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CONTROL OF PEAR SUCKER 1993

Undertaken for the APRC

CONTENTS

	Page No.
SUMMARY	1
INTRODUCTION	1-2
MATERIALS AND METHODS	2-4
RESULTS	4-8
DISCUSSION	9-10
CONCLUSIONS	10
RECOMMENDATIONS	10
ACKNOWLEDGEMENTS	10
REFERENCES	10-11
DATA STORAGE	12

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Authentication

I declare that this work was done under my supervision according to the procedures described herein and that this report represents a true and accurate record of the results obtained.

.....J.V.Cross..... J.V. Cross

Signature

Date .....16 November 93.....

CONTROL OF PEAR SUCKER 1993

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SUMMARY

Two small plot replicated orchard experiments were done in 1993 to investigate the activity of single foliar sprays of AC801757 (100 g ai/ha), Insegar (150 g ai/ha), Consult (40 g ai/ha), Nemolt (225 g ai/ha) or Applaud (125 g ai/ha), or of an application of UK585 (0.25 g ai/tree) to the tree trunk, for control of pear sucker nymphs in comparison with a standard foliar spray of Dimilin WP (plus wetter) or Mitac 20. The volume rate for foliar spray applications was 500 l/ha.

Of the novel treatments tested, AC801757 gave effective short term remedial control of nymphs in both experiments, and Nemolt gave the greatest longer term reduction. The other novel products gave small, but statistically significant, reductions in numbers of nymphs in one of the experiments. The standard Mitac 20 spray was the most effective treatment, but the effectiveness of Dimilin WP was limited, at least in the short term. No phytotoxicity symptoms were observed and no long term effects of any of the treatments on Anthocorid predation were determined. It is recommended that priority should be given to further investigation of AC801757 and Nemolt if supported by Agrochemical companies. Further investigation of the other compounds, at higher doses, is also warranted. The effectiveness of the standard Dimilin WP treatment should also be further investigated in view of its widespread and frequent use by growers.

INTRODUCTION

The pear sucker, *Cacopsylla pyricola,* is the most important pest of pears in the UK. Biology and crop damage are given by Anonymous (1992). Populations are almost universally resistant to organophosphate and carbamate insecticides which developed over 20 years ago (Solomon *et al.*, 1978). Resistance to pyrethroids, well known in other countries (Harries and Burts, 1978; Burts *et al.*, 1989), is believed to be widespread, though these are now rarely used in summer. Anthocorid predatory bugs are encouraged to suppress pear sucker populations, but on most crops in most years at least one application of a selective insecticide specifically against this pest is required. Anthocorid predators are not fully reliable, and their migration into orchards is sometimes too late for adequate natural suppression. Two insecticide products, Mitac 20 (amitraz) and Dimilin WP (diflubenzuron), are used by growers. These are selective with little harmful effect on the predators. They appear to be active only against young stages. The degree

of control achieved is often disappointing, especially when the temperature is low at the time of application. Pear sucker control is one of the costliest components of the crop protection programme on pears. Furthermore, in most years a small but variable number of growers suffer severe contamination of their fruit by honeydew and a lesser degree of contamination occurs in many orchards.

A wider range of effective pesticide products with selective activity is needed for pear sucker control in the UK. Previous research has identified a small number of promising selective compounds. Nemolt (teflubenzuron), a chitin synthesis inhibitor closely related to Dimilin (diflubenzuron), has been shown to be effective by several workers (Solomon and Fitzgerald, 1988; Solomon *et al.*, 1989; Larguier, 1990). It is slow acting, significant reductions in numbers of nymphs becoming apparent only 2 to 3 weeks after application. However, Nemolt is not Approved for use on pears in the UK, although it is available and Approved for other uses. Juvenile hormone analogues have also been shown to have significant activity (Baggiolini *et al.*, 1979; Massardo *et al.*, 1983). One persistent analogue, fenoxycarb, has previously given good results in UK trials (Solomon and Fitzgerald, 1990) and in Europe (Staubli, 1986). A number of other selective compounds also require evaluation (Sterk, 1992). Here the results of two replicated field experiments to investigate the activity of a range of novel selective products in comparison with commercial standards are reported.

