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SUMMARY OF EXPERIMENTS FOR THE CHEMICALCONTROL OF THE AVOCADO BROWN MITE OLIGONYCHUS PUNICAE (HIRST)

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The check list of insect and mite pests of the avocado as compiled by Ebeling (1959) is rather impressive. Yet, the approximately 22,600 acres of avocados in California remain relatively free of serious pests. Because of this, annual pest control guides and circulars familiar to citrus and deciduous fruit growers are not part of the avocado producers' library. The insect and mite problems of the avocado have been so .sporadic that it has been difficult at times to obtain experimental field data on the chemical control of pests for more than two successive years. The one possible exception is the avocado brown mite, *Oligonychus punicae* (Hirst) which is a pest of several varieties of avocados grown in the areas subject to the cool coastal influence. The Hass variety which is second in producing acreage to the Fuerte in California is an excellent host for this mite. Uncontrolled populations may build up and cause severe defoliation. This in turn predisposes the fruit and branches to sunburn. In a few isolated cases direct damage to the fruit as a result of the mites feeding has been observed. The injury sustained was sufficient to downgrade the fruit to culls; but, as yet, so few fruit have been involved the problem has not been of any economic significance. The injury is similar to that sustained by the feeding of the greenhouse thrips, *Heliothrips haemorrhiodalis* (Bouche'), in that the fruit is discolored and turns brown. It is easily distinguished from thrips injury, however, due to the absence of the black specks of fecal deposit left by the thrips. The fruit surfaces may have a white flaky deposit composed of dried cast skins and hatched eggs of the mites.

There is some question as to what effect heavy mite populations have on the Hass tree. Ebeling (1959) observed that the brown mite does not cause as much damage as one might expect when compared to the severe damage done by the six-spotted mite, *Eotetranychus sexmaculatus* (Riley), in similar numbers. The brown mite populations vary considerably from one season to the next and from one locality to another. When visually comparing heavily infested trees with lightly infested trees in the same or different localities, it appears there is no obvious difference in the size or number of fruit even though the treated trees appear lush and green with a full quota of leaves while the leaves on untreated controls are bronzed, leathery, and the tree less thrifty. Comparisons made in the same orchard between replicated mite treatments and untreated controls also show no apparent differences in fruit production, and there appears to be no difference in the set of fruit between treated and untreated trees in the spring following a spray application made the previous year. The "eyeball" estimation of the crop production on treated versus non-treated trees is a poor substitute for actual yield records. However, due to the high variability of mite populations and fruit production from tree to tree and from season to season, it would require records from

excessively large plots over a period of several years to obtain meaningful data on the effect of avocado brown mite infestations on tree growth and fruit production.

Experimental treatments applied for the control of the brown mite have been restricted almost exclusively to the Hass variety. Candidate materials for mite control studies on the Hass are also screened for phytotoxicity on the Fuerte and Bacon varieties.

The following are results from representative experiments for mite control conducted over a period of several years.

Six miticides were applied in a field test in the Fallbrook district. The grove selected had a mite population that was increasing rapidly.

TABLE I. PAPKE ORCHARD, PALA MESA. AUGUST 10, 1961. EFFECTIVENESS OF CERTAIN MITICIDES FOR THE CONTROL OF *O. PUNICAE* (HIRST) INFESTING HASS AVOCADO TREES.

Treatment		Females/Leaf *lbs/100*	*Avg. No. Adult Females/Leaf (N) Days After Treatment* 7	14	30
Control		—	100	307	0.1
Ovotran®	50wp	1	0.5	1.3	0.2
Chlorobenzilate®	25wp	1	0	0.1	0.2
Tedion®	25wp	1	0	2.0	0.0
Mitox®	40wp	1	0.3	0.8	0.1
Aramite®	15wp	2	0	0.0	0.2
OW-9	30wp	1	0	0.1	0.0

A randomized block design with five single tree replicates per treatment was used. Approximately six gallons of spray per tree was applied.

In Table I it is evident that a satisfactory initial kill was obtained with all of the miticides. It will also be noted that the experiment was short lived as the number of mites on the control trees were reduced from over 300 to less than 1 per leaf after the 14th day. This reduction was due to the influence of a "Santana" weather condition—hot dry wind and maximum daytime temperatures of over 90°F for a period of three days. The avocado brown mite is sensitive to high temperatures as shown by McGregor (1941) who reported all stages of the mite were killed in the laboratory at a constant temperature of 91.4°F. In the field McMurtry (1966) showed a sharp decline in the mite population with maximum temperatures of 102°, 105°, and 103°F on three consecutive days with the relative humidity ranging between 8 and 30 percent during that period.

