

Rapid Spread of Alfalfa Pest

spotted alfalfa aphid infests about 75% of state's alfalfa acreage within two years after its discovery in California

Ray F. Smith, John E. Swift, and Jack Dibble

The worst pest of alfalfa ever to reach California has spread within two years to 33 alfalfa-producing counties.

Although those 33 counties contain over 90% of the state's alfalfa acreage, it is estimated that only a little more than 75% of the acreage is infested.

The pest—the spotted alfalfa aphid, *Therioaphis maculata* (Buckton)—first appeared in southern California early in 1954. By the end of that year it had spread to most of the alfalfa-producing sections south of the Tehachapi mountains.

The first spotted alfalfa aphid recorded in northern California was near Edison in Kern County in January 1955. Another small infestation was discovered in Fresno County in April. From these infestations the aphid developed and spread to most of the alfalfa-producing districts.

During the summer months of 1955, the aphid seemed to travel northward along Highway 99. In June it was as far north as Madera County; in July it reached Merced County. In August, Stanislaus County in the San Joaquin Valley and San Luis Obispo County on the coast were reported infested. At about the same time, the aphid made a

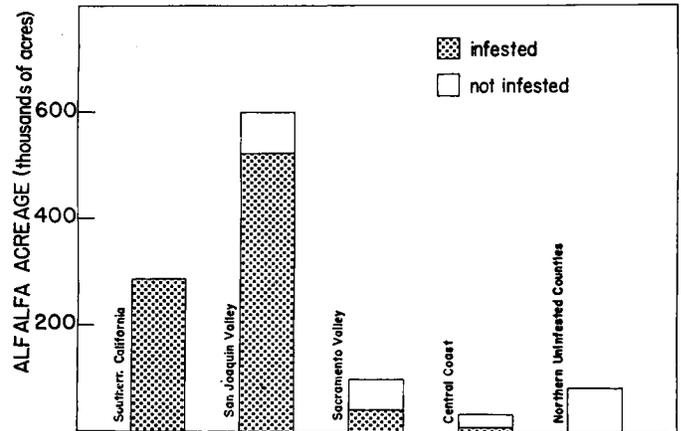
big jump to Tehama County. During September and October, scattered infestations appeared in the Sacramento Valley; the San Joaquin Valley infestations spread over most of the valley; and the aphid appeared in the San Francisco Bay Region.

Southern California, with about one fourth of the state's alfalfa acreage, is now completely infested. The San Joaquin Valley—containing about one half of the state's acreage and producing about two thirds of the alfalfa tonnage—is 87% infested. The Sacramento Valley, with only about one tenth of the acreage, is 41% infested. The central coast area is about 32% infested.

While the aphid was spreading in California, it was also spreading in other areas. In addition to California, it is found in Arizona, Nevada, Idaho, New Mexico, Utah, Texas, Oklahoma, Colo-

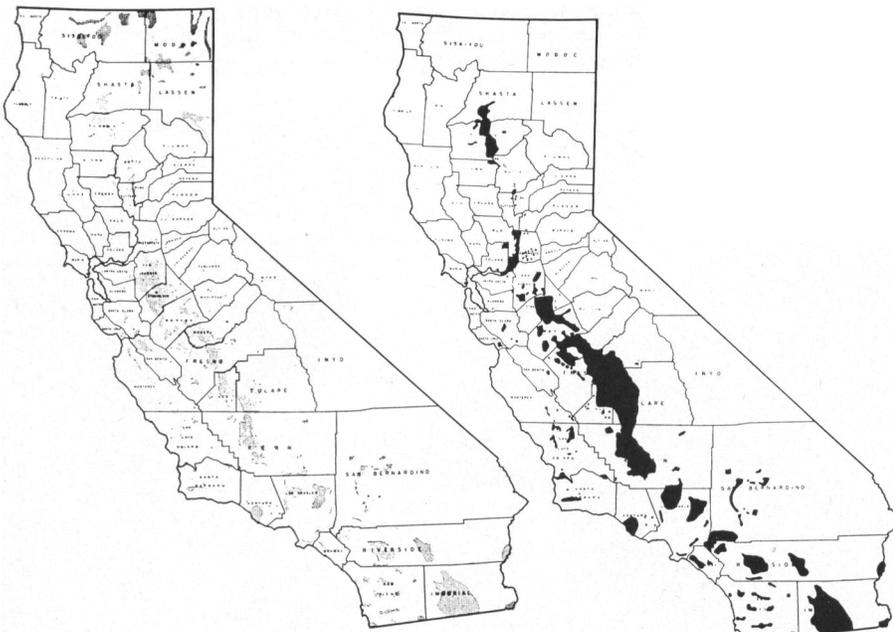
rado, Kansas, Nebraska, Louisiana, Arkansas, and Missouri.

In 1954, damage by the spotted alfalfa aphid in California, although severe, was limited to portions of southern California. One estimate reported losses in that year to be about one third of a million dollars. In 1955, the aphid occurred over a larger area and damage was more extensive. Despite the fact that the total amount of damage was significantly reduced by chemical control measures, the Bureau of Entomology of the State Department of Agriculture has estimated the 1955 crop losses and cost of control to be nearly \$13 million.



Relative distribution of alfalfa hay acreage and the spotted alfalfa aphid infestations in various sections of California.

The distribution of the spotted alfalfa aphid in California at the end of 1955—right—compared with the distribution of alfalfa—left.



Chemical Control

Adequate—if not completely satisfactory—chemical controls are available and must be applied during the growing season to produce satisfactory quality and yields of alfalfa. It is likely that the alfalfa grower will have to depend on chemical control until resistant alfalfa varieties become commercially available or until natural enemies of the aphid being introduced and cultivated take over the control of the pest.

