BROAD SPECTRUM CONTROL OF INSECT PESTS IN PIP FRUIT WITH CHLORPYRIFOS

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Summary

The results of two trials with chlorpyrifos for the control of insect pests in apples in Hawke's Bay are presented and discussed. Chlorpyrifos at 12.5 and 25 gms per 100 litres gave a high level of control of mealy bug (*Pseudococcus* spp.), leaf roller (*Epiphyas postvittana*), codling moth (*Cydia pomonella*), San Jose scale (*Quadraspidiotus perniciosus*) and European red mite (*Panonychus ulmi*) when applied in a spray programme. Chlorpyrifos gave at least equal control of these pests compared with azinphos methyl, diazinon, aminocarb and phosmet.

INTRODUCTION

THE grading standards of pip fruit being exported from New Zealand demands a very high level of control of pests and diseases. This is necessary to maintain New Zealand's marketing position and thus to ensure a satisfactory return for the orchardist. A number of insecticides are currently used to control the range of insect pests affecting pip and stone fruit. No one insecticide gives complete control of all the major insect pests in New Zealand orchards. This paper presents results of two field trials on apples in Hawke's Bay to evaluate chlorpyrifos, a recently developed organophosphate insecticide, in comparison with other standard and candidate insecticides for the control of insect pests on pip fruit.

EXPERIMENTAL

Single tree plots of mature Sturmer apples were selected in a random design with 3 replications. Applications were made with a hand gun at 1400 kPa to give complete coverage to the point of run-off by applying approximately 20 litres of spray per tree. All applications were carried out in weather conditions favourable for spraying, with little or no wind and cool to mild temperatures in the early morning. All formulations used were wettable powders. A fungicide programme of thiophanate methyl (20 gm/litres) was applied with all treatments throughout the season in both trials.

Evaluation of insect control was made at harvest by picking 2 cases (35 to 40 kg) of fruit per tree in a standard representative manner. Fruit were individually examined and the numbers of each pest recorded.

Fruit finish was assessed by grading all fruit according to the standards set by the New Zealand Apple and Pear Board.

Trial 1

The first application of the spray programme was made at late petal fall. Treatments were applied October 20, November 4, 25, December 14, January 11, February 8 and 29. All treatments were harvested on April 4.

European red mite (*Panonychus ulmi*) was first observed in early November with populations increasing rapidly on the untreated control trees and on the trees treated with azinphos-methyl. A single application of tricyclohexyltin hydroxide (12.5 gm/100 litres) was applied in late November to these trees for mite control. No miticide was applied to the other treatments. Damage from leaf roller (*Epiphyas postvittana*) was first observed in late January with the general insect population in the untreated controls increasing steadily from this time.

Trial 2

The spray programme commenced at first cover. Treatments were applied October 20, November 9, 22, December 8, 20, January 9, 23, 30, February 14, 28 and finally March 23. All treatments were harvested on April 12. Insecticide treatments other than chlorpyrifos received two applications of tricyclohexyltin hydroxide (12.5 gm/100 litres) for mite control at a 14 day interval in late January.

RESULTS

Results, expressed as a percentage of infested fruit and the grading for fruit finish for both trials, are presented in Table 1.

TABLE 1: PERCENTAGE OF FRUIT INFESTED WITH VARIOUS INSECT PESTS AND FRUIT FINISH GRADING

Treatment gm/100 litres	Infested fruit %					Fruit Grading	
	Mealy bug	Leaf roller	Codling moth	Adult mite	San Jose scale	% Fancy	% Good
Trial 1:							
chlorpyrifos	25	0	0	1	—	97	3
azinphos-methyl*	37	9.4	0.2	57	—	91	9
diazinon	50	0.2	9.3	7.8	—	44.5	55.5
untreated control	—	69	29	16	87	—	90.7
LSD 5%	3.1	0.5	1.1	—	—	—	—
Trial 2:							
chlorpyrifos	25	0	0	0	0.4	99	1
chlorpyrifos	12.5	0.5	0.7	1.3	0.1	99	1
azinphos-methyl*	50	2.8	0.7	0	2.2	98	2
aminocarb*	75	3.6	0.9	0.3	1.9	98	2
phosmet*	75	1.2	2.0	0.6	2.2	99.7	0.3
untreated control*	—	70	5.7	17	11	98	2
LSD 5%	0.9	0.9	1.1	—	0.5	—	—

* Miticide treatment(s) applied.

DISCUSSION

In both trials the standard treatment of azinphos methyl gave satisfactory control of leaf roller and codling moth, (*Cydia pomonella*), but with a weakness in control of mealy bug and San Jose scale (*Quadraspidiotus perniciosus*) and no suppression of mites. Diazinon gave satisfactory control of mealy bug (*Pseudococcus* spp.) and codling moth with useful mite suppression. Control of leaf roller was inadequate.

In Trial 2, aminocarb gave satisfactory control of leaf roller and codling moth with less activity against mealy bug, San Jose scale and mites. Phosmet gave complete control of codling moth but insufficient control of leaf roller, San Jose scale and mite. Chlorpyrifos at 25 gms gave a very high level of control of all pests present in both trials. The high level of control of all pests with 12.5 gms of chlorpyrifos indicates a useful safety margin in dosage under a range of grower application conditions. Apart from diazinon, all treatments gave acceptable fruit finish.

In addition to the results presented in this paper chlorpyrifos at 12.5 and 25 gms in grower trial observations has also given excellent control of woolly aphid (*Eriosoma lanigerum*). In Trial 1 chlorpyrifos had no apparent effect on predator Ladybirds (*Stethoris* spp.). No mite predators were observed in Trial 2. Results from the commercial usage of chlorpyrifos at 25 gms in pip fruit during the 1972-73 season confirm the excellent activity of the compound through standard orchard spray equipment. As chlorpyrifos is an organophosphate insecticide, it is anticipated that the high level of mite control reported in these trials may not necessarily be maintained for a long period. A possible build up in tolerance to chlorpyrifos may occur as is the normal pattern with this class of insecticides. The general level of toxicity of chlorpyrifos is lower than several insecticides currently in widespread orchard use.

CONCLUSIONS

Chlorpyrifos shows considerable promise as a broad spectrum insecticide controlling all major New Zealand orchard insect pests as well as giving excellent control of mites. Initial grower usage in a season long spray programme on pip fruit has confirmed the trial results for insect control along with very acceptable fruit finish. Further investigations are planned to determine the activity of chlorpyrifos at lower dosages and to extend evaluation to insect pests of other fruit and vegetable crops. Effects of chlorpyrifos on predacious insects will also be examined.

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