Black scale now a major olive pest

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Black scale, *Saissetia oleae* (Oliver), has, until recently, been a minor pest of olive in California, and the specific chemical controls established for black scale have seldom been used. Chemical control of another scale, *Parlatoria*, a more serious pest of olive, resulted in some inadvertent control of black scale.

However, heavy infestations of black scale have developed generally within the larger olive growing districts within the past six years, primarily because chemical treatments for *Parlatoria* were discontinued with the introduction of the scale parasites, *Aphytis* and *Coccophagoides*. (These wasps have effectively controlled *Parlatoria*.) In addition, erratic pruning programs, resulting in dense trees, have further encouraged black scale infestations.

Heavy black scale infestations may cause severe defoliation; reduce the next season's crop; and coat fruit with honeydew (scale exudate), resulting in harvest difficulties and downgrading of quality.

Since black scale has emerged as a major pest of olive, efficient control procedures have become necessary. A two-year study was conducted to determine: (1) most efficient timing of chemical treatments; (2) treatment timing for optimum olive production; (3) effect of timing black scale treatments on control of another pest, the olive bud mite; and (4) efficacy of alternative pesticides for controlling black scale.

Timing chemical control

In California's interior valleys, black scale usually has one generation each year. Hatching begins in early June and extends through July. Young scale crawlers move to the olive leaves during the summer months. In the fall the crawlers move back to young twigs and pass the winter as immature scales. Treatments have generally been recommended during the crawler stage.

Mature Sevillano variety trees were used. Standard treatments included 1.5 percent light medium summer oil alone and in combination with either parathion or carbaryl (Sevin). Materials were applied according to accepted recommendations at the following times: mid-June, late July, mid-August, June plus July, November, and July plus November in 1973 and 1974, and early March in 1974 and 1975. Each treatment was replicated five times using individual trees as replicates. Three-inch-long twigs were sampled from each replicate in November 1973 and 1974 for scale treatments made before that date. Later treatments were evaluated in April 1974 and 1975. Also, ten 1-foot shoots were selected and tagged in March of both years and the resultant bloom counted in May for the treatment effect on olive bloom.

Table 1 shows the effects of treatment timing on black scale control for each season. Oil alone was effective only when applied during the crawler stage and immediately after all crawlers had hatched (July timing). If applied earlier, when hatching was incomplete, or later, when crawlers had increased in size, control was inferior to the oil combinations of either parathion or carbaryl (Sevin). When the weather is warm, as is typical during mid-season treatments, parathion was superior to carbaryl when either was combined with light medium summer oil. Postharvest and March (before the rubber stage) treatments of oil combined with carbaryl gave excellent control.

The results show that the most effective timing of chemical treatment for black scale control is after hatching and before rubber stage development in spring. Light medium summer oil combined with either an organic phosphate or carbamate insecticide is generally more effective than oil alone. The choice of insecticide also is somewhat temperature-dependent. Single treatments applied in July or postharvest are highly effective and economical. Although applications made more than once are slightly more effective, they are not economically feasible.

Relation of timing to fruit production

Trees heavily infested with black scale do not bear economic crops of

TABLE 1. THE EFFECT OF TIMING ON CONTROL OF BLACK SCALE, *Saissetia oleae*

Treatment*	Rate/100 gpa	Year	Average number scale insects after application on: 6/26	6/26 and 7/31	7/31	8/30	7/31 and 11/8	11/8	3/12
Check		1973	8.3	–	5.0	6.5	–	8.5	–
		1974	11.5	3.6	3.6	6.6	6.6	6.6	1.5
Light medium summer oil (LMSO)	1.5 gal	1973	2.3	–	0.0	3.5	–	7.0	–
		1974	5.6	–	0.8	2.8	–	5.5	5.3
LMSO plus parathion 25WP (on 6/26, 7/31, & 3/12)	1.5 gal plus 1 lb								
or		1973	0.4	–	0.8	2.0	–	0.1	–
LMSO plus Sevin 80W (on 8/30 & 11/8)	1.5 gal plus 1.5 lb	1974	1.6	–	1.6	0.4	–	1.6	0.1
LMSO plus parathion 25WP	1.5 gal plus 1 lb	1973	–	0.0	–	–	–	–	–
		1974	–	0.0	–	–	–	–	–
LMSO plus parathion 25WP (on 7/31)	1.5 gal plus 1 lb								
and		1973	–	–	–	–	0.0	–	–
LMSO plus Sevin 80W (on 11/8)	1.5 gal plus 1.5 lb	1974	–	–	–	–	0.3	–	–

* Applied treatments by high-pressure hand-gun sprayer to the point of runoff (approximately 450 gpa). Counts made in late November and April by examining 3-inch-long twigs per replication. There were five replications per treatment, and the twigs were selected from the current season's terminal growth.

