TRIALS WITH PIRIMIPHOS—METHYL/PERMETHRIN ON KIWIFRUIT

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SUMMARY

In 1981/82 and 1982/83 block trials using the insecticide mixture pirimiphos-methyl/permethrin were conducted on kiwifruit (*Actinidia chinensis*). As well as examining control of the principal insect pests under conditions of grower application, the trial blocks were surveyed for mite presence and abundance. A range of mite types were recovered, with considerable numbers of the pest family Tetranychidae (chiefly twospotted mite *Tetranychus urticae*) and also of the non-damaging groups, Tydeidae (*Tydeus* spp) and Oribatei. The latter can pose a quarantine threat. Numbers of tetranychids and tydeids were lower in blocks sprayed with pirimiphos-methyl/permethrin than in comparable blocks sprayed with the currently recommended programme.

INTRODUCTION

Pirimiphos-methyl plus permethrin (Attack 50% EC 47.5 g ai pirimiphos-methyl and 2.5 g ai permethrin per litre) has been shown in previous small scale trial work to give a level of control at least comparable to the current standard programme used in kiwifruit orchards (Smith and Graham 1980). The main insect pests of concern in kiwifruit are leafrollers (principally the brownheaded leafroller, *Ctenopseustis obliquana*), greedy scale (*Hemiberlesia rapax*) and passionvine hopper (*Scolypopa australis*) (Ferguson and Stratton 1978). The presence of insects such as greedy scale or leafrollers, or damage due to leafroller feeding, is not permitted in export fruit. Similarly kiwifruit contaminated by sooty moulds (fungi which develop on honeydew excreted by the passionvine hopper) are graded out of export lines.

In the pipfruit industry the use of insecticides containing synthetic pyrethroids is known to kill predator mites (e.g. *Typhlodromus pyri*) that exert a controlling influence on the populations of pest mites such as the European red mite (*Panonychus ulmi*) (Chapman and Penman 1979). These mite predators have developed a high level of tolerance to the commonly used organophosphate insecticides (e.g. azinphos-methyl) due to many years of prolonged exposure. Application of an insecticide containing a synthetic pyrethroid (such as permethrin) can kill these predators and allow an upsurge of pest mites, resulting in tree damage. In kiwifruit however, mites are currently not a problem, but in order to investigate this fully before pirimiphos-methyl/permethrin was used on export kiwifruit crops, an intensive study of mite populations was initiated in the 1981/82 season, with a follow-up study in the 1982/83 season. (As no miticide is currently registered for use on export kiwifruit, it was important to ensure that no problems with mite populations could result, because it would take several seasons to get a suitable miticide through the registration process). For this research it was preferable to use large-scale block trials, which also enabled this insecticide to be compared with the currently recommended programme under the conditions of grower application.

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METHOD

Blocks of varying age, layout and locality were included in the trials. A total of eleven properties were surveyed in 1982; two of these were carried on through the 1983 season and one new property was included. In each orchard the block sprayed with the pirimiphos-methyl/permethrin programme was compared with a block sprayed with the currently recommended MAF programme. This block was selected on the basis that it bore the closest possible similarity, especially with regard to shelter species. The shelter is suspected as having a major influence on the mite populations in a block (Steven 1982).

Assessments of the insect control achieved were made at harvest in 1982 by closely inspecting 500 fruit randomly selected from each block. Three hundred mature kiwifruit leaves were taken at random from nine of the eleven properties in the 1982 season, for inspection for the presence of greedy scale.

In the 1983 season, the sampling procedure used, was to inspect the fruit while still on the vines. A larger number of fruit (approximately 700) were inspected, particularly those fruit in the areas more likely to sustain insect damage, such as those in large clusters, among leaves, or against supporting structures.

Assessments of mite populations were carried out three times between January and May of each season. The 1982 survey covered populations of all mites occurring in the following situations: (i) the surrounding shelter, (ii) the host weeds under the shelter, (iii) the host weeds under the vines, (iv) the leaves of the vines. In 1983, only the populations of the mites on the kiwifruit leaves were surveyed.

