

Spread of Tristeza on Citrus

melon aphid relatively inefficient carrier of quick decline virus but at its height can ruin orchard in about five years

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Only five minutes are required by the melon aphid—*Aphis gossypii* Glover—after feeding on a diseased citrus tree, to transmit the tristeza—quick decline—virus to a healthy tree. However, the aphid does not remain infective long—probably most individuals lose their ability to transmit the virus shortly after leaving the diseased tree—and apparently only an occasional individual aphid is able to transmit the virus at all.

In 950 experiments, 403,640 melon aphids were transferred from diseased to healthy trees and from the transfers 72 infections were obtained. This is an average of 5,606 aphids per infection and is probably the least efficient transmission ever recorded for a plant virus vector—aphid carrier.

Nevertheless—according to trap records over a three-year period—this efficiency is adequate for rapid spread.

From 1951 to 1954, aphid traps were kept in orange trees in 17 locations in southern California. The traps were changed each week and the aphids identified. By calculating the approximate tree surface area and comparing it with the trap surface, the number of aphids flying to one tree was determined.

The melon aphid made up about 3% of the total flying aphids caught, with—as indicated in the accompanying table—an average of 17,000 flying to each tree in southern California each year and as many as 36,000—to a single tree—in the Covina-Azusa district alone. Both of these figures are considerably more than necessary to produce the observed rate of spread. At its height, the actual field spread was seldom more than two diseased trees each year for each single previously diseased tree; but when there have been enough diseased trees to be noticed, this rate of spread will ruin an orchard in about five years.

In the Covina-Azusa district—where

the highest melon aphid populations and the most rapid spread of the tristeza virus took place—the actual field efficiency of the vector was about one new infection for each 18,000 melon aphids moving from diseased to healthy trees.

In the Riverside-Redlands-Corona district, the spread has not been as rapid as might be expected from the aphid population there, but perhaps symptoms in this area were mild. On the coast at Capistrano, the population of melon aphids has been quite low, and this also is true of all the citrus in San Diego County.

In the Ventura County district, citrus is planted throughout a wide climatic range and shows a corresponding range of aphid infestation; citrus trees from Fillmore to Saticoy generally have a high population of aphids, including the melon aphid. Citrus on the desert has characteristically low aphid populations—mostly the green peach and cowpea aphids—and very few melon aphids. In Kern and Tulare counties, aphid populations are similar—most years—to those found in the desert.

The melon aphid is dark gray when on citrus. It breeds on many hosts over most of the world, but only in this country does it carry the tristeza virus. Outside the United States, the virus is carried by the black citrus aphid—*Aphis citricidis* (Kirk.)—which is a much more efficient vector than the melon aphid. Colonies of 100–300 melon aphids, for example, gave only 6.3% infection, while in Brazil similar-sized colonies of *A. citricidis* gave 76.3% infection.

Other aphids caught and identified during the three-year experiment and commonly found on citrus are:

The green citrus aphid—*Aphis spiraeicola* Patch. Apple-green in color, it is usually the most abundant aphid on citrus in coastal southern California,

causes direct injury to citrus, and sometimes necessitates spraying.

The green peach aphid—*Myzus persicae* (Sulz.). Pale green to pinkish in color, it breeds on a large number of plants, is very active, and carries many plant viruses although not the tristeza virus.

The brown citrus aphid—*Toxoptera aurantii* (Fonsc.). Often called the black citrus aphid—although most specimens are a mahogany-brown color—it is primarily tropical in habit but is found in California on both citrus and camellia.

The cowpea aphid—*Aphis medicaginis* Koch. The blackest aphid found on citrus—old, wingless females are shiny black—breeds on many plants and thrives under high temperatures.

Other aphids—occasionally found breeding on citrus—were the potato aphid—*Macrosiphum solanifolii* (Ashm.); the foxglove aphid—*Myzus solani* (Kalt.); the sunflower aphid—*Aphis helianthi* Monell; and the bean aphid—*Aphis fabae* Scop. The remaining aphids caught came from nearby weed and crop plants.

Each year the big peak of aphid population comes in the spring, with the growth flush in April and May and sometimes in March. Little secondary peaks come in July or August and sometimes again in November. The size of the figures in the accompanying table—which gives the total numbers of all aphids flying to one orange tree each year—indicates why citrus trees are often rapidly reinfested following a spray application.

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Total and Average Aphids Flying to Single Orange Trees per Year Located in Four Citrus Districts of Southern California, 1951–1954

District	Melon aphid	Green citrus aphid	Green peach aphid	Brown citrus aphid	Cowpea aphid	Total of all aphids per tree per year
Riverside-Redlands	25,000	329,000	31,000	190	3,340	423,000
Covina-Azusa	36,000	809,000	33,000	2,360	5,200	956,000
La Habra-Anaheim	4,000	631,000	15,000	1,980	760	678,000
Costa Mesa-Capistrano	3,000	153,000	6,000	4,510	600	186,000
Average	17,000	480,000	21,000	2,260	2,500	561,000
Per cent	3.01	85.68	3.81	0.40	0.44	