Oak Pit Scales

control possible with emulsion-type foliage oil and toxaphene spray

A. Earl Pritchard and Robert E. Beer

Oak pit scales are serious pests of oak trees in California. Terminal growth, branches, and smaller trees are often killed as a result of the feeding scales, and large trees may be weakened seriously. Experimental work indicates that oak pit scales may be controlled.

Adult pit scales are characterized by a soft body completely enclosed within a leathery sac. They are further characterized by producing a gall-like plant growth so that the insect appears to be set in a pit. The pit formation is caused by a toxin which is injected into the oak bark while the scales are feeding. The pit is most pronounced on actively growing wood.

The oak pit scales which occur in California are natives of Europe, brought into California on young oak trees.

Only during recent years have they been present in destructive numbers throughout the San Francisco Bay region and other areas in northern California, although they were first recognized as being established near Stockton in 1913.

Three species of oak pit scales are now known to be present in California. The least pit scale—*Asterolecanium minus* Lindinger—is the most common and widespread, although the drab pit scale—*A. quercicola* Bouché—is often abundant. The golden pit scale—*A. variolosum* Ratzeburg—is seldom encountered. The habits of all three species appear to be similar, and it is not necessary to distinguish between them for control purposes.

Trees of the white oak group are favorite hosts, and the English oak, as well as the native valley oak and blue oak, is particularly subject to injury. The coast live oak and the California black oak are sometimes severely infested, but many of these trees escape serious damage.

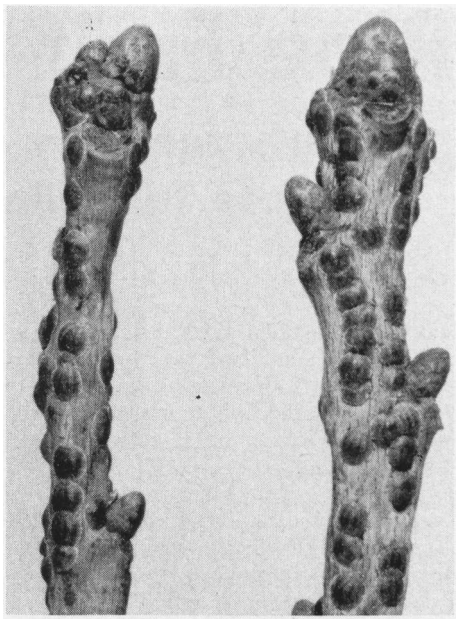
Oak pit scales have a single generation annually in California. No males are known, and the females give birth to living young. The young scales crawl around for several days after which they settle down and lose their legs. They grow gradually in size and slowly secrete the protective sac. The adult females overwinter before producing crawlers.

The reproductive patterns of the least pit scale and the drab pit scale were determined by means of bands of masking tape which were placed on heavily infested twigs. The bands were ringed with Tanglefoot to catch the crawlers, and the bands were replaced weekly.

In the San Francisco Bay region, near Woodside, during 1949, the first crawler emergence of the least pit scale was approximately May 1st. This was followed by very rapid reproduction near the middle of May and a strong decrease in the number of crawlers early in June. During late June, July, and the first part of August, there was sustained reproduction although considerably lower than the peak rate in May. During the latter part of August and in September, reproduction declined steadily. The last crawlers were found near the middle of September.

At Berkeley, during 1949, the rate of reproduction of the drab pit scale was similar to that at Woodside. The summer emergence was proportionately low, however. There was also a lag in the emergence which was possibly due to cooler temperatures in Berkeley.

There is a high mortality of young pit scales, some of which is possibly due to predaceous mites and insects. However, no parasites nor diseases of oak pit scales have been found in California.



Showing the golden pit scale on terminal growth of English oak.

A dormant spray of oil emulsion has been recommended by several workers for control of oak pit scales. Arborists and other workers in California have not been satisfied with the results of dormant oil sprays.

