

# INTEGRATED CONTROL OF THE FRUIT-TREE LEAF ROLLER, *ARCHIPS ARGYROSPILUS* (WALKER), AND THE EYE-SPOTTED BUD MOTH, *SPILONOTA OCELLANA* (DENIS & SCHIFFERMULLER)

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## ABSTRACT

Pre-bloom sprays to control the fruit-tree leaf roller, *Archips argyropilus* (Walker), and the eye-spotted bud moth, *Spilonota ocellana* (Denis & Schiffermuller), were applied in an apple orchard where no insecticides have been used for 6 years. The phytophagous mites in the orchard are held under control by predacious phytoseiid mites.

Azinphos-methyl at 5 and 2½ lb. 25% W.P. per acre gave excellent control of the two insects when applied at the pre-pink stage. Dormant oil at 6 gal. per acre applied at the ½-inch green stage was ineffective. Oil at 6 gal. and azinphos-methyl at 2½ lb. did not reduce predacious phytoseiid mites over the untreated control. No phytoseiid mites were found on trees treated with azinphos-methyl at 5 lb. The timing of the effective sprays would not interfere with a program of codling moth control by the sterility method.

## Introduction

Interest and research on control of the fruit-tree leaf roller, *Archips argyropilus* (Walker), and the eye-spotted bud moth, *Spilonota ocellana* (Denis & Schiffermüller), has declined in recent years following the introduction of wide spectrum insecticides for codling moth control. Materials such as azinphos-methyl and carbaryl in regularly applied seasonal spray programs on apples has reduced the fruit-tree leaf roller and eye-spotted bud moth to minor pests.

Developments in autocidal control of the codling moth (Proverbs, Newton and Logan, 1967), have raised the question whether these insects will become major pests if codling moth sprays are no longer required. The type of fruit damage caused by these two pests in British Columbia orchards has been described by Madsen and Arrand (1966). An indication that both the fruit-tree leaf roller and eye-spotted bud moth can increase to damaging numbers has been noted in an orchard which has not received codling moth sprays since 1961. In the above orchard, Downing and Moilliet (1967), have shown that both the European red mite, *Panony-*

*chus ulmi* (Koch), and the McDaniel mite, *Tetranychus mcdanieli* (McGregor), are held below economic levels in McIntosh and Spartan trees by the predacious phytoseiid mite, *Metaseiulus occidentalis* (Nesbitt).

Studies were begun in this experimental orchard in 1967 to develop an integrated control program for the fruit-tree leaf roller and the eye-spotted bud moth. The objective was to find a chemical control that would not upset natural control of phytophagous mites nor have an adverse effect on released codling moths sterilized by gamma radiation. Spray applications were limited to the pre-bloom period of tree growth. This timing was at least two weeks before a codling moth release program would begin, and at a time when some predacious mites were still in overwintering sites.

## Methods

Treatments were applied to three apple varieties in the test orchard, Red Delicious, McIntosh, and Spartan. Plots were not replicated within each variety and the plot size was 2x3 trees in the Red Delicious and Spartan varieties and 4x4 trees in the McIntosh variety.

The sprays were applied with a one-sided air-blast sprayer set to deliver 60 gallons of spray mixture per

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TABLE 1—Control of the fruit-tree leaf roller and eye-spotted bud moth with pre-bloom treatments.

Material and amount per acre	Time of application	Apple Variety	Post-bloom Counts		Harvest Counts	
			Larvae per 300 clusters	% fruit injured by	Leaf roller	Bud moth
Dormant oil—6 gal. (200-220 vis)	½ inch green	McIntosh	13	82	4.5	15.0
		Spartan	17	66	9.8	15.1
		Delicious	15	76	5.6	13.2
Dormant oil—6 gal. (200-220 vis) Azinphos-methyl—2½ lb. 25% W.P.	½ inch green early pink	McIntosh	0	0	0.5	1.1
		Spartan	0	3	0.5	0.9
		Delicious	0	2	0.8	1.1
Azinphos-methyl—2½ lb. 25% W.P.	early pink	McIntosh	0	2	0.7	1.3
		Spartan	0	1	0.8	0.7
		Delicious	1	0	0.6	0.6
Azinphos-methyl—5 lb. 25% W.P.	early pink	McIntosh	0	0	0.5	0.9
		Spartan	0	0	0.4	0.7
		Delicious	0	0	0.5	0.8
Check	—	McIntosh	17	107	7.4	17.6
		Spartan	17	79	9.6	18.1
		Delicious	16	61	8.1	12.2