MATERIALS AND METHODS

The two experiments were done in commercial pear orchards on the cultivar Conference. The sites, chosen because growers reported a long history of serious infestations by pear sucker, were at Elverton Farm, Teynham, Sittingbourne, Kent (site 1) and Nicol Farm, Teynham, Sittingbourne, Kent (site 2). The planting system was single rows at both sites, 3.65 x 3.65 m spacing (≡ 751 trees/ha) at site 1 and 4.3 x 4.3 m spacing (543 trees/ha) at site 2. The rootstock was quince A, and the orchards were both well established and at least 30 years old.

Treatments (table 1 overleaf) were single foliar sprays of aqueous solutions of the pesticide products tested (table 2 overleaf) applied on 21 June 1993 at site 1 and 12 July at site 2, except for treatment 6 (UK585). An aqueous solution of UK585 was painted in a 10-15 cm wide band 30 cm from ground level round the trunk of each treated tree with a paint brush on 21 April 1993 at both sites. Foliar spray applications were made with a JLO Tronic motorised air-assisted knapsack sprayer (no 3 flow rate regulator) at a volume rate of 500 l/ha to simulate commercial medium volume spray application. The sprayer incorporates an air sheer nozzle producing a very fine spray quality. Actual spray volume rates were generally within 10% of target.

Table 1. Treatments

Treatment number	Product	Product dose/ha	Date of application (1993)	
			Site 1	Site 2
1	Dimilin WP	600 g	21 June	12 July
2	Mitac 20	3.5 l	21 June	12 July
3	AC801757	500 g	21 June	12 July
4	Insegar	600 g	21 June	12 July
5	Consult	400 ml	21 June	12 July
6	UK585	2.5 ml/tree#	21 April	21 April
7	Nemolt	1.5 l	21 June	12 July
8	Applaud	500 ml	21 June	12 July
9	Untreated	-	-	-

Painted on tree trunk

Table 2. Pesticide products used for treatments

Product	Manufacturer/ supplier	Active ingredient	Formulation	Approval status*
Dimilin WP	Zeneca	diflubenzuron	25% w/w WP	Approved
Mitac 20	Schering	amitraz	200 g/l EC	Approved
AC801757	Cyanamid	fenpyrad	20% WG	Not Approved
Insegar	Ciba-Agriculture	fenoxycarb	250 g/kg WP	Not Approved
Consult	Dow-Elanco	hexaflumuron	100 g/l SC	Not Approved
UK585	Bayer	'coded'	100 g/l EC	Not Approved
Nemolt	Shell Chemicals UK	teflubenzuron	150 g/l EC	Not Approved
Applaud	Zeneca	buprafezin	250 g/l SC	Not Approved

* For use on pears in UK

Randomised complete block experimental designs with four replicates were used. Plots consisted of 4 adjacent trees at both sites, but records were taken only from the centre two trees, the outer trees acting as guards. Plots were arranged end to end in a row for each block, blocks occurring in adjacent rows. An anti-drift screen (2.1 x 1.7 m) was used to prevent interplot contamination by drift at the time of spraying.

A random sample of twenty older, fully-expanded truss leaves and twenty younger fully-expanded leaves from shoots was taken 4 and 22 days after treatment (d.a.t.) at site 1, and 4 and 14 days after treatment at site 2. The number of live pear sucker nymphs, and, at the second assessment, the number of eggs, were counted. Numbers of Anthocorid adults and nymphs were also counted. Trees were examined for signs of phytotoxicity. At site 2 an additional assessment of Anthocorid populations was made on 23 July 1993, 11 days after application of spray treatments. Four beating tray samples were taken per plot in the usual way and the number of Anthocorid adults and nymphs counted.

Analysis of variance was done on the data. This was satisfactory for most of the data, except for the second pear sucker assessment at site 2 in which numbers were low and erratic with no obvious differences apparent.

