



Distribution of leaf scorch disease in California almonds, 1974.

**A** NEWLY RECOGNIZED leaf scorch disease has recently been found over a wide area in the state's almond-producing districts. First noted in 1958 on a few scattered trees in the Quartz Hill area of Los Angeles County, by (then) Farm Advisor J. A. Beutel, and soon after near Brentwood in Contra Costa County, the disorder has been referred to as "golden death" or "almond decline." Surveys made during the 1974 season have shown that the disease is sporadic but widespread in the central and northern portions of the Great Central Valley: from Merced County northward to Butte and Glenn counties, an important almond producing area.

The disease is characterized by marginal leaf scorch which initially appears in July and August. Only a single terminal shoot or branch might show symptoms at first, with the remainder of the tree appearing perfectly normal. In subsequent seasons more branches become involved, until the whole tree eventually displays a characteristic golden-brown appearance. This progression of symptom expression occurs over a period of three to five years while tree productivity steadily declines. In Los Angeles County, no longer an important almond-producing area, the disease has been observed to spread slowly through the orchards, destroying productivity of individual or-

# "GOLDEN

## *a new leaf scorch to almond*

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chards in 10 to 15 years. In some orchards in Contra Costa County, an estimated 50% of the trees are affected. The disease has been seen on more than 10 commercially important almond varieties, including Nonpareil, Mission (Texas), NePlus and Peerless.

Leaves do not wilt and droop, as in a drought-affected tree, but portions of otherwise healthy green, full-sized leaf blades suddenly desiccate from either the edges or tips, resulting in a zonate pattern in the dead leaf portions. On a number of almond varieties the leaf tissue between the green and scorched areas appears as a bright yellow band—a diagnostic feature which distinguishes this disease from leaf damage caused by salt excess. The leaf scorch may appear on one or several different areas of an affected leaf, involving only a small portion or as much as three quarters of the leaf blade. Trees which have been once affected by leaf scorch disease do not recover.

Disease confirmation is shown in this test with the production of reddish-purple streaks in the wood tissues after 5-20 minutes' immersion in acidified methanol. Wood piece on right is from healthy tree.



### **Presence of bacteria**

Examination of affected leaf tissue using the electron microscope has consistently revealed bacteria in the water-conducting tissues; healthy leaves do not contain these organisms. There is a marked similarity in appearance between the bacteria in leaf scorch-affected almond leaves and those which are known to cause Pierce's disease in grapevines—as well as a resemblance in leaf symptom expression for the two diseases. In fact, recent greenhouse studies, using a leafhopper vector (reported by Mircetich, et al., and Auger, et al., at the Annual

# DEATH"

## *threat grows*



Newly affected tree with typical leaf scorch symptoms on a single terminal branch.

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Meeting of the American Phytopathological Society, 1974) have shown that the bacterial agent of the almond leaf scorch disease can be moved from infected almond to healthy almonds. Furthermore, the leaf scorch bacteria have also been transmitted from almond to grapevine, inducing symptoms of Pierce's disease. In a similar manner the bacteria causing Pierce's disease in grapevine have been transmitted to almond to induce leaf scorch. Further study of this relationship is in progress.

An extremely useful test, either for early detection or confirming the identity of the disease in almond, has been a

chemical staining reaction first devised for peach phony disease in the southern states many years ago. Woody tissues from leaf scorch-affected almond branches show reddish-purple streaks in longitudinal sections after 5 to 20 minutes' immersion in acidified methanol.

More information is needed on varietal susceptibility of almond, and the effect of antibiotic transfusions into leaf scorch-affected trees, so that steps can be taken to alleviate tree and production losses. Indications thus far are that this new problem is a threat to the almond industry, if its behavior in any way imitates that of Pierce's disease in grapevines.

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Diseased leaf showing marginal scorch and bright yellow band between green and necrotic tissues.

As disease progresses, tree shows more scorch symptoms.

Trees in the later stages of decline become uniformly scorched in late summer.

