CHLORPYRIFOS FOR INSECT CONTROL IN GRAPES AND KIWIFRUIT

C.J. SHARPE and E.A. UPRITCHARD

Ivon Watkins-Dow Limited

SUMMARY

Chlorpyrifos as an emulsifiable concentrate and a wettable powder formulation was evaluated for the control of the dominant insect pests of grapes (*Vitis vinifera*) and kiwifruit (*Actinidia chinensis* var. *chinensis*). Five trials were conducted on grapes and five trials on kiwifruit in the Poverty Bay, Bay of Plenty areas. A very high level of leaf roller (*Tortricidae* complex), greedy scale (*Hemiberlesia rapax*) and mealy bug (*Pseudococcus* spp.) control was achieved with a programme of chlorpyrifos at 0.5 kg/ha for grapes and 15-25 g/100 litres on kiwifruit.

INTRODUCTION

Insects and/or their damage are one of the major causes of imperfections in unsprayed kiwifruit. The use of a suitable insecticide can result in an almost fourfold increase in the amount of perfect fruit (Ferguson 1980).

The principal insect pests of kiwifruit are greedy scale, leafs roller (mainly *Ctenopseustis obliquana*), passion vine hopper (*Scolypopa australia*) and a native moth (*Strathmopoda skelloni*) (Ferguson and Stratton 1978). Control of insect pests in kiwifruit is currently achieved with multiple applications of azinphos-methyl and/or phosmet from October until harvest in May.

The major insect pests of grapes are mealy bug and leaf rollers, (a three species complex of *Epiphyas postvittana: Ctenopseustis obliquana* and *Planotortrix excessara*).

Control of these pests in grapes is usually by a regular programme of insecticide applications or symptomatic treatment.

Chlorpyrifos is a broad spectrum organophosphorus insecticide of moderate mammalian toxicity which is used in pip fruit for the control of a wide range of insects including leaf roller, mealy bug and scale crawlers. It has contract, ingestion and vapour activity and exhibits short residual activity on plant foliage.

METHOD

The trials reported in this paper were conducted on commercial orchards and vineyards which had a history of insect infestations.

Kiwifruit

The kiwifruit treatments were applied using a motorised pump and gun simulating orchardists' spraying methods. A No. 4 tip plate at 1700 kPa pressure was used, resulting in a fine penetrating spray. The vines were sprayed with two passes per site and using 8-12 litres of spray mix per vine. Three or more single vine replicates were used.

Trials A, B and C were done at Te Puke on pergola trained Hayward vines and Trial D was done at New Plymouth on T bar trained Hayward vines. The treatment dates are shown in Table 1.

Sampling was done by random inspection of 100 to 200 fruit and leaves off each vine. Assessments were made by visual determination of fruit damage and/or the presence of live insects on the fruit and leaves. Scale assessment was carried out with a microscope.

TABLE 1: Treatment dates of kiwifruit trials

Trial	A	B	C	D
Treatment dates	Nov 24 Dec 20 Jan 14 Jan 28 Feb 16 Mar 23	Jan 14 Jan 28 Feb 16 Mar 22 Apr 5	Nov 2 Jan 19 Feb 23 Feb 15 Mar 23 Apr 26	Dec 16 Dec 29 Jan 11 Feb 1 Feb 21 Mar 10 Apr 14 Apr 16* Apr 30
Harvest date	May 78	May 78	May 79	May 79

* Very heavy rain immediately after application necessitated a repeat treatment.

Grapes

The grape trials were conducted on a split block basis with applications made using commercial equipment. Plot size varied from 0.75 to 1.5 ha. The insecticides were applied in combination with the grower's fungicide programme. No areas were left untreated therefore the level of insect control with chlorphyrifos could only be compared with a commercial standard. Trial A was applied using airblast equipment using D6-25 nozzles at 1400 kPa and applying 1200 litres/ha.

The equipment used in Trials B, C, D, E was a boom and nozzle arrangement using hydraulic nozzles at 3000 kPa and applying 900 litres/ha. Details of the trials on grapes are presented in Table 2.

TABLE 2: Grape trials — application times and varieties.

Trial	A	B	C/D	E
Variety	Reisling Sylvaner	Reisling Sylvaner	R. Sylvaner Pinotage	Pinotage
Treatment Dates	Nov 1 Dec 5 Feb 16	Oct 20 Nov 15 Dec 18 Jan 15	Oct 20 Nov 18 Dec 23 Jan 18	Feb 17 Feb 28
Harvest date	15/3/79	15/3/79	5/3/80	15/3/79

Assessments were done by excluding the outside rows and then randomly selecting 100 bunches from the inner rows of each treatment, and from the area where infestation was most likely to occur, i.e. the centre of the fruit line. Each bunch was scored for both the presence and density of mealy bug (the only insect present at harvest).

A 0-5 scale was used where:

Scale		mealy bug*/bunch
0	=	0
1	=	1 — 5
2	=	6 — 10
3	=	11 — 20
4	=	21 — 40
5	=	► 50

* No differentiation was made between stages of development.