RESULTS

At site 1, large numbers of pear sucker nymphs and eggs and very few Anthocorid predators were present at the time of treatment. Leaves and fruit were starting to become sticky with honeydew. By 4 days after treatment, the Mitac, AC801757, Insegar and Dimilin treatments had significantly ($P < 0.05$) smaller numbers of live nymphs per leaf than the control, though differences due to Dimilin or Insegar were small (table 3 overleaf). Results on young and old leaves were similar. Small numbers of Anthocorid predators were recorded (table 6). By the second assessment, 22 days after treatment, numbers of nymphs had declined even on the untreated control plots. Populations of Anthocorid predators had increased. At this stage there were significantly less live nymphs on plots treated with Dimilin, Mitac, Consult or Nemolt. There were also significantly more eggs recorded on plots treated with Dimilin, Mitac, AC801757 or Insegar (table 5).

At site 2, numbers of pear sucker nymphs were initially lower than at site 1 and there were larger numbers of Anthocorid predators on all plots at the time of treatment. By the first assessment, 7 days after treatment, numbers of live nymphs were significantly smaller on Mitac or AC801757 treated plots (table 4) on both old and young leaves. None of the other treatments significantly reduced numbers. By the second assessment 14 days after treatment, numbers of nymphs had sharply declined on all plots and there were no significant treatment differences. There were no treatment differences between numbers of eggs at the second assessment (table 5).

Table 3. Mean numbers of live pear sucker nymphs per leaf at site 1

Treatment number	Product	First assessment (4 d.a.t.)			Second assessment (22 d.a.t.)		
		old leaves	young leaves	mean	old leaves	young leaves	mean
1	Dimilin WP	6.1	7.5*	6.8*	1.1*	1.8*	1.4*
2	Mitac 20	1.0*	0.5*	0.7*	0.5*	1.3*	0.9*
3	AC801757	1.7*	2.4*	2.0*	2.3	2.9	2.6
4	Insegar	3.1*	9.2*	6.2*	1.4*	2.8	2.1
5	Consult	4.9	11.2	8.0	1.2*	1.8*	1.5*
6	UK585	6.1	12.4	9.2	2.2	1.8*	2.0
7	Nemolt	4.4	10.9	7.6	0.7*	0.6*	0.6*
8	Applaud	4.5	10.8	7.7	2.6	1.6*	2.1
9	Untreated	6.1	12.2	9.1	2.2	3.8	3.0
s.e.d. (24 d.f.)		0.96	1.47	1.03	0.40	0.79	0.50

* significantly less than untreated ($P < 0.05$) note: d.a.t. = days after treatment

Table 4. Mean numbers of live pear sucker nymphs per leaf at site 2

Treatment number	Product	First assessment (4 d.a.t.)			Second assessment (14 d.a.t.)		
		old leaves	young leaves	mean	old leaves	young leaves	mean
1	Dimilin WP	3.5	2.1	2.8	0.08	0.10	0.09
2	Mitac 20	1.3*	0.8*	1.0*	0.18	0.06	0.12
3	AC801757	1.8*	1.2*	1.5*	0.19	0.20	0.19
4	Insegar	2.8	2.4	2.6	0.03	0.10	0.06
5	Consult	3.5	3.0	3.2	0.15	0.20	0.18
6	UK585	3.2	3.2	3.2	0.10	0.10	0.10
7	Nemolt	3.2	2.8	3.0	0.04	0.16	0.10
8	Applaud	3.8	2.5	3.1	0.15	0.13	0.14
9	Untreated	3.0	2.6	2.8	0.14	0.23	0.18
s.e.d. (24 d.f.)		0.45	0.54	0.39	-	-	-

* significantly less than untreated ($P < 0.05$) note: d.a.t. = days after treatment

Table 5. Mean number of pear sucker eggs per leaf

Treatment number	Product	Second assessment	
		site 1 22 d.a.t.	site 2 14 d.a.t.
1	Dimilin WP	10.2	0.62
2	Mitac 20	13.0*	0.62
3	AC801757	13.4*	0.80
4	Insegar	17.5*	0.78
5	Consult	8.4	1.04
6	UK585	5.1	0.62
7	Nemolt	6.5	0.80
8	Applaud	5.5	1.00
9	Untreated	6.9	0.87
s.e.d. (24 d.f.)		2.65	0.46