The results in Table 1 show that over two seasons, a programme of pirimiphos-methyl/permethrin has provided a level of control of the commonly occurring insect pests of kiwifruit, that is comparable to the currently recommended MAF programme. In the 1982 season one of the orchards included in the trial, missed a spray at the early fruit development stage. This, coupled with a high pest pressure from an adjoining barberry (*Berberis* sp.) hedge resulted in a higher incidence of both leafroller damage and greedy scale, than in other orchards, thus raising the average level of pest incidence shown in Table 1.

TABLE 1: Insect control level assessment results at harvest.

Harvest Year	Leafroller ‰ Incidence		Sooty mould ‰ Incidence		Greedy scale (Fruit) ‰ Incidence		Greedy scale (Leaves) ‰ Incidence	
	MAF*PM/P**		MAF	PM/P	MAF	PM/P	MAF	PM/P
1982	0.7‰	0.9‰	0	0	0.1‰	0.1‰	0.4‰	0.9‰
1983	0	0	0	0	0	0	0	0

* MAF insecticide programme

** Pirimiphos-methyl/permethrin programme

The summarised results of the mite population survey presented in Table 2, show a noticeable suppression of numbers of tetranychids (mostly twospotted mite) by the pirimiphos-methyl/permethrin programme compared to the MAF programme in 1982, but in 1983, these numbers were similar. The tetranychid mites were the only pest mites found in the surveys and kiwifruit vines are not a preferred host plant for twospotted mite.

Oribatid and tydeid mites are generally understood to be scavengers, or to feed on fungi and algae, but are of interest in this survey because of the quarantine problems they can create if found on exported kiwifruit. Oribatids in particular have caused concern with regard to this aspect. Tydeid mite numbers showed a high level of suppression from the pirimiphos-methyl/permethrin programme whereas oribatid mite

numbers showed no difference. In the 1983 season oribatid numbers were generally higher under the MAF programme, but variability between orchards was high.

There were fewer predator mites on samples from the pirimiphos-methyl/permethrin programme in 1982 and 1983. In part, this would reflect the lower numbers of prey mites in these samples. The ratio of predator mites to prey varied considerably, and without a discernible pattern. (Two-spotted mites and tydeids were considered to be the major prey groups and were put together for this calculation.)

The principle predator found in these surveys was an agistemid mite, *Zetzellia* sp.. Phytoseiid mites, which include the predatory mites used in integrated mite control programmes on pipfruit and in glasshouses, were not found on kiwifruit in the 1982 season, except on a block that was unsprayed. In the 1983 season, a very small number of live phytoseiid mites were found in the May sample from a block sprayed with the MAF programme.

TABLE 2: Survey of mite populations in 1982 and 1983

Assessment dates	Kiwifruit leaf counts					% infested	
	Spray programme used	Tet ¹	Tyd ²	Ori ³	Pred ⁴	Weeds under shelter and vines	Shelter leaves
1982							
Jan	PM/P**	1.5	12	6	0.3	10	13
	MAF*	0.9	13	5	1.6	22	17
Feb	PM/P	13	3	7	0.6	28	30
	MAF	52	53	11	1.5	50	38
April	PM/P	19	7	12	3.0	33	67
	MAF	115	204	15	20	36	68
1983							
Feb	PM/P	120	3.5	12	1.5		
	MAF	97	105	53	1.0		
March	PM/P	68	46	18	3.5		
	MAF	81	87	26	37		
May	PM/P	18	5	7.5	6		
	MAF	15	76	25	63		

1. Tetranychids (probably twospotted mite). 2. Tydeid mites. 3. Oribatid mites. 4. Predator mites.

* MAF insecticide programme

** Pirimiphos-methyl/permethrin programme

CONCLUSIONS

Insecticide spray programmes of pirimiphos-methyl/permethrin on kiwifruit have provided a comparable level of control of the commonly occurring insect pests, to the current recommended standard programme.

The use of an insecticide mixture containing a synthetic pyrethroid (permethrin in this case) has given noticeable suppression of tetranychid mites in the first season of use, when compared to the standard programme and a similar population level in the second season of usage. The numbers of tydeid mites have shown a high level of suppression in both seasons, while oribatid numbers have not been affected in either season.

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