Tests were made at Lafayette in February, 1949, on valley oaks infested with the least pit scale to determine quantitatively the results of dormant oil treatment.

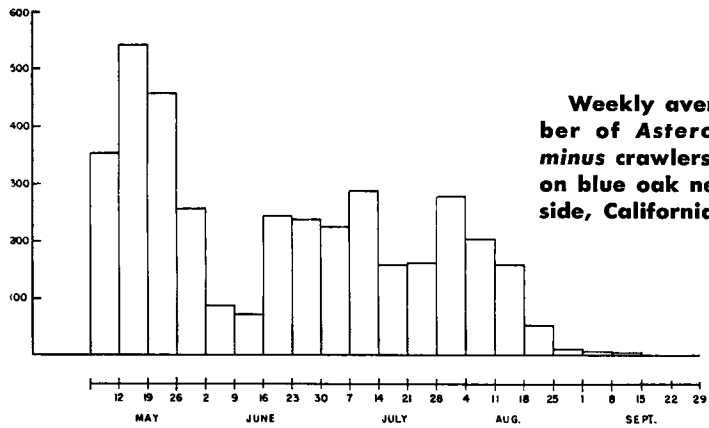
The tests all employed a 5% emulsion-type dormant oil. The treatments were each made on two trees, while two trees were used as a check. One treatment was with dormant oil alone; one was with the addition of one pound actual DDT per 100 gallons of diluted emulsion; and one was with the addition of 1½ pounds actual toxaphene per 100 gallons of diluted emulsion.

Counts were made of the number of scales on 25 twigs from each treatment, and infestations were calculated on a basis of scales per square inch of twig surface. Seven months after treatment, counts were made of the young scales.

The results indicated that excellent control was obtained if only the old wood was taken into consideration. A considerable number of scales was found on the new growth, however. It thus appeared that the dormant application had persisted as a repellent to the crawlers, and the new generation from surviving females was concentrated where the greatest damage to the tree could be incurred. The addition of either DDT or toxaphene did not appear to contribute to the control by dormant oil.

Further experimental work was con-

Continued on page 14



Weekly average number of *Asterolecanium minus* crawlers per band on blue oak near Woodside, California, 1949.

OLIVES

Continued from page 12

standard grade into canning quality. Merely raising the average size one, or even two, grades might not justify the thinning expense. Reducing the volume of a given crop by thinning may improve the possibilities of obtaining a more satisfactory crop the following year. Thus the tendency toward alternate bearing will probably be reduced.

Further experiments are planned on fruit thinning of olives, and it is hoped that a technique for spray thinning can be developed which will further reduce the thinning costs.

H. T. Hartmann is Assistant Professor of Pomology in the Experiment Station, Davis.

Karl W. Opitz is Farm Advisor, Tulare County.

The above progress report is based on Research Project No. 1301.

ROT

Continued from page 10

stored at room temperature for three days, when another reading was made.

Results of this work indicate that the application of fungicidal dusts did not effect any control of rot.

There was no consistent difference between the no-treatment blocks and the fungicidal dust treatments nor was there any difference between one or two applications of the dusts in either the field reading or in the readings from the stored fruit samples.

Almost all of the rots occurred at damaged places on the fruit such as skin cracks, worm holes, stem scars, and sun scald spots. It was not unusual to find a rotted fruit where the mold had entered exposed tissue following a fruit growth crack even though the fruit had been previously covered with a protective dust.

It is generally agreed that the incidence of rot is much greater if rains occur shortly before or during the harvest season. One explanation of this is that moist conditions are more favorable for spore production, spore germination, establishment and development of the organisms concerned.

Another idea is that rains may cause an increase in fruit growth cracks especially if the roots and other parts of the plant are in an active condition.

Since irrigation alone does not cause any appreciable increase in growth cracks, rains probably exert their effect by increasing humidity of the air. Increased humidity of the air would lessen water loss from plants and thereby cause an increase in turgidity. Such an increase might cause rupturing of the fruit skin, providing openings for infection. Such turgid fruit would also be more subject to mechanical injury during picking.

