

Natural Enemies of Olive Scale

aggressive parasitic wasp promising as means of suppressing olive scale in California orchards

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Reductions of 90% to 98.6% in olive scale populations in California orchards have been achieved by the use of natural enemies of the pest.

A tiny parasitic wasp—Persian *Aphytis*—from Iran and Iraq and one of seven species of imported parasites and predators of the olive scale—*Parlatoria oleae* (Colvée)—has been particularly aggressive. It has shown considerable promise in suppressing populations of the olive scale in commercial plantings in California.

The imported natural enemies of the olive scale were widely distributed throughout the state in 1952-53. Releases of 6,477,680 individual parasites and predators were made in approximately 275 separate locations in 19 counties—from San Diego in the south to Glenn County in the north.

From the activities of the Persian *Aphytis* in the test plots it appears that this single species is capable of suppressing the olive scale to a lower level than has formerly existed in California, and this is viewed as an important contribution to California agriculture.

The oldest plot in which the Persian *Aphytis* has been studied is at Herndon, Fresno County, which has been under surveillance for approximately 18 months. The parasites have reduced the scale in this plot from an initial index level of 1,124 down to a comparative index of only 16. This amounts to a reduction of 98.6%. In 1951 the crop in this orchard was reduced to a very low quality by *Parlatoria* attack, whereas an

Population Samples of *Parlatoria oleae* Herndon, Fresno County

	Feb. 28, 1952	July 24, 1952	Mar. 2, 1953	July 28, 1953
Total females on twigs ...	291	19	45	7
Total females on leaves ..	833	30	36	9
Total females in sample ..	1124	49	81	16
No. leaves infested ...	255	20	27	9
% leaves infested ...	51.0%	4.0%	5.4%	1.8%
% twigs infested ...	96.0%	40.0%	48.0%	16.0%
Max. No. females per twig ...	88	7	25	4
Max. No. females per leaf ...	22	8	4	1
Mean No. females per infested leaf	3.25	1.5	1.33	1.0
Mean No. females per orchard-run leaf ...	1.66	0.06	0.072	0.018

duced on a single brood of the scale. However, there are periods of the year when the efficiency of the parasites is considerably reduced. This is caused by the tendency of the scale population to develop in a somewhat uniform, single-stage condition.

Studies conducted for the past two seasons have shown that the Persian *Aphytis* is most active and effective during the months of March, April, and May. Its activities for the remainder of the year are comparatively subdued. However, the single, brief, but intense period of parasitization in the spring is sufficient to cause enormous mortality in the scale populations and to reduce them to a remarkable extent.

The other imported species of parasites and predators are expected to supplement the Persian *Aphytis* in combating the olive scale. Although the combined effect of the natural enemies may tend to alleviate the destructive effects of the pest, it is still too early to determine if the parasites will achieve and sustain commercial control of the olive scale.

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Experimental specimens of the Persian *Aphytis* were collected in Iran and Iraq by A. M. Boyce, Director of the Citrus Experiment Station, University of California, Riverside.

The California State Department of Agriculture, Bureau of Entomology, co-operated in the state-wide distribution of colonies of the olive scale parasites.

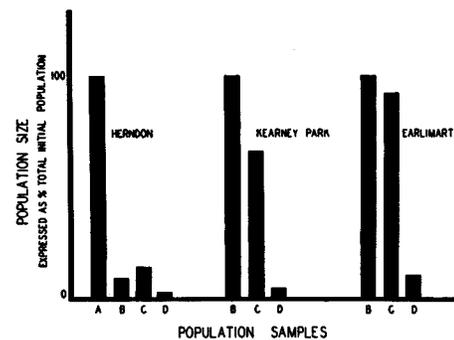
examination made on August 20, 1953, showed only six scale insects in a sample of 500 fruit.

Similar reductions have occurred in plots more recently established. For instance, the scale population has been reduced 95.9% within a year in a plot at Kearney Park, Fresno County. During the same period an extremely heavy population in a plot at Earlimart, Tulare County, was reduced 90% through the action of the imported parasites.

Parasitization

The Persian *Aphytis* attacks the maturing female olive scale and lays a single egg on the scale's body. From this egg hatches the young larva that quickly consumes the scale, then pupates, and finally develops to the adult wasp which escapes from the scale covering by cutting a circular hole through it.

The complete cycle from egg to adult requires less than three weeks under good conditions in the field. Thus, the short developmental period permits several generations of parasites to be pro-



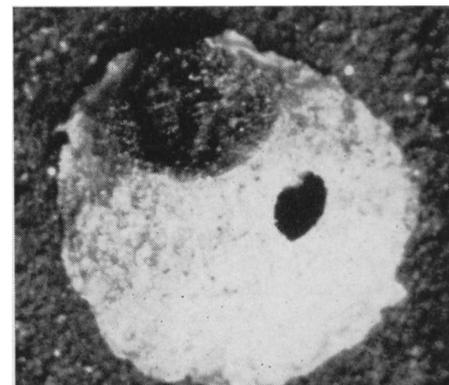
Proportional reduction of *Parlatoria oleae* in three test plots of Persian *Aphytis*.

Sample A—February 28, 1952.

Sample B—July 24, 1952.

Sample C—March 3, 1953.

Sample D—July 28, 1953.



Mature olive scale killed by Persian *Aphytis*. Parasitic wasp cuts circular hole through scale covering for egress. Magnified about 40 times.