* significantly greater than the control ($P < 0.05$)

note: d.a.t. = days after treatment

Table 6. Mean numbers of Anthocorid adults and nymphs recorded per plot

Treatment number	Product	site 1 (/40 leaves)		site 2 (/40 leaves)	site 2 (/4 beats)
		4 d.a.t.	22 d.a.t.	4 d.a.t.	11 d.a.t.
1	Dimilin WP	1	0	6	56
2	Mitac 20	0	2	1	38
3	AC801757	0	3	3	57
4	Insegar	0	2	4	56
5	Consult	0	8	1	49
6	UK585	0	5	3	50
7	Nemolt	2	1	2	28
8	Applaud	2	7	9	61
9	Untreated	0	4	11	81

note: d.a.t. = days after treatment

DISCUSSION

The experiments were designed to explore possible differences in the efficacy of the products tested in controlling established infestations of pear sucker nymphs. Heavy infestations were present at the time of treatment, especially at site 1, including large numbers of eggs, nymphs and adults. Nymphs were actively secreting honeydew at a high rate which was causing serious contamination of the fruits. At this time numbers of Anthocorid predators were very low, but increased markedly in the two to three weeks after treatment. This caused populations of pear sucker to decline, even on the untreated controls, so reducing possible longer-term treatment differences. In this respect the experiments did not adequately test the long term activity of treatments. The reason for the significantly larger numbers of pear sucker eggs at the second assessment at site 1 is not clear.

The Mitac 20 and AC801757 treatments gave the greatest short term reduction in numbers of nymphs in both experiments. These treatments were the only ones of those tested which could be regarded as commercially satisfactory for remedial treatment of heavy infestations of nymphs. Temperatures were favourable for activity of the Mitac 20. Commercial experience has indicated that best results are achieved when the temperature is high (>20°C) at the time of application. The AC801757 treatment was the most promising novel compound tested. The dose rate tested in these experiments (100 g ai/ha) was 7 times lower than that of the Mitac 20 standard (700 g ai/ha). However, the novel product did not appear to be persistent as numbers were not significantly less than the control by the time of the second assessments.

Results with Dimilin and Insegar were disappointing and, in the latter case, at variance with the recent findings of other workers. In the short term, numbers of nymphs were less than on the control at site 1, but differences were small. The Dimilin did appear to have persistent activity because relative differences were greater by the second assessment at this site. Dimilin has given poor results in previous published experiments (Riedl and Hoying, 1989). Also, the manufacturers recommended dose rate (previously 2 kg product/ha) has been greatly reduced since 1989 (now 600 g/h); though the lower rate is now supplemented by addition of an adjuvant non-ionic wetter. Resistance of *Cacopsylla pyri* (a closely related species predominating in other European countries) to Dimilin WP is rumoured to be widespread in Europe. The activity of Dimilin WP, widely used by UK growers, deserves closer investigation.

Nemolt, a chitin-synthesis inhibitor closely related to Dimilin WP, also had persistent activity. Numbers of nymphs recorded at the second assessment at site 1 were smaller than for Dimilin WP, though differences between the products were not statistically significant. This product, already available in the UK though not registered for use on fruit crops, deserves further investigation.

Small statistically significant reductions in numbers of nymphs also occurred with the Applaud and Consult treatments at site 1. Though perhaps the least promising of the novel compounds tested they were used at low dose rates (as

advised by manufacturers) in these experiments. Further investigations at higher dose rates are warranted. Similarly, the UK585 was tested at what appears a very low dose (0.25 g ai/tree) painted on the tree trunks long before assessment.

CONCLUSIONS

* Of the novel products tested, the AC801757 showed the greatest short term activity in remedial control of nymphs.

* Nemolt, though slower acting, also had useful longer term activity.

* The other novel products tested only appeared, at best, to have limited activity.

RECOMMENDATIONS

Experiments should be done in 1994/95 to further investigate the remedial and preventive activity of the novel products for control of pear sucker. Priority should be given to AC801757 and Nemolt, though further investigation of the other products (at higher dose rates or of multiple application) and other novel compounds should be included if supported by Agrochemical Companies. In Italy, Brolini *et al.*, (1990) have shown that sodium-dioctyl-sulfosuccinate (a component of domestic detergent and soap products) has useful activity against *Cacopsylla pyri*, the predominent european species. This compound also deserves investigation. The activity of Dimilin should also be investigated in view of its widespread and frequent use by growers.

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DATA STORAGE

Data are stored in the Entomology Department, HRI East Malling.