Cyclamen mite control in strawberries

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In preliminary tests, the acaricide abamectin gave equal or better control of cyclamen mites compared with that provided by other materials currently used in Central Coast strawberries.

Strawberry plants heavily infested with cyclamen mites develop a compact, stunted leaf mass in the center; flowers wither and die, and fruit becomes dwarfed. Plants in upper half of photo were untreated. Those in foreground were treated with abamectin.

Since the mid-1940s, the cyclamen mite has spread throughout California's Central Coast and has become a serious pest in the region's strawberry crops. Highly infested leaves become severely stunted and crinkled, resulting in a compact leaf mass in the center of the plant. Cyclamen mite feeding on flowers can cause them to wither and die. Fruit on infested plants is dwarfed, and the seeds stand out on the flesh of the berry. When uncontrolled, this mite can virtually stop berry production.

Cyclamen mite problems have previously been reported only as a problem in second-year berries. We have seen cyclamen mite coming into first-year berries by June.

Cyclamen mites, *Steneotarsonemus pallidus* (Banks), are usually found along the midvein of young unfolded leaves and under the calyx of just-emerging flower buds. The cyclamen mite is not visible with the naked eye and, when mature, measures about 1/100 inch long. Mature mites are pinkish orange and shiny. The hind legs are thread- or whip-like in the female and grasping or pincer-like in the male. Eggs are translucent and comparatively large. The female lays about 90 eggs, about 80% of which develop into females.

During the summer, the mites grow from eggs to mature adults within 2 weeks. Mite populations build up rapidly soon after they begin to infest a field. Cyclamen mites overwinter as adult females in the crown of the strawberry plants.

During early March, the mites start to reproduce. They can be easily transferred from one location to another by pickers, bees, birds, and equipment, including strawberry freezer trays. There are two natural predator mites, *Typhlodromus bellinus* Womersley and *Typhlodromus reticulatus* Oudemans, but they seldom provide economic control of the mites. The six-spotted thrips can be an important natural enemy when present.

For control of the cyclamen mite, a large amount of water carrying an acaricide is needed, since the entire mite population is in very young folded leaves and just-emerging flower buds. Dr. William Allen, University of California at Berkeley, developed a high-volume spray treatment using endosulfan, which controlled this pest for many years. It now appears cyclamen mites may be resistant to endosulfan, since commercial application of this chemical in many fields is not reducing the mite population enough to maintain commercial control. Dicofol also has been used successfully for many years to control this pest, but it now seems to be losing some of its effectiveness.

These mites multiply so fast that the initial kill must be extremely high if control is to last long enough to be of practical value. The picking of fruit every 3 to 4 days severely restricts the types of pesticides that can be used, because of acaricide residues.

We began a 2-year study to compare currently used materials with abamectin, which has been reported to control this mite on cyclamen flowers. We also wanted to determine the most effective rates of abamectin, the need for surfactants, and the gallonage of water per acre for most efficient control of this pest.

Field study

The tests took place in areas heavily infested with cyclamen mites in four separate commercial fields. Individual plants were staked, and three emerging, unfolded leaflets per plant were taken to determine mite populations. Mites on each leaflet were counted under a microscope.

Acaricides were applied with a carbon dioxide sprayer with a single 8003 nozzle, operated at 40 psi. We used a randomized block design in all experiments. Because of the highly variable cyclamen mite population between plants, only single-plant replication was used. A pretreatment mite count was taken to help select plants with similar mite numbers.

In 1987, we used the cultivar Selva with 10 replications of each treatment. Because this was a second-harvest-year planting, the older, dead leaves were removed from the plants. The plot was sprayed September 23, 1987, and mites counted 7 days later. In this test, endosulfan failed to reduce the cyclamen mite population below that in the untreated control, but the abamectin treatments significantly reduced populations (table 1).

The first two 1988 experiments were conducted in fields of Pajaro and Chandler strawberries to test two lower amounts of water per acre and two rates of abamectin, with and without 0.25% oil additive. Other research on two-spotted mites in cotton had suggested that abamectin moves through the leaf tissue, aided by lower water application and the addition of a light oil. The two 1988 strawberry experiments included 11 treatments and six replications.

