Mites on Walnuts

experimental studies with aramite for spider mite control

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Photograph by C. C. Anderson

Trees to the right showing the effects of heavy mite populations. Note the heavy leaf drop. Trees to the left treated with aramite. Note absence of foliage drop.

Spider mites are found frequently in large numbers on the foliage of walnuts in northern California.

As a result of the unabated feeding of the spider mites the foliage becomes chlorotic, bronzy-brown and in a relatively short time, drops from the tree.

The principal species involved are the European red mite and the Pacific mite. In northern California the Pacific mite is the most troublesome of the two. There is little doubt but that control programs directed against the codling moth and walnut aphid may influence the mite population. Some of the materials used may favor an increase in numbers while others may result in a decrease. In addition to the disturbing influences of insecticides there are many natural factors that tend to regulate the mite population. These are both physical and biological in nature, but do not always serve to keep the population below an economic level. When natural conditions favor the mite, heavy populations may develop in orchards that have received no application of insecticides of any kind. When such favorable conditions prevail over an area it is difficult to determine what part, if any, insecticides may have played in increasing the mite population. Such a situation existed during the 1950 season with mites occurring in destructive numbers over wide areas. Even where treatments were similar, destructive infestations developed in some orchards but not in others.

Past experiments have shown that certain insecticides and treatments result in an increase in the mite populations. For example it has been demonstrated that as the dosage of DDT is increased the danger of mites becoming a problem also increases. However, there usually appears to be no serious adverse effect attributed to the DDT when low dosages are used. With a conventional sprayer one half pound of 50% DDT wettable powder to 100 gallons of water in the codling moth spray appears to be safe. This amount is equivalent to about 2.4 pounds of actual DDT per acre. If this dosage is increased to one pound of 50% DDT per 100 gallons there is evidence that some increase in the mite population will occur. When larger amounts are used, very noticeable increases can be expected.

Where DDT has been applied with an air carrier type sprayer for the control of the codling moth no evidence, directly attributable to the DDT, of a serious mite problem developing has been detected where the dosage per acre has ranged from approximately 3.5 to four pounds of actual DDT.

What has been said about DDT affecting mite populations also seems to apply to a lesser or greater extent to other chlorinated hydrocarbon insecticides. It is certain that they should all be used with care, and their indiscriminate application should be avoided. Evidence obtained thus far indicates that there is a cumulative effect when two chlorinated hydrocarbon insecticides are used in combination. For example when one half pound of 50% DDT per 100 gallons of water is used in the codling moth spray with a conventional sprayer no adverse effect is likely to occur, but if one pound of benzene hexachloride, containing 6% gamma isomer or one half pound of 25% lindane is added to the mixture for aphid control, some increase in the mite population may take place. Within reasonable limits it appears that the greater the total concentration of chlorinated hydrocarbon insecticides in the spray mixture, the more acute the mite problem is likely to be.

Both parathion and tetraethyl pyrophosphate are toxic to spider mites, and have been used to control these pests on walnut. However, neither of these insecticides are effective in killing mite eggs, and usually more than a single application is needed to insure satisfactory control. A high initial kill is desirable because both insecticides are destructive to natural enemies of orchard mites, and in their absence a rapid increase in the mite population is likely to take place if weather conditions are favorable. Both parathion and tetraethyl pyrophosphate are somewhat effective against mites when used at a concentration effective against the walnut aphid. Where used to control aphids during the past season of heavy mite infestation, one and two applications of either of these materials in many cases adequately controlled mites. However, in numerous cases a single application for aphid control was not sufficient to also control the mites and as a result heavy defoliation occurred. Where the mite infestation developed late in the season a single application of the above materials resulted in satisfactory control of the pest. This was due largely to the fact that weather conditions then no longer favored a rapid increase in the mite population.

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Control of Spider Mites Obtained with the Acaricide Aramite (88R)

Treatment and composition per 100 gallons of water	Date applied	Average number of active mites per sample						
		July 24	Aug. 1	Aug. 2	Aug. 4	Aug. 9	Aug. 21	Sept. 1
		(50)*	(25)	(25)	(30)	(50)	(50)	(50)
Check	....	31.4	130.8	124.3	147.8	135.4	133.6	138.0
1 pound 15%	July	(50)	(40)		(50)	(50)	(50)	(50)
wettable powder	29	28.4**	22.9	....	31.1	14.2	40.6	28.5
2 pounds 15%	Aug.		(25)		(50)	(50)	(50)	(50)
wettable powder	1	....	124.3**	....	14.2	6.0	0.2	0.2
2 pounds 15% wettable powder, multifilm L. ⅓ pint	Aug. 1	....	124.3**	....	14.2	6.5	0.6	0.7
2% dust 60 pounds	Aug.			(40)	(50)	(50)	(50)	(50)
per acre	2	....	....	139.3**	31.2	31.7	28.4	39.1
3 pints 25% emulsion + 2 pints	Aug.			(25)	(50)	(50)	(50)	(50)
multifilm L	2	....	....	124.3**	25.4	12.8	12.7	7.7

*Number of leaflets examined. **Pretreatment count.