RESULTS AND DISCUSSION

Kiwifruit

Table 3 presents the results of greedy scale and leaf roller control

The results demonstrate a very high level of greedy scale and leaf roller control with chlorpyrifos even when infection levels were high.

TABLE 3: Greedy scale and leaf roller control in kiwifruit.

Trial Treatment	g/100 litre	Live greedy scale % Fruit infested A	B	C	D	% leaves infested A	B	C	Leaf roller damage % fruit affected A	B	C	D
chlorpyrifos WP	15	0	-	-	-	0	-	-				
chlorpyrifos WP	25	0	-	0	0.4	0	-	0	0	-	-	-
chlorpyrifos EC	15	0	0 c	-	-	0	7.5 b	-	0	-	0	0
chlorpyrifos EC	20	-	0 c	-	-	-	6.5 b	-	0	-	-	-
chlorpyrifos EC	25	0.5	0.5 bc	0	0.6	0.5	2.5 b	0	0	1.6	-	-
azinphos-methyl WP	75	0	-	-	-	0	-	-	0	3.3	0	0
azinphos-methyl WP	50	-	-	0	-	-	-	0	0	-	-	-
azinphos-methyl + phosmet	25 + 112	-	1.5 b	-	-	-	1.5 b	-	-	-	1.0	-
untreated		7.0	21.5 a	25	34	8.7	33.5 a	27	-	2.6	-	-
CV %			12*				25		1.0	6.8	47	39
										47		

Trial A/C: Excellent control of greedy scale and leaf roller was obtained with all treatments.

Trial B: Chlorpyrifos at all rates gave equal or superior control of greedy scale on the fruit to the standard phosmet/azinphos methyl treatment under severe scale infestation. As the site was not located until January, no November or December treatments were applied. Leaf roller damage was not well controlled due to the omission of the early season sprays.

Trial D: Excellent leaf roller control was obtained with chlorpyrifos under a high infection pressure. Scale control, although not complete was very good.

The excellent control of leaf roller and greedy scale by chlorpyrifos has also been demonstrated in MAF trials in 1978-79 (P.R. Sale pers comm) and by a dipping test conducted by DSIR in 1979 (A.M. Ferguson pers comm).

Grapes

The only insect present at harvest was mealy bug. The comparative results with chlorpyrifos and a commercial standard are presented in Table 4.

TABLE 4: Percentage of bunches infested by mealy bug and level of infestation within the bunch.

Trial Treatment	Rate kg/ha	A I*	A II*	B I	B II	C I	C II	D I	D II	E I	E II
chlorpyrifos 50 WP	0.5	4	1.2	0	0	4	1.0	6	3.0	4	2.3
chlorpyrifos 40 EC	0.5	-	-	-	-	8	1.0	18	1.4	-	-
dimethoate 40 EC	0.7	-	-	-	-	10	1.0	-	-	-	-
methomyl 20 NAC	0.3	-	-	40	1.8	-	-	-	-	16	3.1
aminocarb 75 WP	2.25	32	2.7	-	-	-	-	-	-	-	-
pre-treatment	-	-	-	-	-	-	-	-	-	80	4.7

* I % bunches infested with mealy bug. II infestation scale (see text).

No imcompatibility with fungicides or phytotoxicity symptoms were observed.

Mealy bug life cycles vary between species. *P. calceslariae* is probably the dominant species in Poverty Bay (J. Charles pers comm). This species appears to have at least three generations, the first, crawlers, emerging about the end of October, the second in December and the third in January/February. The results demonstrate that an insecticide programme with applications timed to bud movement, late December and mid January (before the bunches close) gave adequate mealy bug control. An indepth study of the various species is required to define the timing of the insecticide applications necessary to encompass the variations in life cycles.

In Trial E a marked degree of control was achieved with a double application 11 days apart to a heavy infestation of mealy bug despite the difficulty in obtaining coverage once the bunches had closed.

Applications of insecticide may be required outside those suggested for mealy bug to control leaf roller which may attack grapes at any stage of growth.

CONCLUSION

The use of chlorpyrifos as either the wettable powder or emulsifiable concentrate in spray programmes at 0.5 kg/ha on grapes and 15-25 g/100 litres on kiwifruit gave a high level of control of mealy bug on the former and both greedy scale and leaf roller on the latter providing an alternative insecticide to the presently used standard insecticides for these crops.

ACKNOWLEDGEMENTS

Thanks are due to the willing cooperators who made sites available for the trials and to the staff of Ivon Watkins-Dow Limited Research Division who conducted the trials.

REFERENCES

Ferguson, A.M. and Stratton, A.E., 1978. Insect control on kiwifruit. Part 1. *Proc. 31st NZ Weed and Pest Control Conf.:* 135-9.

Ferguson, A.M., 1980. Major causes of imperfections in Bay of Plenty kiwifruit crop. *Proc. 33rd NZ Weed and Pest Control Conf.:* 92-5.