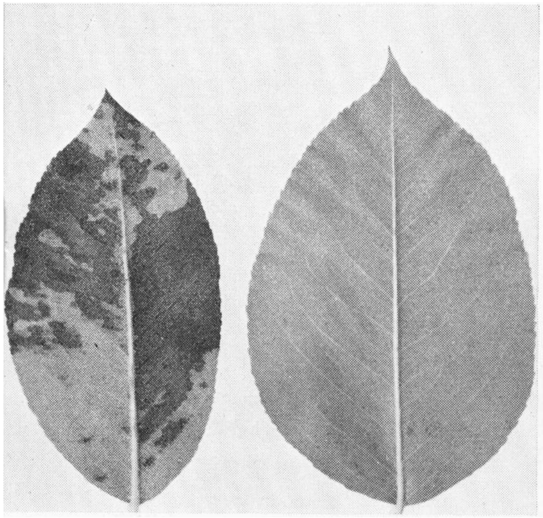
HAROLD F. MADSEN AND PETER H. WESTIGARD

Resistance to acaricides by European Red Mite studied in Bartlett pear field plots



Leaf damaged by European red mites on left, healthy leaf on right.

The incidence of resistance to certain acaricides by the European red mite—*Panonychus ulmi* (Koch)—has increased severely during the past few seasons. The acaricides were organic phosphate compounds and such specific acaricides as Ovex and other closely related compounds, Chlorobenzilate and Kelthane. All of the observations on European red mite resistance in California have been from the field. Laboratory studies have not been conducted due to the difficulty of rearing this mite species under artificial conditions.

In an attempt to find a means of preventing or delaying the development of resistant strains, field trials in a Bartlett pear orchard near Marysville were established in the 1958 season. Bartlett pear foliage is very sensitive to spider mite attack. A mite population which reaches three or more mites per leaf will result in leaf burn and defoliation, especially if daily weather temperatures reach 90°F or above. The objective of the trials was to make repeated applications of two acaricides, one a phosphate and one a chlorinated hydrocarbon, which had not been used previously in the test orchard. The compounds were used alone and in combination with materials which had a nonspecific action against spider mites. The treatments were repeated regardless of need for the applications, to see whether a resistant strain of European red mite would develop.

The compounds chosen were Ethion—0, 0, 0′, 0′, tetraethyl, S, S′, methylene biphosphorodithioate—and Tedion—2, 4, 5, 4′, tetrachloro diphenyl sulfone. They were used alone and in combination with two nonspecific compounds, summer oil—Volck Supreme—and Glyodin—2-heptadecyl-2-imidazoline acetate.

Each trial plot was an acre in size and unreplicated. The sprays, applied with blower-sprayer equipment, varied from 900 to 1,000 gallons per acre.

In 1958 three sprays—except Ethion alone—were applied to all plots, regardless of the need for the applications. Two were preharvest treatments and one postharvest. In 1959 all plots received an application in May, and subsequent treatments were applied when the mite counts indicated a potentially damaging population.

In both seasons, leaf samples were taken at intervals and brushed with a mite brushing machine to determine the mite populations.

1958–1959 European Red Mite Plots on Bartlett Pears
(mite counts expressed as average number mites per leaf)

1958

Materials	Dosage per acre	Application dates	Mite counts						
			May 7	May 19	June 10	June 24	July 14	Aug. 13	Aug. 26
Ethion*	7.5 lbs.	May 8 June 11 June 26 Aug. 15	2.5	0.1	0.5	3.5	0.6	4.8	3.6
Ethion* Volck Supreme oil	7.5 lbs. 11.2 gallons	May 8 June 11 Aug. 15	3.2	0.0	0.0	0.0	0.0	0.4	0.0
Ethion* Glyodin	7.5 lbs. 7.5 quarts	May 8 June 11 Aug. 15	2.6	0.1	0.3	0.1	0.4	3.7	2.1
Tedion**	3.7 lbs.	May 8 June 11 Aug. 15	2.7	0.2	0.0	0.0	0.0	0.0	0.0
Tedion** Volck Supreme oil	3.7 lbs. 11.2 gallons	May 8 June 11 Aug. 15	2.1	0.0	0.0	0.0	0.0	0.0	0.0
Tedion** Glyodin	3.7 lbs. 7.5 quarts	May 8 June 11 Aug. 15	3.2	0.2	0.0	0.0	0.0	0.0	1.2

1959

Materials	Dosage per acre	Application dates	Mite counts					
			May 25	June 11	June 25	July 6	July 20	Aug. 11
Ethion*	9.4 lbs.	May 27 June 26	0.3	1.0	2.1	4.7	....	....
Ethion* Volck Supreme oil	9.4 lbs. 9.4 gals.	May 27	0.2	0.0	0.0	0.0	0.2	1.1
Ethion* Glyodin	9.4 lbs. 9.4 qts.	May 27 June 26	0.4	1.4	4.1	5.1	....	....
Tedion*	9.4 lbs.	May 27 July 6	0.1	0.1	0.5	1.7	3.8	6.2
Tedion* Volck Supreme oil	9.4 lbs. 9.4 gals.	May 27	0.1	0.0	0.0	0.0	0.0	0.0
Tedion* Glyodin	9.4 lbs. 9.4 qts.	May 27 June 26	0.1	1.4	5.0	6.5	....	....