TABLE 1. Comparison of acaricides for cyclamen mite control in strawberries

Treatment	Rate	Water	Oil 0.25%	Number mites/leaflet*° 7 days	14 days	21 days
	lb ai/ac	*gal/ac*				
1987, Selva variety						
Untreated	—	—	—	8.9 a	—	—
Endosulfan	6.0	600	—	8.6 a	—	—
Abamectin	.01	400	0	1.0 b	—	—
Abamectin	.01	400	0	0.9 b	—	—
1988, Pajaro variety						
Untreated	—	—	—	14.2 a	18.8 a	—
Endosulfan	6.0	600	—	2.9 b	3.8 b	—
Dicofol	2.0	400	—	2.8 b	3.9 b	—
Abamectin	.01	150	0	1.0 b	2.7 b	—
Abamectin	.01	150	+	4.5 b	3.6 b	—
Abamectin	.01	300	0	1.8 b	1.3 c	—
Abamectin	.01	300	+	0.8 b	0.1 c	—
Abamectin	.02	150	0	0.2 b	2.0 bc	—
Abamectin	.02	150	+	0.8 b	1.8 bc	—
Abamectin	.02	300	0	0.4 b	0.2 c	—
Abamectin	.02	300	+	0.5 b	0.2 c	—
1988, Chandler variety						
Untreated	—	—	—	108.2 a	65.8 a	30.2 a
Endosulfan	6.0	600	—	46.6 b	35.3 b	31.4 a
Dicofol	2.0	400	0	30.6 b	35.8 b	31.8 a
Abamectin	.01	150	0	40.2 b	23.3 c	15.0 b
Abamectin	.01	150	+	34.1 b	17.9 cd	14.3 b
Abamectin	.01	300	0	37.8 b	8.4 d	11.1 cd
Abamectin	.01	300	+	33.3 b	12.0 d	10.5 cd
Abamectin	.01	150	0	18.0 b	7.6 d	11.2 cd
Abamectin	.02	150	+	33.8 b	12.9 d	7.8 d
Abamectin	.02	300	0	29.6 b	15.1 d	11.4 cd
Abamectin	.02	300	+	11.8 b	14.9 d	8.8 d
1988, Pajaro variety						
Untreated	—	—	—	44.6 a	73.9 a	29.2 a
Endosulfan	6.0	600	—	31.7 b	42.2 b	16.2 b
Dicofol	2.0	400	—	10.2 c	10.7 c	4.3 c
Abamectin	.01	400	—	5.7 c	13.1 c	3.1 c
Abamectin	.01	600	—	7.4 c	18.2 c	6.0 c
Abamectin	.02	400	—	12.2 c	19.6 c	4.6 c
Abamectin	.02	600	—	8.6 c	8.8 c	2.2 c

* Days after treatment.
° Numbers in columns followed by the same letter are not significantly different at 5% level.

All treatments in the Pajaro field, including endosulfan and dicofol, reduced cyclamen mite below levels in untreated plots (table 1). There was a trend for better control with abamectin at the higher rates of water, but neither higher rates of the acaricide nor the addition of oil seemed to help.

In the Chandler field, endosulfan and dicofol significantly reduced the mites below untreated levels 7 and 14 days after treatment, but by the 21st day, this difference had disappeared (table 1). Those treatments had significantly more mites at 7 and 14 days than did the abamectin treatments with the higher gallonage of water and higher rates of the acaricide. Addition of oil did not significantly reduce mite numbers.

The last experiment, in a field of Pajaro strawberries, tested two rates of abamectin in 400 and 600 gallons of water per acre. There were seven treatments and eight replications. Endosulfan significantly reduced the mite population below levels in untreated plots, but it gave intermediate control when compared with dicofol and abamectin treatments. Abamectin control of cyclamen mite was not enhanced by water rates above 400 gallons per acre.

Conclusion

Abamectin treatment resulted in a significantly longer period of control of cyclamen mite than did endosulfan. In one test, endosulfan treatments did not reduce mites below the untreated levels. In two tests, this chemical gave intermediate control.

Dicofol treatments significantly reduced cyclamen mite numbers below untreated levels in all experiments. It was comparable to most of the abamectin treatments in two of the three tests in which it was included, but in one test, cyclamen mite populations were significantly higher in dicofol than in abamectin treatments 14 and 21 days after application.

Abamectin treatments at 0.01 pound active ingredient per acre in 300 gallons of water or more resulted in equal or better control of cyclamen mite than was given by endosulfan or dicofol. At the 0.02-pound rate, cyclamen mite control was obtained at a lower gallonage of water. Addition of 0.25% light oil to the abamectin treatments did not seem to help. These tests in four strawberry fields suggest that abamectin at rates of 0.01 and 0.02 pound active ingredient per acre may be adequate for acceptable commercial control when used with enough water.

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