Beet Leafhopper Transmits Citrus Stubborn Disease

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Recent studies in California and Europe have shown that certain leafhoppers can transmit the stubborn disease organism, *Spiroplasma citri*, after acquiring it by various artificial means. We also know that one leafhopper, *Scaphytopius nitridus* (DeLong), can acquire the organism by feeding on infected citrus and can then transmit it to periwinkle plants (*California Agriculture*, January 1975) and citrus.

Another species, the beet leafhopper, *Circulifer tenellus* (Baker), has also been scrutinized closely as a possible vector of the stubborn organism because field-collected *C. tenellus* were often found to harbor *S. citri* (*California Agriculture*, November 1973). However, proof was lacking that *C. tenellus* could transmit the stubborn organism after acquiring it by feeding on infected plants. Within the last year, we have been able to demonstrate that the beet leafhopper is indeed a vector of the stubborn disease organism as well as curly-top virus.

One of the difficulties we encountered in our study was the inability of the leafhopper to survive long on citrus. We therefore tried various manipulations of laboratory reared leafhoppers in which they were allowed to feed on both sugarbeet and diseased citrus (or alternately on sugarbeet and diseased citrus) before they were transferred to healthy citrus plants or periwinkle plants.

In one experiment, several stubborn-diseased Madam Vinous sweet orange seedlings growing in a plot at the University of California Field Station at Moreno, Riverside County, were covered with cages 4 X 4 X 3 feet wrapped with leafhopper-proof Saran screen. Then four healthy Madam Vinous sweet orange seedlings and one greenhouse-grown sugarbeet were planted inside each cage, and 200 laboratory reared *C. tenellus* were introduced into each cage in July, 1974. At the end of October, 1974, the *C. tenellus* were removed from the cages (using a De-Vac insect collecting machine) and caged for 20 days on healthy periwinkle plants in a greenhouse. Two of these periwinkle plants developed the yellow leaves and small flowers typical of infection by *Spiroplasma citri*, and the organism was isolated from both plants. A few *C. tenellus* caged on one of these two periwinkle plants survived the 20-day feeding period; these were transferred to a healthy Madam Vinous seedling and allowed to feed until they died. Several months later this plant also developed symptoms of stubborn disease, and *S. citri* was isolated from it. Subsequently, *S. citri* was successfully graft inoculated into other healthy citrus plants from the plant.

In other efforts to show that *C. tenellus* could transmit *S. citri*, we collected the leafhopper from fields at several locations in California and caged them on periwinkle plants in the greenhouse. During 1974 and 1975, *C. tenellus* collected from Moreno and Riverside, Riverside County; from Victorville, San Bernardino County; and from Bakersfield, Kern County, all transmitted *S. citri* to periwinkle. Six periwinkle plants developed yellow leaves and small flowers, and *S. citri* was isolated from each.

Circulifer tenellus can therefore acquire the stubborn organism by feeding on diseased citrus in the field and can then transmit it. Also, *C. tenellus* from several locations in California do not only harbor the organism but can transmit it to periwinkle. Thus, this species has some role in the spread of *S. citri* in the field, although its importance in contrast with that of *Scaphytopius nitridus* or other as yet unidentified vectors needs to be determined. Because *C. tenellus* occurs commonly in arid areas where citrus is grown, and because it reproduces on various plants in and near citrus, it may prove to be important in the spread of stubborn disease in the Southwest.

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