WALNUTS

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It has long been recognized that dust in some manner favors an increase in the mite population. Severe infestations are frequently encountered along dusty roads and similar locations. In the course of the walnut insect investigations it has been observed that the frequent application of certain insecticides in the form of dusts to control aphids has resulted in an accumulation of heavy dust deposits on the foliage. This condition is frequently correlated with an increase in the mite population. This does not mean that dusts should not be used in the walnut insect control program. It does mean, however, that the grower should use proper formulations and apply the correct amount carefully so that maximum control can be obtained with a minimum of material thus obviating the necessity of frequent treatments and heavy accumulations of dust.

Mites are less likely to be destructive in orchards that receive good cultural care than in those that are neglected. Dryness in particular is favorable to mites, and orchards should never be allowed to suffer for want of water. It is also a bad practice to permit a cover crop or weeds to persist too long in an orchard. It may support large numbers of mites which later move to the trees.

Most of the experimental studies dealing with orchard mites have been conducted at Linden in San Joaquin County, although some investigational work has been done at San Jose in Santa Clara County. During the past season in the experimental orchard at Linden it became evident by the middle of July that a serious mite infestation was going to develop. A series of experiments with the acaricide aramite—beta chloroethyl beta (p. tertiary butyl phenoxy) alpha methyl ethyl sulfite—were conducted in a portion of the orchard where the early mite infestation was heavy. This portion of the orchard had received a previous codling moth spray of Linden-Mix—three pounds of standard lead arsenate, one half pound of 50% wettable DDT, one half pound of safener—plus one pound of 6% gamma isomer BHC per 100 gallons of water applied with a conventional rig. To compare populations, the mites that occurred along the upper side of the midrib on a number of sample leaflets were counted. Examinations were made with a binocular stereoscopic microscope equipped with 9X oculars and a 1X objective. As the leaflet was slowly moved across the stage, all mites in the field were counted. This meant that all mites on a three-quarter inch strip along the upper midrib were included. The leaflets were picked at random from the southeast side of the trees where the mite infestation was the heaviest. The size of the sample varied from 25 to 50 leaflets per plot. The Pacific mite was most abundant, although there were a few European red mites present. The aramite was applied as a wettable powder, as an emulsion and as a dust. The wettable powder and the emulsion were applied with a conventional sprayer having a 25 foot tower equipped for automatic spraying. About 50 gallons of spray were applied per tree at a pressure of approximately 600 pounds per square inch. A 2% dust was applied with an orchard duster at the rate of approximately 60 pounds per acre. The treatments, dates of application and the degree of control obtained are given in the table. All the treatments except the dust resulted in satisfactory control. In this plot some defoliation occurred late in August. In the one pound wettable plot where the averages closely parelleled those of the dust plot the trees late in August looked very good with little defoliation. The explanation for this apparent anomaly appears fairly simple.

The dust coverage was good and there resulted a fairly uniform, but not exceptionally good kill of mites. There were very few leaflets with heavy populations and very few with no mites. Inspection of the leaves revealed that the webbing was undisturbed. In the spray plots it was noticed that the webbing was matted and disturbed on most leaflets. The coverage was not as good in the one pound sprayed plot and some leaflets escaped the treatment. As a result there were a number of leaflets in the samples left with large populations which tended to obscure the good kill which resulted where the mites were contacted. The mites were increasing by the end of the season when the effects of the material had worn off.

Although no destructive mite populations occurred in any of the sprayed blocks, control was best where the two pound dosage per 100 gallons of water was applied. In the portion of the orchard not treated serious defoliation occurred and the contrast between the treated and untreated portion of the orchard is well shown in the photograph.

The treatments did not greatly effect the predator population. The most abundant predator present was the small ladybird beetle—*Stethorus*. This predator may have been partially responsible for helping to hold at a low level the mite population once it had been reduced by the aramite treatments. Whatever the cause may have been, the population in these plots continued low for the rest of the season. Egg kill appeared to be fairly good on those leaves with small numbers of mites, indicating that coverage is very important.

Crack tests of the harvested nuts were made to determine if heavy mite infestation and defoliation seriously affected quality. Where noticeable defoliation and heavy mite damage appeared by the first of August, there was some evidence that quality was reduced. It is possible that serious infestations especially if repeated the following year, may have an adverse effect on the subsequent crop. Where defoliation occurred early, the trees tended to send out new growth, a condition which may adversely affect the physiology of the trees. In case of a very cold winter a lot of this new wood growth would be killed back.

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NEMATODE

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There appears to be a distinct advantage in the use of the plow application as against chisel application which would indicate that in future work on soil fumigation the use of the plow as a means of application must be included.

It is possible that further work may be of value in developing a program of rotation in which soil fumigation can be effectively used. In San Benito County, for instance, a three-year rotation program is commonly used with sugar beets. If the sugar-beet nematode populations in infested fields could be reduced enough in two years of rotation with nonsusceptible crops, a fumigation treatment might result in satisfactory yields. A field plot designed to test the practicability of such a program is under consideration and will be tried this winter if weather conditions permit.

One of the most significant results of this experiment was the demonstration of the more effective control obtained by the plow type application. However, the cost of the treatment was relatively high—approximately $40.00 per acre at the rate of 250 pounds per acre.

The reduced effectiveness of fumigants in heavier soils makes control by fumigation even more uncertain. Therefore it is not possible at the present time to recommend the use of soil fumigants in the control of sugar-beet nematode in California.

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