarines at full bloom reduced the incidence of thrips infestation between full bloom and petal fall. Russet on nectarine fruits was reduced and export packout increased significantly.

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