This hypothesis might explain why more secondary rot in fruit has been found in some instances from sprayed than from unsprayed plots. Since defoliation by leaf spotting fungi has been prevented, plants have been kept in an actively growing condition. This has caused an increase in the number of growth cracks and mechanical injury during picking, probably resulting in more secondary rots. Unsprayed, and therefore defoliated, plants produced fruit which was flaccid. This fruit probably had fewer growth cracks and less mechanical damage during picking resulting in less secondary rot.

Since fruit rots are correlated with wet weather during harvest season and since these fall rains usually come late in the season, any practice which would bring the crop to maturity earlier to escape these rains might be of some value for control. Plant breeders might also select for earliness of maturity so that the crop can be harvested before the fall rains begin.

R. G. Grogan is Instructor in Plant Pathology and Junior Plant Pathologist in the Experiment Station, Davis.

The above progress report is based on Research Project No. 980.

SCALES

Continued from page 9

ducted near Woodside. Tests were made in late May on valley oaks and blue oaks which were heavily infested with the least pit scale. The treatments were each made on two trees while four trees were used as checks. One treatment consisted of a 2% light-medium emulsion-type foliage oil containing 4½% DDT, while the other treatment consisted of a 2% light-medium emulsion-type foliage oil along with one quart of 60% toxaphene emulsion—containing 1½ pounds actual material per quart—per 100 gallons of diluted emulsion.

Summary of Results of Dormant Oil Sprays on February 22, 1949, for Control of *Asterolecanium minus*.

	Pretreatment Feb. 21	Post-treatment Aug. 24	
	Scales/ sq. in.	Scales/ sq. in. old wood	Scales/ sq. in. new growth
5% oil—80% emulsion	7.5	0.0+	11.9
5% oil—80% emulsion 2# DDT—50% wettable	1.9	0.0+	10.6
5% oil—80% emulsion, 1 qt. toxaphene, 60% emulsion	9.4	0.0+	12.5
Checks	5.0	4.4	6.3

Counts were made of the number of scales on 30 twigs from each tree, and infestations were calculated on a basis of scales per square inch of twig surface. Pretreatment counts were based on over-wintering females, while counts made four months after treatment were based only on the new generation of scales. A comparison of the results showed that excellent control was obtained with oil and toxaphene, while oil and DDT gave negligible control.

The Summary of Results of Light-Medium Oil Combination Sprays on May 21, 1949, for Control of *Asterolecanium minus*

	Pretreatment May 19	Post-treatment Sept. 14	
	Adults/ sq. in. old wood	Scales/ sq. in. old wood	Scales/ sq. in. new growth
Valley oaks			
2% oil—80% emulsion, 1 qt. toxaphene, 60% emulsion	29.4	0.0+	0.6
Check	21.9	25.6	93.8
Blue oaks			
2% oil—80% emulsion containing 4.5% DDT	23.8	30.0	56.9
Check	21.9	17.1	46.3

Weekly band counts of crawlers were also made in connection with these tests. These counts indicated that practically no reproduction occurred following the oil and toxaphene spray, while crawler activity was not affected for more than one week after the oil and DDT spray.

Tests were also made in late July, 1949, on three valley oaks which were very heavily infested with the least pit scale. There was no apparent control on the tree which was sprayed with toxaphene alone at the rate of one quart of the 60% emulsion per 100 gallons of water. One hundred per cent control was obtained on a tree sprayed with 2% light-medium emulsion-type foliage oil along with one quart of 60% toxaphene emulsion per 100 gallons of diluted emulsion.

A. Earl Pritchard is Assistant Professor, Division of Entomology and Parasitology, and Assistant Entomologist in the Experiment Station, Berkeley.

Robert E. Beer was Research Assistant, Division of Entomology and Parasitology in the Experiment Station, Berkeley, when these studies were conducted.

The above progress report is based upon Research Project No. 1318.