Project SP116: Effects of fungicides against apple sawfly 1998

Contractor: Horticulture Research International – East Malling

Project Staff: J V Cross, Dr C N Jay

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Summary

Previous research in the UK and in Poland showed that certain fungicides have insecticidal activity against apple sawfly. An orchard experiment tested the efficacy of a wider range of approved fungicides, applied during blossom for the control of apple sawfly. The experiment was conducted in apple orchards (cv. Discovery) in Kent, in 1998. The fungicides tested were Systhane 6 Flo (1.5 l/ha myclobutanil 60 g/l EW), Topas 100 EC (2 kg/ha penconazole 100 g/l EC), Bayleton (0.2 kg/ha triadimefon 25 % w/w WP), Dorado (400 ml/ha pyrifenox 200 g/l EC), Rubigan (330 ml/ha fenarimol 120 g/l), PP Captan 80 (3.4 kg/ha captan 80% w/w) and Defensor FL (500 ml/ha carbendazim 500 g/l SC). These were applied as single foliar sprays at a volume of 200 l/ha with an air-assisted tree and bush fruit sprayer.

At Nichol Farm, the infestation of apple sawfly was too small for assessment but at Culnels Farm the infestation of apple sawfly was adequate to test the efficacy of the treatments. A mean of 20% of the trusses on the untreated control plots were infested. All the fungicides reduced the % trusses infested significantly by (30–60%) but there were no statistically significant differences between the fungicide treatments. Differences between treatments might have been obtained if the treatments had been applied later to coincide better with the peak flight of the pest, which was delayed by wet weather conditions. A series of sprays is likely to be needed to ensure more commercially acceptable control. Because they may have only low to moderate efficacy against apple sawfly, fungicides should not be relied upon for the control of damaging attacks of sawfly until further research has been done to optimise their method of use.

Introduction

Apple sawfly is a key pest of apple. It can be controlled by a spray of HCH (Gamma-Col) or carbaryl (Thinsec) at or shortly after petal fall. The approval for HCH is to be reviewed shortly and Zeneca Crop Protection, the manufacturer, has decided not to defend its continued registration and to withdraw their product from the UK market. Old stocks can be used until the end of 1999. Growers are unwilling to use carbaryl except where thinning is required. Previous APRC-funded work (Cross, 1993; 1995) demonstrated that other available insecticides, such as OPs, are of only moderate efficacy. Owing to their toxicity to bees, OPs have to be applied after petal fall when the pest is more difficult to control. However, the research also showed that an early bloom spray of the fungicide thiophanate-methyl was surprisingly effective against apple sawfly.

Research in Poland (Olszak & Maciesiak, 1996) has shown that certain fungicides (fenarimol, cyproconazole + captan and thiophanate-methyl) are highly effective (>93% control) in reducing damage caused by apple sawfly to apple. The fungicides were most effective when applied at the peak of the flight of the pest, which usually occurred at the pink bud growth stage. Flight activity was monitored using white sticky 'Rebel^{R} bianco' traps.
Research is needed to validate the findings of the Polish experiments under UK conditions and to evaluate the effects of a wider range of fungicides approved for use on apple in the UK. The aim of the work described in this report was to evaluate the efficacy of single foliar sprays of the fungicides Systhane, Topas, Bayleton, Dorado, Rubigan, Captan and Defensor FL applied at the peak flight of the adults against apple sawfly.

Methods and Materials.

The peak of the apple sawfly flight period was monitored using white sticky traps (Graf *et al*., 1995) at five sites across Kent. The experiment was done in established Discovery apple orchards at two sites; Culnels Farm, Iwade, Kent and Nichol Farm, Teynham, Kent. The orchard at Culnels Farm was Discovery on M26 rootstocks with 1 in 9 George Cave as a pollinator. The orchard at Nichol Farm was Discovery on M9 rootstock with 1 in 9 James Grieve and Crab Apple as pollinators. Both sites had a history of infestations of apple sawfly and sawflies were found on white sticky traps placed in the orchard, albeit in small numbers.

Treatments comprised single foliar sprays of a range of seven fungicides and an untreated control (Tables 1*a* & 1*b*). Treatments were applied on 28 April 1998 at Culnels Farm and 6 May 1998 at Nichol Farm, at the early bloom and full bloom stages respectively.

Table 1*a*. Treatments.

Product	Company	Active Ingredient	Formulation	Product dose (l or kg/ha)
Systhane 6 Flo	Promark	myclobutanil	60 g/l EW	1.5 l
Topas 100 EC	Ciba Agric.	penconazole	6% w/w WP	2 kg
Bayleton	Bayer	triadimefon	100 g/l EC	0.2 kg
Dorado	Zeneca	pyrifenox	25% w/w WP	0.4 l
Rubigan	DowElanco	fenarimol	200 g/l EC	0.33 l
PP Captan 80 WG	Zeneca	captan	120 g/l	3.4 kg
Defensor FL	Tripart	carbendazim	80 % w/w	0.5 l
Untreated control		-	-	-

Table 1*b*. Classes of fungicides for the treatments.

