

correlated with the use of strip-treatment. Citrus red mite populations were generally lower than in adjacent regularly treated areas, and mealybugs were less evident throughout the groves than pre-test surveys had indicated. The natural enemies of the California red and black scales were common throughout both plots and proved to be effective in maintaining a satisfactory degree of biological control.

Second Trials, 1956-59

Information accumulated during 1951-55 indicated modification of the strip-treatment schedule would improve the control program.

The desirability of modification hinged on the findings of other researchers that spring oil-spray treatments on Valencias in Orange County may be detrimental to fruit quality and production. Also, it proved difficult to maintain and coordinate a program of treating alternate pairs of rows at six-month intervals. Financial savings to the grower could be improved because—even though one-third less spray material was applied per year—the pest-control operator had to go through the grove twice a year.

Furthermore, it was now known that purple scale could go untreated for a full 18 months under a strip-treatment program; the purple scale parasite had become established during the 1951-55 test period and was slowing down the rate of purple scale increase in Orange County. Therefore, a 24-month period between treatments might be feasible under strip-treatment, which would mean treatment of every other pair of rows once a year—only one-half the grove—in the fall. Pest-control costs would be reduced by at least 50% and the spring oil spray treatments eliminated.

Early in 1956 a modified program was initiated for the same Valencia test plots used in the first trials. The spring oil treatment was omitted and each fall every other pair of tree rows were to be treated. Each successive year the rows untreated the year before would be treated. A third 10-acre test plot near Irvine was established under the new modified program early in 1956.

In the process of converting the original strip-treatment plots from a six-month to a 12-month alternation program, certain rows had to go untreated for a longer time than would have occurred on the original schedule. In one plot a considerable citrus red mite attack occurred in those particular rows the first season. Barring that one incident, the two original alternate strip-treatment plots continued under satisfactory commercial control of all pests under the 12-month alternation program until April 1959 when the test was terminated.

The new plot near Irvine had received regular annual treatments and had a heavy black-scale infestation. There was evidence of previous citrus red mite damage and all the usual insect species were present. Under the 12-month alternation strip-treatment program the black-scale infestation decreased satisfactorily within one year and all other pests remained under good commercial control until April 1959.

The purple scale parasite accounted for considerable mortality through parasitization and host-feeding on scale in the untreated rows as well as on scale that may have survived in the treated rows. Thus the parasite was instrumental in the

success of the strip-treatment program. Other potential pests in the groves studied were held in check by effective natural control factors, primarily parasites and predators.

The effectiveness of natural enemies—in any biological-control program—is seriously inhibited by even moderate ant populations. Sustained control of ants is essential.

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