Aphid Resistant to Parathion

strain of walnut aphid in San Jose area found to have developed definite resistance to parathion

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A strain of walnut aphid—*Chromaphis juglandicola* (Kltb.)—encountered in the San Jose area during insect investigations in 1953 exhibited definite resistance to parathion.

To determine the degree of resistance, tests were conducted in which the resistant San Jose strain was compared with a nonresistant strain collected at Walnut Creek.

The two populations were compared by exposing aphids on walnut leaves to different amounts of a 0.5% parathion dust by means of a vacuum bell jar duster. The procedure used was to count the aphids on freshly gathered walnut leaves, dust the leaves and then hold them for four hours, at which time mortality counts were made. All tests were replicated and adequate checks were maintained.

The results obtained showed that 140 mg.—milligrams—of the 0.5% parathion dust were required for the LD_{50} level of the San Jose strain, while only 20 mg. of the dust were required for the LD_{50} of the Walnut Creek strain. This indicates a sevenfold resistance to parathion on the part of the San Jose aphids. The slope of the regression line for the resistant San Jose population—as illustrated on the accompanying graph—is typically less steep than the line for the nonresistant Walnut Creek aphids.

To obtain additional information on resistance, a field test was conducted on the San Jose aphids. Treatments were applied with the latest model high-capacity air-carrier sprayer. One block of trees was sprayed with parathion 25% wettable powder at the rate of two pounds per acre in 100 gallons of water. A second block was treated with 14% nicotine dry concentrate at the rate of nine pounds per acre in 100 gallons of water. The amount of parathion and water used was twice that normally recommended, while the nicotine dosage was increased from approximately seven to nine pounds, and the water from 50 to 100 gallons.

The parathion resulted in a marked reduction in the aphid population, but the kill was considered unsatisfactory, because—for good control with parathion—the aphid population should all but be eliminated from the treated area. This is believed to be necessary because of the adverse effect parathion exerts on natural enemies. The initial mortality obtained with the nicotine treatment was less than expected, but the control was good.

The treatment exerted no marked harmful effect upon the natural enemies, and they proceeded to hold the aphid in check. The rate of increase in the parathion block would have been much more rapid if it had not been for a rather heavy invasion of predators which tended to curb the aphid population.

The predator increase in this plot was unusually rapid.

A portion of the orchard not under experimentation was treated by a commercial pest-control operator. The dosage of parathion 25% wettable powder—needed to give satisfactory control—was roughly three pounds per acre, a threefold increase over the usual dosage.

Specimens of the resistant San Jose strain and the nonresistant form from Walnut Creek were examined, but no difference between the two was detected.

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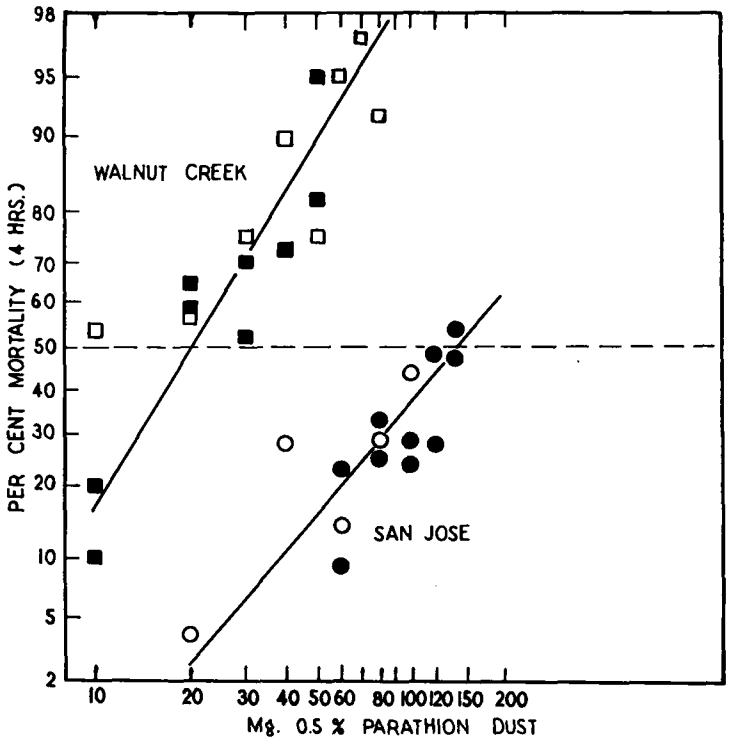
Comparison of Parathion and Nicotine Dry Concentrate in Controlling the Walnut Aphid at San Jose in an Area Where the Walnut Aphid Is Showing Resistance to Parathion.

Treatment (Approximate amounts applied per acre)	Average number of aphids per leaflet on survey dates given				
	Aug. 21*	Aug. 24	Sept. 4	Sept. 11	Sept. 17
25% parathion wettable powder— 2 pounds in 100 gallons of water	27.30	1.33	12.40	15.01	19.83
14% nicotine dry concentrate— 9 pounds in 100 gallons of water	27.30	0.44	0.54	1.01	1.89

* Before treatment.



Log Probit mortality curve for nonresistant Walnut Creek strain of the walnut aphid as compared with that of the resistant San Jose strain. Open squares and circles, tests run August 14, and solid squares and circles, tests run August 21.