A Preliminary Diagnosis of a Sudden Decline in Valencia Orange Trees on Volkamer Lemon Rootstock in Venezuela

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ABSTRACT. During 1985, a sudden decline was detected in sweet orange trees on Volkamer lemon rootstock in northwestern Venezuela. Symptoms in the affected plants were flaccid leaves, loss of brightness, defoliation, dry shoots, zinc deficiency symptoms in the new leaves, water sprouts on the trunk and in some cases death of the tree. These symptoms are very similar to those of blight in USA, declinio in Brazil and marchitamiento repentino in Uruguay. Preliminary results showed a relationship among the visual symptoms of disease, the lack of water uptake by the trees and the presence of amorphous plugs in the trunk wood of affected plants. However, there were no differences in the zinc content of leaves, trunk wood and soil between healthy and diseased plants. *Fusarium* sp. and *Colletotrichum* sp. were isolated from root and shoot samples. Pathogenicity tests are underway to determine any relationship to the disease. No tristeza stem pitting or honey-combing were seen at the budunion of the trees. No plant parasitic nematodes were detected in the soil or roots of healthy and diseased plants.

Index words. survey, blight.

In 1985, a sudden decline was detected in 6-yr-old Valencia sweet orange trees on Volkamer lemon rootstock in a citrus plantation in northwestern Venezuela. Initially, the affected plants showed a loss of brightness and flaccid leaves, as if they were suffering from drought. The plants began to defoliate, and showed twig dieback and visual zinc deficiency symptoms in the new leaves. In the more advanced stages, the branches were completely dry, the trees had thin canopies and numerous water sprouts on the trunk. Total defoliation often occurred and some trees died 6 to 8 months after the first symptoms were detected. The visual symptoms are similar to those caused by blight in the USA (5), declinio in Brazil (3) and marchitamiento repentino in Uruguay (4). For this reason, studies were carried out in an attempt to determine if this disease had diagnostic characteristics similar to these declines.

MATERIALS AND METHODS

Citrus trees showing sudden decline symptoms and apparently healthy trees were selected from commercial orchards in the states of Aragua, Carabobo and Yaracuy.

The trees were rated on a scale from 0 to 5, according to their visual symptoms: 0 = healthy; 1 = flaccidity and loss of brightness of the leaves, but little or no thinning of foliage; 2 = small leaves with zinc deficiency, and plants beginning to defoliate; 3 = severe defoliation, dry twigs and numerous water sprouts on the trunk; 4 = almost complete defoliation, leaves with strong zinc deficiency symptoms, and weak new shoots; 5 = complete defoliation and death (1).

The water uptake of the trees was determined using the syringe injetion method of Lee *et. al.* (2). Samples of trunk wood were taken after removing two pieces of bark, and making two holes, 5 cm deep, on two sides of the trees, 20 cm above the budunion with a zinc-free drill bit. The wood samples from each tree were collected in plastic bags, and the zinc content was measured as described previously (6, 7). Leaf samples from the trees were taken from the inner canopy at the cardinal points and the zinc content was measured. The zinc content was measured in soil samples taken at 0-20, 20-40, and 40-60 cm depth.

Bark patches were removed at the budunion to determine if tristeza

stem pitting or honey-combing was present.

Root and shoots were collected from the trees and isolations were made on potato-dextrose-agar and samples were placed in humid chambers to detect any fungi or bacteria.

Soil and root analyses were made to check for the presence of plant parasitic nematodes.

To determine if xylem occlusions were present, some of the diseased plants were cut down and samples of trunk wood were taken 20 cm above the budunion. The samples were immersed in phosphate buffer containing 0.02% sodium azide. Cross sections, 20 μm thick, were made using a cryostat, as previously described (1).

RESULTS AND DISCUSSION

In one of the orchards, the preliminary results showed a relationship among the visual symptoms of the disease, the lack of water uptake by the trees (table 1) and the presence of amorphous plugs in the trunk wood, as has been described for the diseases in the blight-declinio group. About 30% of the vessels had amorphous plugs. There were no differences in the zinc content of leaves, trunk wood and soil between healthy and diseased plants (table 1). The affected plot was located at the Durute Colony, distrito Sucre, Yaracuy state, approximately 10°N lat, and 68°W long. The elevation was 300 m with an average rainfall and temperature of 1,200 mm and 25 C. During the dry season the plants were furrow irrigated to supply the water needs. The soil type was light clay with a pH of 6.6 and a organic matter content of 0.75%.

In the other commercial plantations visited in the states of Aragua, Carabobo and Yaracuy, the trees showed some of the decline symptoms described, such as, dead twigs, small and flaccid leaves but no zinc deficiency in the new flushes and healthy and apparently declining trees took up water.

TABLE 1
VISUAL SYMPTOMS, ZINC CONTENT IN THE TRUNK WOOD, AND WATER UPTAKE OF DECLINING AND HEALTHY TREES OF VALENCIA SWEET ORANGE ON VOLKAMER LEMON ROOTSTOCK IN THE STATE OF YARACUY, VENEZUELA, 1986

Plant no.	Visual symptoms[z]	Zn content of trunk wood (μg/g)	Water uptake[y] (ml/sec.)
1	0	21	0.30
2	0	66	0.45
3	2	48	0.01
4	3	66	0.03
5	4	75	0.05
6	4	66	0.03
7	3	—	0.05
8	3	—	0.07
9	3	—	0.08
10	3	—	0.06

[z]Canopy decline rating (0 = healthy; 2 = plants beginning to defoliate, small leaves with zinc deficiency; 3 = severe defoliation, water sprouts on the trunk; 4 = almost complete defoliation, weak new shoots.
[y]The rate of water uptake for a healthy tree was 0.33 ml/sec.

No tristeza stem pitting or honeycombing was seen under the budunion of the trees, although some of the healthy and diseased plants showed pitting in the wood and pegging of the bark similar to the symptoms of xyloporosis.

Fusarium sp. were present in all isolations made from root and shoot samples, and *Colletotrichum* sp. were present only in shoots. Pathogenicity tests are underway to see if there is a relationship between the fungi and the disease. In some cases, bacteria appeared on the media, but they were gram positive.

Soil and root analyses eliminated the possibility of plant parasitic nematodes as causal agents of the disease.

The affected plants did not respond to rain, irrigation, fertilization and fungicide treatments or insect control.

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