



Control of Aphids on Barley

- **ECONOMIC TREATMENT LEVELS**
- **ANALYSIS OF YIELD INCREASES**

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BARLEY IS NOT subjected to widespread insect attack, except for periodic aphid infestations. This study was conducted over several years to determine whether direct aphid feeding caused sufficient injury to barley to warrant the expense of insecticide treatment. The accumulated data indicate that when aphid populations are expected to reach 25 to 30 aphids per tiller, barley yields may be reduced if the aphids are not controlled.

In some years aphids can be doubly destructive by reducing yields through direct feeding, and by acting as vectors of the barley yellow-dwarf virus. During this study, the incidence of the virus disease was very low and it was not determined whether insecticide treat-

ments would help reduce the virus disease problem.

The population density of aphids varies considerably from year to year, area to area, and usually from one field to another in the same area depending on the planting date and other climatic factors. The most common aphid species attacking barley in southern California and in the southern San Joaquin Valley are the oat bird-cherry aphid, *Rhopalosiphum padi* (L.) and the corn leaf aphid, *R. maidis* (Fitch).

Most of the aphids attacking barley in southern California are confined within the sheath of the young barley plant. Therefore, it would appear that a systemic insecticide or a material of rather

high volatility would best serve to eliminate the protected aphids.

Seed treatments

Two large-scale field trials were conducted in which 1 lb of actual Thimet was used as a seed coating in each 100 lbs of seed. There were 4 treated plots in each field and each treated plot was separated by a check plot of equal size.

Prior to conducting the field trials, laboratory tests had shown that 1 lb of Thimet per 100 lbs of seed reduced germination by about 30%. Thus, the seeding rate in the treated field plots was increased from 100 to 130 lbs per acre, whereas about 100 lbs of untreated seed were planted per acre in the check plots.

Very good control of aphids in barley was obtained with commercial-scale airplane applications as low as 5 lbs of 10% Thimet granules (½ lb actual toxicant) per acre. However, problems with hopper calibration, and the extreme accuracy in flying necessary to apply this low rate of the systemic insecticide, make a 7½- to 10-lb rate of application more realistic. Chemical control of aphids on barley was found economical only when populations averaged significantly higher than 25 to 30 aphids per tiller. In seven southern California barley fields treated with Thimet granules (at 1 lb of actual material per acre) the mean yield increase was 434 ± 128 lbs per acre. Even at the lowest increase (306 lbs per acre) the value of the extra yield was well above the cost of aphid control. The average aphid population in the check plots rose to 39 per tiller.

The seed was planted in dry soil and the fields were irrigated two days later.

The data show that seed treatment would not give satisfactory aphid control for more than three to four weeks after planting. Aphids invading the treated plots after this period were unharmed. Soon, there were as many aphids in the treated plots as in the check plots. For this reason, and because the Thimet seed treatment reduced germination, and because aphid infestations vary so widely, seed treatment is not recommended.

Aerial applications

Parathion and Systox were applied as sprays at 4 oz per acre, and at 2 and 4 oz per acre, respectively. Thimet granules were applied at ½ and 1 lb actual toxicant per acre. These materials were applied by airplane on large-size, replicated plots with equal-size checks separating each treated plot.

In general, the parathion and Systox treatments were not as satisfactory as the Thimet granules in reducing aphids protected within the barley sheath. However, they did give adequate control of aphids on the outer leaves.

When 20 lbs or less of Thimet granules were applied per acre with standard insecticide dusting equipment, the granules tended to bridge at the hopper opening. This caused an uneven distribution of the granules. Airplanes equipped with a Sellers' Swathmaster applicator or similar type of hopper gave excellent distribution of granules even at rates as low as 5 to 10 lbs per acre.

One to two days after the granules were applied, the fields were irrigated. In some areas irrigations (to move the toxicant to the root zone) may not be scheduled to coincide with aphid treatment. In such cases, spray materials may be more satisfactory than granules even though the sprays may not give as good aphid kill within the barley sheath.

Ten-per-cent Thimet granules applied

at 5 to 10 lbs per acre by airplanes equipped with a Sellers' Swathmaster applicator gave very good control of aphids on barley. However, the 5-lb application rate requires extreme accuracy in flying as well as in calibrating the hopper opening. This low poundage may not be practical for normal commercial application. A more realistic application rate appears to be 7½ to 10 lbs of 10% granules per acre.

Economic treatment level

The data indicate that yields above the cost of treatment may be expected when aphids are controlled at a level averaging about 25 to 30 per tiller. Chemical control of aphids is economical only when their populations rise significantly above this level.

In southern California and the southern San Joaquin Valley, aphid populations rapidly disappear as soon as the barley heads begin to emerge from the boot. In these areas, aphid treatment just prior to or at any time after the heads begin to emerge is unwarranted. In cooler areas, aphids sometimes persist after the heads emerge.

Expense and profit

The prices of different pesticides vary as do application costs. Knowing these specific costs, the price received for barley, and the economic treatment level, better predictions of profit can be made.

For example, during the years 1960 to 1965, the price received by California barley growers ranged from \$2.10 in 1960 to \$2.40 in 1965—or an average of \$2.28/cwt. In southern California airplane application costs have remained rather uniform, at a minimum of \$1.50 per acre. (That is, 5 to 15 lbs per acre of Thimet granules—or sprays at 5 gallons of solution per acre are applied at this price.) Above 15 lbs of granules or 5 gallons of spray solution, application costs increase.

In 1965, the cost of 10% Thimet granules was \$0.27 per lb. At 10 lbs per acre this pesticide cost \$2.70 plus \$1.50 for application, or a total of \$4.20 per acre for aphid control on barley. At this treatment cost, a grower would have had to increase his yield 175 to 200 lbs per acre during the 1960–65 period to pay for the cost of aphid control.

During this study, a number of field tests gave yield increases above the cost of treatment. Where yield increases were noted, the aphids in the check plots rose above 25 to 30 per tiller. Increases of approximately one-half ton per acre were obtained in two barley fields whereas the check plot population rose to 90 aphids per tiller.

In other tests where the check population was lower than 25 to 30 aphids per tiller, yield increases were only enough to pay for the cost of treatment—or no yield increase was noted. In this case the expense of treatment would be a total loss.

When the various field trials in the seven fields treated with Thimet granules at 1 lb actual material per acre were compared, the mean yield increase was found to be 434 ± 128 lbs per acre. At the lower confidence limit (i.e., $434 - 128 = 306$ lb/A), yield increases would have been above the cost of aphid control. The average aphid population in the check plots rose to 39 per tiller.

Two tests were conducted where 5 lbs of 10% Thimet granules were applied. In one field there was nearly a half-ton increase in yield. The aphids in the check plots rose to 90 per tiller. In the other field, no increase was noted but the aphids in the check plot only increased to 19 per tiller.

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