LEAFHOPPER–*Natural citrus stubborn disease?*

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The citrus stubborn disease organism, **Spiroplasma citri**, has been transmitted from citrus to periwinkle plants by a leafhopper, **Scaphytopius nitridus**, which breeds on citrus in southern California. This is the first report of transmission of the stubborn disease organism by insects that acquired the organism by feeding on diseased citrus plants.

CITRUS STUBBORN DISEASE has caused widespread damage to orange, grapefruit, and tangelo trees in arid areas of California and in other arid citrus-growing areas of the world. It was first thought that stubborn was caused by a virus. However, recent evidence indicates that the cause is a mycoplasma-like organism, *Spiroplasma citri*, found in the food-conducting tubes of citrus plants infected with the disease.

After *S. citri* was found in phloem of diseased citrus, techniques were developed that allowed this organism to be isolated from diseased plants and cultured in cell-free nutrient media.

When it was demonstrated that *S. citri* can be isolated and cultured from the beet leafhopper, *Circulifer tenellus* (see *California Agriculture*, November 1973), determining whether this and other leafhoppers are vectors of *S. citri* seemed to be the next step. *Scaphytopius nitridus*, a species that was discovered only a few years ago breeding in California citrus groves, was considered a primary suspect vector of the stubborn disease organism because 1) several of its close relatives are known to transmit mycoplasma-like organisms similar to *S. citri* and 2) it feeds and reproduces on citrus. As a result of intensive study, it can be shown that in the laboratory *S. nitridus* can acquire the organism by feeding on diseased Madam Vinous sweet orange seedlings.

The first step was to graft-inoculate Madam Vinous seedlings with field-collected diseased tissue. These seedlings subsequently became infected with *S. citri* and developed symptoms of stubborn disease. Then adult *S. nitridus* from disease-free colonies maintained in the greenhouse were fed on the diseased seedlings for 24 days. From the 24th day, the disease organism was cultured in artificial media from the bodies of several of these leafhoppers. Also on the 24th day, groups of 50 to 100 of these leafhoppers were transferred to 10 disease-free periwinkle plants (*Vinca rosea*) and allowed to feed for two weeks. About three weeks after the leafhoppers were removed from the periwinkle the leaves of four of the plants began to show signs of yellowing. The plants became progressively more chlorotic, and some of the new flowers that bloomed were much smaller than normal flowers. We were able to culture the stubborn disease organism repeatedly from stems and leaves of these four plants. The disease agent was also transmitted from these plants to healthy periwinkle plants by graft inoculation.

This acquisition of the stubborn disease organism by non-infectious leafhoppers after a long feeding period on stubborn-diseased orange seedlings and the eventual transmission of the organism to periwinkle plants is highly significant. *Scaphytopius nitridus*, long suspected of being a vector of *S. citri*, is in fact capable of naturally acquiring the organism and of transmitting it to plants. Certainly, the ability of *S. nitridus* to transmit *S. citri* to citrus remains unproved at this time, but the transmission to periwinkle constitutes a most significant step toward this possibility. Moreover, the near relative of *S. nitridus*, *Scaphytopius delongi*, breeds on citrus in central California. Eventually it may be found to transmit *S. citri* in central California citrus groves.

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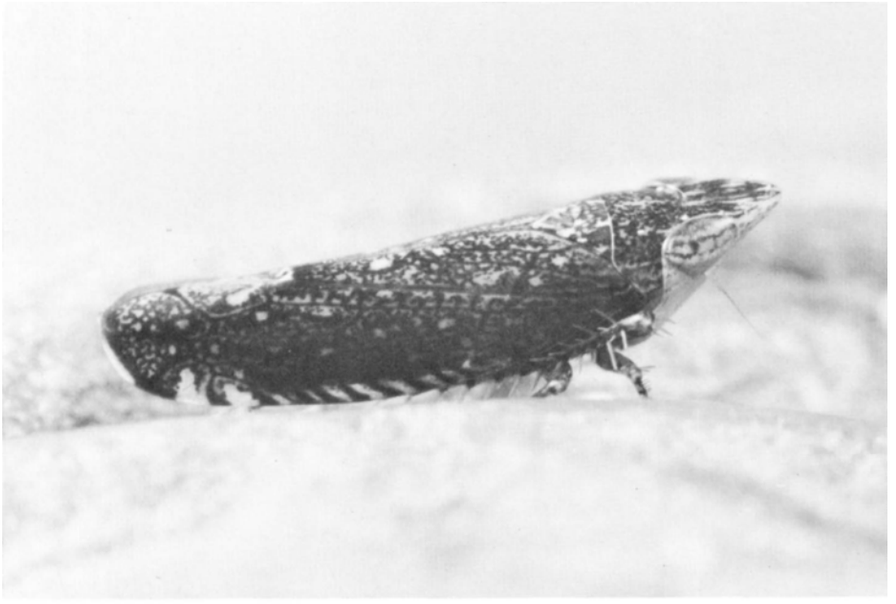
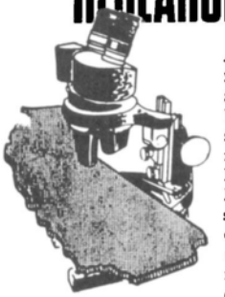
Left, healthy periwinkle plant; **right,** periwinkle affected by citrus stubborn disease.



Leafhopper, **Scaphytopius nitridus,** vector of citrus stubborn disease.

RESEARCH PREVIEWS



A continuing program of research in many aspects of agriculture is carried on at University campuses, field stations, leased areas, and many temporary plots loaned by cooperating landowners throughout the state. Listed below are some of the projects currently under way, but on which no formal progress reports can yet be made.

HERBICIDES AND PERENNIAL WEEDS

THE BEST CONTROL of perennial weeds is achieved by the translocating type of herbicide, which moves into the underground rhizomes, tubers, and roots. Since random field testing of such herbicides has yielded poor results, U.C. Davis researchers are using fundamental and applied research in the field, greenhouse, and laboratory to determine the effect of herbicides on growth, reproduction, and metabolism of perennial weeds.

BIOLOGICAL CONTROL OF APHIDS

In a current approach to aphid control, scientists from California will search foreign countries for natural enemies of aphids. The predators and parasites will be imported and colonized in carefully supervised field plots, with follow-up investigations on the role of the newly established natural enemies in integrated control programs.

CALIFORNIA AGRICULTURE
Progress Reports of Agricultural Research, published monthly by the University of California Division of Agricultural Sciences.

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California Agriculture will be sent free upon request addressed to: Editor, *California Agriculture, Agricultural Publications,* University of California, Berkeley, California 94720. Notify same office for change of address.

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