NOTE: Sevin was used in some of the above trials, because parathion must not be used close to harvest.

TABLE 2. COMPARISON OF CERTAIN MATERIALS FOR THE CONTROL OF BLACK SCALE, *Saissetia oleae*, AT LINDSAY

Treatment*	Rate/100 gal water	Average number of insects† Immatures	Crawlers
LMSO (FMC)	1.5 gal	14	34
Sun 7E (Sunoco)	1.5 gal	41	63
PGSO-2 (Gava-D)	1.5 gal	4	7
PGSO-2 (Gava-D)	2 gal	15	0
Volck Supreme (Chevron)	1.5 gal	0	27
PGSO-2 plus parathion 25WP	1 gal plus 1 lb	5	0
PGSO-2 plus Sevin 80WP	1 gal plus 1.5 lb	0	20
PGSO-2 plus Sevimol 4F	1 gal plus 1 qt	0	7
PGSO-2 plus Imidan 50WP	1 gal plus 1 lb	0	5
PGSO-2 plus Diazinon 50WP	1 gal plus 1 lb	0	7
PGSO-2 plus Trithion 25WP	1 gal plus 1 lb	1	25
PGSO-2 plus Supracide 2E	1 gal plus 1 qt	1	5
PGSO-2 plus Dylox 80SP	1 gal plus 10 oz	0	0
Check	----	16	55

* Treated by high-pressure hand gun to point of runoff; three single tree replications per treatment. LMSO = light medium summer oil; PGSO-2 = Pure Gro Summer Oil.

† Counts made by sampling nine twigs from current season's terminal shoot growth and examining the second three inches of twig from the shoot tip. Treated 7/31/73 and sampled 11/30/73.

olives. To measure effects of timing of chemical control treatments on olive production, ten 1-foot shoots per tree were selected from the most effective treatments from the previous experiment. These were tagged in March before bud swell, and flower clusters were counted at bloom.

Figures 1 and 2 show that the longer black scale remains uncontrolled during the growing season, the more adverse its effect on the following season's bloom and on the crop. Although effective control can be obtained at various times during the growing season (table 1), black scale should be controlled before August for maximum crop production. As the season progresses and treatment is delayed, black scale has a depressing effect that approaches that on untreated trees.

Effect on olive bud mite control

The olive bud mite, *Oxyenus maxwelli*, has reportedly reduced olive fruit set in northern olive districts of California. It also occurs in high numbers in other olive districts, although no data are available regarding its influence on fruit set. Previous research has established that olive bud mite can be controlled by prebloom application of dusting or wettable sulfur. However, control is erratic, and phytotoxicity to bloom might occur with such treatments.

To determine the effect of black scale treatment timing on control of olive bud mite, 10 blossom clusters per tree were collected during bloom following the year of treatment. In all treated trees, olive bud mites were fewer than in untreated trees (fig. 3).

The results show that treatments for black scale generally depress olive bud mite development. Time and type of chemical treatment influence the extent of this depressing effect. Oils combined with the carbamate carbaryl or the organic phosphate parathion applied after July provide the best control of olive bud mite.

Alternative materials

Materials currently recommended for black scale control include light medium summer oil alone or in combination with parathion or carbaryl (Sevin). Efficacy of other chemicals was also tested on black scale. Treatments were made in July, and scale counted in November.

Treatments, rates, and control data are presented in table 2. Oils alone gave poorer control than did the combination of an oil plus an insecticide. One exception was the narrow-range superior spray oil PGSO-2, which gave fair control, although still not better than the combinations.

Many of the chemicals used in this experiment are not presently registered for use in olives. The test does show, however, that in addition to parathion and carbaryl, a number of alternative insecticides may be available should the need arise.