Ovotran® and Tedion® are two miticides which were used extensively and successfully against citrus red spider, *Panonychus citri* (McGregor), on citrus until the resistance factor precluded their use. These compounds have a very low mammalian toxicity and therefore present a minimum hazard to persons exposed. In addition, no adverse side effects have developed in avocado orchards following their experimental use for mite control.

TABLE II. BAILLARD ORCHARD, CARPINTERIA. JULY 29, 1966. OVOTRAN® 50WP VS TEDION® 25WP AT 1 POUND PER 100 GALLONS OF WATER APPLIED FOR THE CONTROL OF *O. PUNICAE* (HIRST) INFESTING HASS AVOCADO TREES.

Treatment	*Total No. Adult Female Mites Found on 200 Leaves/(N) Weeks After Treatment*				
	2	*4*	*6*	*8*	*10*
Control	599	357	311	581	609
Ovotran®	18	0	4	1	38
Tedion®	8	2	2	2	3

The pretreatment examination of the orchard showed a light population present on all trees in the experimental area. Each treatment was replicated six times utilizing four trees per replicate. The mite population remained relatively uniform on the control trees throughout the duration of the experiment. Both Ovotran® and Tedion® performed equally well. This was important as Ovotran® was being phased out as a miticide at this time and a replacement material was needed.

Examination of the plots on February 1, 1967, six months after treatment, showed only a "trace" mite population on the treated plots while the untreated controls still maintained a light population.

A narrow range spray oil currently being used on citrus was incorporated in a field study to compare its performance with Chlorobenzi-ate® and the standard Tedion® treatment.

TABLE III. BAILLARD ORCHARD, CARPINTERIA. OCTOBER 23, 1967. EFFICACY OF THREE MITICIDES APPLIED FOR THE CONTROL OF *O. PUNICAE* (HIRST) INFESTING THE HASS AVOCADO.

Treatment			*Avg. No. Adult Female Mites/Leaf (N) Weeks After Treatment*					
		Amt/100 gals	*1*	*2*	*3*	*5*	*7*	*10*
Control		—	14	22	27	15	28	2
Tedion®	25wp	1 lb	2	2	1	1	2	0
Chlorobenzilate®	25wp	1 lb	0	0	1	1	4	0
N.R. Oil[1]		1 gal	0	0	1	1	1	0

[1] Narrow range oil as defined in the "Treatment Guide for California Citrus Crops" 1970-1971.

Both Chlorobenzilate® and the narrow range oil were as effective as the standard Tedion® treatment, and no phytotoxic effects were observed as a result of their use.

The use of summer spray oils as used on citrus was recommended by Ebeling (1953) for the control of scale insects on avocado. With the strong current trend toward the use of materials which are safe to handle and apply, and are least likely to cause a biological upset, citrus spray oils fill these qualifications.

With the cooperation of the Farm Advisors and the Agricultural Commissioners' offices of Santa Barbara County, a suitable orchard was located in Carpintería. The mite

population was evenly distributed and increasing. The trees were about as uniform in size and configuration as one could expect in an avocado orchard.

TABLE IV. BAILLARD ORCHARD, CARPINTERIA. AUGUST 14, 1968. TREATMENTS APPLIED FOR THE CONTROL OF *O. PUNICAE* (HIRST) INFESTING THE HASS AVOCADO.

Treatment		*Avg. No. Adult Female Mites/Leaf (N) Weeks After Treatment*				
	Amt/100 gals	*2*	*4*	*6*	*10*	*12*
Control	—	23.0	35.0	50.0	84.0	52.0
Lt. Med Soluble Oil	1½ gals	1.1	0.6	6.0	14.0	14.0
Narrow Range Oil[1]	1 gal	0.1	0.2	3.0	8.0	8.0
Tedion 25wp	1 lb	0.1	0.1	5.0	10.0	16.0

[1] Narrow range oil as defined in the "Treatment Guide for California Citrus Crops" 1970-1971.

The experimental design in Table IV was a randomized block with six four-tree replications per treatment. Approximately 7½ gallons of finished spray was applied per tree. All three miticides performed well under the heavy pressure from the high mite population in the untreated controls and the adjacent untreated trees surrounding the experimental area. On the twelfth week it was difficult to find suitable leaves on the controls for counting mites as they nearly all were damaged to the extent of being "bronzed" and unfit as a food source. Larvae, pupae and adults of *Stethorus picipes* (Casey) were numerous in both the treated and control blocks at that time. Some "dusty wing" larvae were also present on both treated and untreated trees. "Dusty wings" are coniopterygids, so called because of the white, fine, powdery wax on the wings. They are predaceous on mites and small insects.

It is significant that mite predators were able to become established in such a relatively short period of time after treatment. With a careful choice of a miticide, it appears that an effective integrated mite control program could be developed.

LITERATURE

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