A.I.	Class	Target disease
myclobutanil	D.M.I.*	Powdery mildew + Scab
penconazole	D.M.I.	Powdery mildew
triadimefon	D.M.I.	Powdery mildew
pyrifenox	D.M.I.	Powdery mildew + Scab

fenarimol	D.M.I.	Powdery mildew + Scab
captan	phthalimide	Scab
carbendazim	benzimidazole	

*D.M.I. = Demethylation Inhibitor

The design of the experiment was a randomised block with five replicates. Plots consisted of five adjacent trees in a row at Culnels Farm and nine adjacent trees at Nichol Farm. The trees which were assessed were guarded on each side by an unsprayed row and at each end by a treated tree (i.e. five trees were sprayed, but only the central three were used for assessment). Sprays were applied at 200 l/ha using a Solo 436 self propelled air assisted mini sprayer adapted for spray application to small plot tree and bush fruit experiments (Cross and Berrie, 1995). The sprayer was calibrated before spraying and the volume of spray applied was determined by measuring the sprayer tank volume before and after applications of each treatment. The accuracy of application of each treatment was calculated (observed volume applied as % required volume) (Table 2). The air temperature, relative humidity (determined using a whirling psychrometer) and windspeed (2m height) were measured before and after application of the treatments (Table 2).

Table 2. Accuracy of spray applications and meteorological conditions at time of treatment application.

		Culnels Farm	Nichol Farm
Accuracy of spray application (%)			
Systhane		106.4	97.0
Topas		96.0	91.4
Bayleton		105.4	97.7
Dorado		112.3	96.3
Rubigan		105.8	99.1
Captan		93.6	100.3
Defensor		95.1	99.2
Meteorological conditions			
Air temp °C	- start	12	15
	- end	14	18
RH%	- start	78	80
	- end	60	73
windspeed (ms^{-1})		0.9	1.3

Effects of the treatments were assessed at the fruitlet stage on 26 May 1998 at Culnels Farm and on 27 May 1998 at Nichol Farm. The numbers of fruitlets per truss damaged by sawfly larvae and the total numbers of fruitlets per truss were assessed for 100 trusses per plot (3 trees were assessed per plot at Culnels Farm and 7 trees were assessed per plot at Nichol Farm).

The data were analysed by analysis of variance using the Genstat statistical package (Payne *et al*., 1987).

Results

The numbers of apple sawfly adults were generally small at all sites and below the economic threshold of 20-30 adults per trap determined for the Rebel trap design. This may have been due in part to the wet weather conditions around the blossom period. Although small numbers of sawfly were found at Nichol Farm, there was no damage on the untreated plots and so the treated plots were not assessed. Attacks were moderately severe at Culnels Farm with 20% of trusses infested by larvae on the untreated control plots. All treatments reduced the mean percentage of trusses infested with larvae significantly compared to the control. Rubigan had the lowest mean % trusses infested though differences from the other treatments were not significant (Table 3). Each infested truss had between 1-3 damaged fruitlets.

Table 3. Mean % trusses infested with apple sawfly larvae at Culnels farm, Iwade.

Treatment	% trusses infested
Untreated	20.2
Topas	13.8
Dorado	13.6
Bayleton	11.4
Rubigan	8.6
Defensor FL	10.4
Systhane	10.6
PP Captan	12.0
S.E.D. (28 d.f.)	2.8

Discussion and Conclusions

This work shows the potential of using fungicides to give some control of apple sawfly. It also highlights the importance of timing the application to coincide with the flight periods to achieve optimum control. In this season, a later spray application, or a second application, may have increased the efficacy of the treatments as the peak flight of the pest was delayed by wet weather conditions. A series of sprays is likely to be needed to ensure a more commercially acceptable level of control. Olszak & Maciesiak (1996) found that Rubigan gave better control than other fungicides tested and our results confirm that finding. In our experiment, the fenarimol product used was Rubigan (120 g a.i./l SC) which was applied at 330 ml product/ha. Olszak & Maciesiak (1996) used Rubigan 12 (120 g a.i./l EC) at 450 ml/ha. Fungicides provide an ideal alternative to insecticides for sawfly control as they can be sprayed during bloom with no adverse effects on bees and with a number of applications approved. Fungicides may also be less harmful to beneficial insects which are important in an integrated pest control system. At present, there is little information on the mode of action of the fungicides, although it has been suggested that egg development is restrained and larval development is reduced; other modes of action such as a repellent or an antifeedant effect may also occur.

In view of their possible low to moderate level of efficacy, fungicides cannot be relied upon to control damaging attacks of sawfly until further research has been done to optimise their method of use.

Recommendations

Further experiments are needed to confirm the results of the experiment reported here and to improve the timing of the treatments.

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