Because the spotted alfalfa aphid is now in most of the state's alfalfa fields its impact on alfalfa production—if it continues to cause the damage it did last year—will be greater in 1956 than in 1955.

The success of a chemical control program depends upon careful application

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clover was very competitive in Field No. 5 where it amounted to 69% of the forage in the check and 71% in the fertilized treatments.

Forage Quality

The feed composition of the 1953 samples was analyzed. In every field, crude protein was increased. The phosphorus-fertilized areas averaged 13.1% protein compared to 9.0% for the check treatment. Total protein per acre was increased from two times in Field No. 3 to nine times in Field No. 4.

The quality of the feed prior to the introduction of the clovers and use of fertilizer—at the stage of maturity when sampled—was at a nutritional level that would require feeding a protein supplement.

The values for crude fiber, fat, ash, and calcium were not consistently affected by fertilization.

The phosphorus level of feed grown on this range soil—when unfertilized—is inadequate for livestock well-being. The range improvement operations of seeding legumes and phosphorus fertilization increased the phosphorus in the feed significantly. This was in large part the result of the response of the clovers, since their phosphorus content was increased more than the resident annuals.

Effect of Livestock Use

The relative difficulty of establishing seeded forage species encountered in areas with an herbaceous cover is primarily due to that cover. Resident annuals are present in most seedings, and these annuals develop faster than most seeded species. A heavy concentration of stock in early spring not only reduces this competition by weedy annuals but converts them into meat or wool when palatable and nutritious.

Field No. 1 was very weedy in the seeding year, so two enclosures—12' square—were placed in the field. The clovers in the enclosures suffered from the severe competition of the resident annual grasses, but in the open field a good stand of seeded clovers developed the first year.

The grazing load of better than three animal-unit-months per acre in early spring favored the legumes. The continuation of this practice for three seasons resulted in the dominance of sub-clover over rose and crimson clover. In the phosphated strips in Fields Nos. 2, 3, and 4, which were relatively clean, deferring the grazing had no unfavorable effect on the clovers.

In the unfertilized strips in Fields Nos. 2 and 4, and in both the fertilized and unfertilized strips in Field No. 5,

an early grazing during the seeding year would have been helpful to the clovers.

Since it is almost impossible to have range land in a Mediterranean-type climate completely free of weeds before seeding, a concentrated grazing by livestock or a mowing is usually imperative the first spring.

The use of a mixture of annual clovers of varying growth habit allows much greater latitude of adjustment of livestock use than is otherwise possible.

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The range improvement studies reported in this article were conducted with the assistance of the Franceschi Ranch and the Chamberlain Ranch near Lincoln, Placer County.

WALNUTS

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at a rate to exceed four pounds of actual material per acre. This dosage is sufficiently high to give adequate control of the codling moth.

Where air carrier sprayers are employed—at a maximum ground speed of 1½ miles an hour—the following mixture in combination with a suitable aphicide and applied at the rate of 200 gallons per acre has been effective:

DDT, 50% wettable powder.....	20 lbs.
DDT depositor	2 lbs.
Light summer oil emulsion containing 80% oil	3 gals.
Water	500 gals.

Experiments conducted with a dry depositor substituted for the light summer oil emulsion gave inconclusive results.

Where treatments are applied with a conventional sprayer, the following spray mixtures in combination with a suitable aphicide are effective:

1. Standard lead arsenate.....	2 lbs.
DDT, 50% wettable powder.....	½ lb.
Safener-commercial basic zinc sulfate product containing 50% zinc expressed as metallic	½ lb.
Light summer oil emulsion containing 80% oil	¼ to ⅓ gal.
Water	100 gals.
2. DDT, 50% wettable powder.....	¾ lb.
Light summer oil emulsion, containing 80% oil	¼ to ⅓ gal.
Water	100 gals.

Regardless of the formula used, it was necessary to slurry the dry ingredients and add them to the spray tank with agitator going and the tank one-third to one-half filled with water. The oil was added when the tank was three-fourth or more full.

The finished spray mixture must be applied as a thorough coverage spray. For large trees, upward to 1,000 gallons or more of spray are needed per acre.

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RUSSET

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tonite, five showed less russet on the bentonite-dusted fruit, but the differences were not significant.

Further tests using more and varied applications will be needed to determine more accurately the effect bentonite may have on russetting.

Insecticides have come under suspicion as possible russet-causing agents. Therefore, in 1955 a number of commonly used insecticides were tested in the Sacramento Valley orchard. A block of about 100 mature trees was given the standard lime sulfur, wettable sulfur cluster-bud spray and the 10-90 copper-lime dusts for blight control. Single applications and various combinations of nine insecticides were applied at the recommended time and concentration for each. Each treatment was applied to a set of four trees.

As seen in the table in column 1 on page 9, none of the four miticides applied either alone or in combination with parathion had any effect on russetting. DDT, lime sulfur, wettable sulfur, and TEPP also were shown to have no influence on the amount of russetting.

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The studies concerning streptomycin treatments and fruit russetting in the Sacramento Valley orchard were made in Professor Peter Ark's plots.

The above progress report is based on Research Project No. 1450.

ALFALFA

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of the available control measures. Best results can be obtained if all alfalfa growers in an area cooperate in combating the pest so that heavy infestations are not left untreated to serve as a reservoir for reinfestation. Poor timing, inadequate applications, and negligence in watching the development of the pest will reduce the effectiveness of the control measures and in some instances may even aggravate the problem by disturbing natural control factors.

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The spread of the aphid reported above has been followed by co-operative surveys conducted by the University of California, the State Department of Agriculture, and the County Farm Advisors and Agricultural Commissioners.