*25% wettable. ** 50% wettable.

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R. S. BRINGHURST AND VICTOR VOTH

Larger Strawberries

through plant breeding

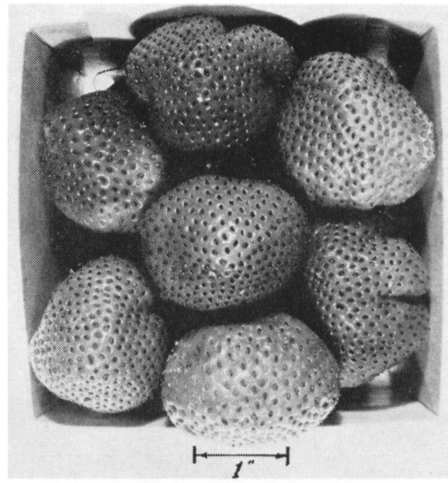
Larger strawberries is one of the prime objectives of the current plant breeding program because harvesting cost decreases as fruit size increases.

Selected seedlings from hybridization between a native South American strawberry—*Fragaria chiloensis*—and commercial California varieties or selections have consistently produced exceptionally large fruit.

During the 1958 season one hybrid selection tested in a semi-commercial planting at Davis produced strawberries that averaged 21.3 grams per fruit throughout the season, compared with 8.9 grams for Lassen, 11.4 grams for Shasta and 12.6 grams for Solana.

During 1959, a different hybrid selection averaged 20.6 grams through the season, compared with 11.5 grams for Lassen, 9.6 grams for Shasta, and 13.3 grams for Solana. On the first full picking the fruits of the hybrid had an average weight of 47 grams per fruit compared with 16 grams for variety Lassen, 14 grams for Shasta, and 17 grams for Solana.

Although those two hybrid selections consistently bear larger fruit than any other strawberry variety in these tests, it may be some time before derivatives are available for use as commercial varieties. A number of undesirable plant and fruit characters appear to be associated with large size. However, because of experience in plant breeding programs, it is reasonable to assume that acceptable combinations of fruit and plant characters can be bred into selections that will maintain the wanted large fruit size.



Midseason fruit from hybridization between the Shasta variety and the native South American variety, in a standard one pint basket.

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RED MITE

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With Ethion alone, control of European red mite was difficult the first season. The orchard had a history of mite resistance to other organic phosphates although Ethion had not been previously used. Four treatments were necessary in 1958, and the mites built up in the interval between sprays even though populations were sharply reduced immediately following each treatment. Leaf damage was evident by midsummer. In 1959 the populations continued to increase despite two applications, and both leaf burn and defoliation were widespread by early July when the plot was resprayed with another acaricide to avoid more damage.

The Ethion-Glyodin combination looked promising in 1958 although the mites did build up in August. In 1959, however, the mites were not controlled after two applications, and severe leaf burn and defoliation were evident by June, when the plot was resprayed.

The Ethion-oil combination gave very good control over the two-year period. The mite counts remained below economic levels, and there was no evidence of foliage damage.

With Tedion, control was excellent with all combinations in the 1958 season. A few mites were encountered in late August on the Tedion-Glyodin plots, but no significance was attached to the count at the time. In the 1959 season, however, it was evident that the Tedion-Glyodin treatment was not providing control. The mites continued to increase regardless of the spray applications until severe leaf burn and defoliation occurred. In July it was necessary to discontinue the plot and spray with another acaricide. The plot treated with Tedion alone followed the same general pattern except that mites did not increase to damaging numbers as rapidly. In early July, following the first spray in May, the plot showed enough mites to warrant retreatment. After the second application on July 6, the populations did not decline and continued to increase until the trees showed leaf burn and defoliation. At this point, the plot was discontinued.

The Tedion-oil plot was outstanding in both 1958 and 1959. Not a single mite was encountered in any of the leaf samples, and the trees were free of any sign of mite damage. The plot was especially striking as it was located between the Tedion and Tedion-Glyodin sprayed trees, both of which showed extensive foliage damage.

Although there were no concurrent laboratory studies, it seems probable that the European red mite developed a resistance to Tedion and Ethion as a result of repeated applications of these compounds in the same area.

The performance of the Glyodin combinations, especially with Tedion, is difficult to explain. An excessive wetting of the tree, when Glyodin was included, was suspected of causing a lower deposit of Tedion. However, leaf analysis showed the deposit of Tedion was actually higher when used in combination with Glyodin than when used alone. It is possible that the heavy dosage of Glyodin ties up Tedion so it is not available to the mites. There is also a possibility that only part of the Tedion is active and therefore a resistant strain of the red mites develops rapidly.

One point that was illustrated as a result of the trial plots is the danger of repeated use of the same compound. Even though spectacular results are obtained in one season, complete failure may be encountered in the next.

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