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TITLE: ALMOND LEAF SCORCH 79 U5

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INTRODUCTION:

Almond leaf scorch is a serious disease of almonds that is present at least to some extent in most areas where almonds are grown. It has destroyed orchards in only two areas--the Lancaster district where the disease killed hundreds of trees over the past 15 or more years and the Antioch-Brentwood districts where the disease is extremely serious now and has been for the past 5 years. In most areas infected trees are scattered and relatively few in total number.

Almond leaf scorch is caused by a bacterium that lives in the water-conducting vessels of the tree and by producing a powerful toxin causes the leaves to burn and fruits to drop and eventually kill limbs and trees. Yield losses are very high in affected trees. The causal bacterium is the same organism that causes Pierce's Disease of grapes. These diseases constitute an ever present threat to both almonds and grapes because of the potential for epidemics. Leaf hopper vectors of the sharpshooter and spittle bug group that feed in the water-conducting vessels in the leaf veins spread the disease.

The team of plant pathologists and entomologists involved in the almond leaf scorch project has attempted to acquire information about the disease and the insect vectors that spread it on which control measures could be based.

PROGRESS AND PLANS:

1. Chemotherapy

After injecting trees with several different chemicals at varying dosages we concluded that Terramycin at 10-15 grams/tree (a.i.) in 1-2 liters water injected annually in the dormant season will result in remission of symptoms in mild to moderate cases. Severely diseased trees will not take up the chemical very well because the xylem is not sufficiently functional. Table 1 shows results of Terramycin injections in 1978-79. Trees are rated by quadrants from 1-4, the smallest number being the least affected.

Table 1. Tree injection with Terramycin for control of almond leaf scorch - 1978-79.

Tree No.	Dose (grams)	1978 Disease reading	1979 Disease reading
1	15	8	0
2	15	8	0
3	15	10	0
4	15	10	0
5	15	12	0
6	15	15	4
7	15	16	10
Untreated	0	12	16

New chemicals are being tested to try to find cheaper and more effective ones. No residue was found in nuts or hulls from trees injected during the dormant season.

2. Tree Surgery

We cut out branches with incipient infections and observed the tree for recurrent symptoms. Our results showed that new infections can be removed by surgery and trees can be cured. Careful annual inspections are required for this method to be effective.

3. Susceptibility of Almond Varieties

Field obervations indicate that varieties vary in susceptibility to almond leaf scorch. Rate of movement of infection tested in the plot at Davis shows that after 2 years the infection in Milo occurred throughout the entire 4 year old trees, whereas the infection in trees of the other varieties that became infected was still limited to inoculated branches. No infection occurred in Harvey, Ruby, Carmel, and Fritz but these results must be verified. Table 2 shows the distance of maximum spread in the inoculated branches for each variety in 2 years.

Table 2. Movement of leaf scorch in inoculated branches of almond 2 years after inoculation.

Cultivar	Spread in cm
Peerless	160
Thompson	50
Price	54
Mission	63
Long IXL	80
Merced	40
NePlus	95
Carrion	50
Nonpareil	85
Drake	40
Davey	90
Milo	450

Our data also show that most branches die within 4 years after infection.

Inoculation experiments

Graft and needle inoculations were more efficient (31%) than insect inoculation (5.5%) in tests made at Kearney and West Side field stations. Even though 31 of 131 inoculation sites showed symptoms the year they were inoculated only 3 developed symptoms again the following year. This lack of persistance of infections may account for the low incidence of the disease in the San Joaquin Valley.

Reservoir hosts

Many wild plants were collected in the vicinity of almond orchards with high incidence of disease. These plants will be tested for infection with the leaf scorch bacterium using a very sensitive serological technique. Results of these tests are not available at this time.

Vector studies

No known vectors of the leaf scorch bacteria could be found in consistent association with diseased orchards or their environs. In the case of one orchard spittle bugs seemed to be the most common potential vector in the vicinity. A search for possible reservoir hosts is being made in this area.

Non-vector leaf hopper species injected with leaf scorch bacteria did not vector the bacteria.