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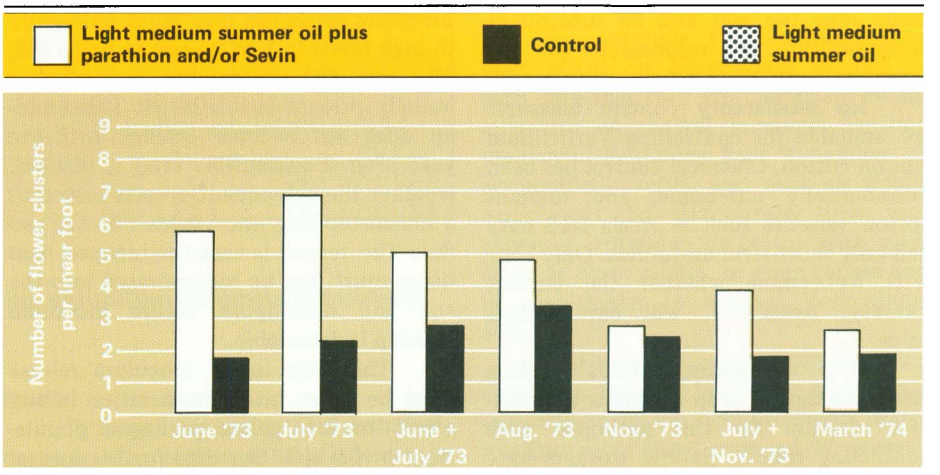

Fig. 1. Effect of application time for black scale control on following season's Sevillano olive bloom. Fox Orchard, Lindsay. Sampled May 1974.

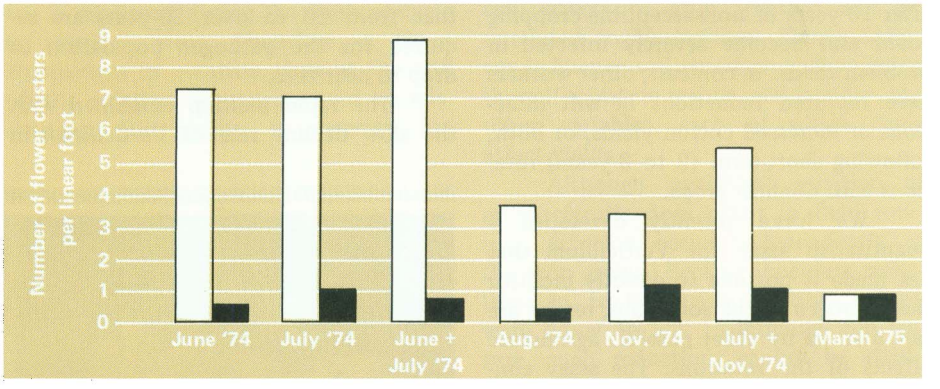

Fig. 2. Effect of application time for black scale control on following season's Sevillano olive bloom. Fox Orchard, Lindsay. Sampled May 1975.

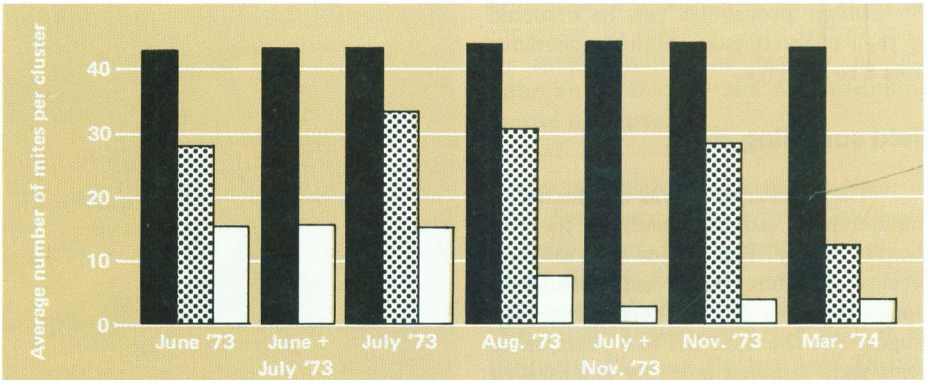

Fig. 3. Effect of black scale spray timing on concentration of olive bud mites on blooms the following season. Sampled May 1973/74.