acre at 100 psi. Some treatments were applied on 10 April, when the McIntosh buds were in the  $\frac{1}{2}$  inch green stage, and the remainder were applied on 27 April, when the McIntosh buds were in the pre-pink stage. The early sprays were dormant oils directed against the over-wintering eggs of the fruit-tree leaf roller and overwintered larvae of the eye-spotted bud moth. The later applications of azinphos-methyl at 5 and  $2\frac{1}{2}$  lb. were designed to control the newly emerged larvae of the two insects.

The treatments were evaluated by post-bloom counts of larvae, and by harvest counts of injured fruit. The post-bloom counts were made by examining a total of 300 fruit clusters per treatment and recording the number of fruit-tree leaf roller and eye-spotted bud moth larvae. At harvest, all of the fruit on the two centre trees in each treatment was examined and the fruit-tree leaf roller and eye-spotted bud moth damaged apples were recorded.

The effect of the various treatments on predacious mites was determined by leaf counts taken at intervals throughout the season. Samples consisted of 100 leaves picked at random from each treatment. The leaves were run through a mite brushing machine (Henderson and McBurnie, 1943), and the mites counted with the aid of a stereoscopic microscope.

### Results

The data from the plots are summarized in Table 1. Dormant oil at the dosage used, was ineffective against the fruit-tree leaf roller and the eye-spotted bud moth. Azinphos-methyl at either  $2\frac{1}{2}$  lb. or 5 lb. gave excellent control of the two insects.

There was no difference in the control obtained within the three apple varieties, and the check counts showed the infestation to be fairly uniform.

Mite counts showed no difference in the number of phytoseiid mites on the check trees and those treated with dormant oil or azinphos-methyl at  $2\frac{1}{2}$  lb. No phytoseiids were found on trees treated with azinphos-methyl at 5 lb.

The white apple leafhopper, *Typhlocyba pomaria* (McAtee), was present in high numbers on all three apple varieties in the orchard. There was no indication that any of the pre-bloom treatments controlled the leafhoppers and their feeding caused severe leaf damage in all plots.

### Discussion

These data indicate that a pre-bloom application of azinphos-methyl will adequately control the fruit-tree leaf roller and eye-spotted bud moth should these insects become a problem in orchards under a program of autocidal control of the codling moth. Azinphos-methyl at a dosage of  $2\frac{1}{2}$  lb. 25% W.P. per acre gives adequate control, and does not adversely affect predatory phytoseiid mites. The pre-pink timing of the application would not interfere with a sterile codling moth release program, since in most seasons it is not necessary to release moths until after the trees have blossomed. One danger in an application of azinphos-methyl close to the bloom period is toxicity to bees and other pollinating insects. This danger will be minimized if the sprays are applied as early as possible during the pink stage of tree development.

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### References

- Downing, R. S., and T. K. Moilliet. 1967. Relative densities of predacious and phytophagous mites on three varieties on apple trees. *Can. Entomol.* **99**:738-741.
- Henderson, C. F., and H. Y. McBurnie. 1943. Sampling technique for determining populations of citrus red mite and its predators. U.S. Dept. Agr. Circ. 671.
- Madsen, H. F., and J. C. Arrand. 1966. The recognition and biology of orchard insects and mites in British Columbia. *Brit. Columbia Dept. Agr. Entomol. Branch* 66-2.
- Proverbs, M. D., J. R. Newton, and D. M. Logan. 1967. Autocidal control of the codling moth by release of males and females sterilized as adults by gamma radiation. *J. Econ. Entomol.* **60**:1302-1306.