The Occurrence of Citrus Blight on Sweet Orange and Cleopatra Mandarin Rootstocks in Northwestern Argentina[1]

R. H. Brlansky, R. F. Lee and J. P. Agostini

ABSTRACT. Declining 27- to 30-yr-old sweet orange trees on sweet orange rootstock and 17-yr-old sweet orange trees on Cleopatra mandarin rootstock in Oran, Salta in northwestern Argentina were diagnosed as positive for citrus blight. Water uptake, using syringe injection was lower (< 0.2 ml/sec) and zinc levels of the wood were higher in declining trees than in nearby apparently healthy trees. Amorphous occlusions, characteristic of blight, were abundant in the xylem vessels of diseased trees but were normally absent in healthy trees. Sweet orange and Cleopatra mandarin rootstocks have been considered as immune or tolerant, respectively, to blight. It now appears that both rootstocks can be affected by blight but with the symptoms generally appearing later in the life of the tree than on trees on more blight-susceptible rootstocks.
Index words. declinio, declinaniento, citrus tree declines.

Citrus blight, a disease of unknown etiology, has caused considerable tree loss in many areas of the world. Susceptible rootstocks include rough lemon, rangpur lime, trifoliate orange, and Carrizo citrange. Rootstocks such as sour orange and Cleopatra mandarin have been considered tolerant and sweet orange has been considered resistant (9). In many citrus areas with a high incidence of blight, sweet orange and Cleopatra mandarin are being used as replacements for blight-susceptible rootstocks.

In this paper, we present data showing the occurrence of citrus blight in the northwestern area of Argentina on sweet orange trees on sweet orange and Cleopatra mandarin rootstocks.

MATERIALS AND METHODS

Declining and healthy 27- to 30-yr-old Calderon sweet orange trees on sweet orange rootstock and 17-yr-old Valencia sweet orange trees on Cleopatra mandarin rootstock in Oran, Salta in northwestern Argentina were tested for blight. The healthy trees were growing vigorously whereas the declining trees had thin canopies and exhibited typical blight symptoms (7).

The canopies of declining and healthy trees were rated on a scale whereby 0 = healthy and 4 = severely affected tree, as previously defined (6). Tests commonly used for the diagnosis of citrus blight were performed on healthy and declining trees on each type of rootstock. The syringe water uptake test (6) was performed and zinc analyses were made on samples of oven-dried trunk wood (8). In addition, trunk wood cores were extracted from the trees using a Hagloff increment borer (Forestry Suppliers, Jackson, MS 39204-0397) and the presence of amorphous and filamentous occlusions in cross sections of 100 xylem vessels was determined as previously described (2, 3). Plug morphology was examined by scanning electron microscopy as described by Brlansky et al. (1).

RESULTS

Results of the tests are shown in table 1. Diseased Calderon sweet orange trees on sweet orange rootstock had an average canopy rating of 2.0 as compared to zero for the healthy trees. In the diseased trees, the zinc content of the wood was significantly higher and the water uptake was significantly lower than for

[1]Florida Agricultural Experiment Station Journal Series No. 8279.

TABLE 1
CHARACTERISTICS OF HEALTHY AND DECLINING CALDERON SWEET ORANGE TREES ON SWEET ORANGE AND CLEOPATRA MANDARIN ROOTSTOCKS IN NORTHWESTERN ARGENTINA

No. of trees sampled	Canopy rating[z]	Zn concn in wood (μg/g)	Water uptake (ml/sec)	No. of plugs/100 vessels	
				Amorphous	Filamentous
Sweet orange					
8	0	1.8	0.78	0	0.3
9	2.0	5.4*[y]	0.08*	22.9*	9.1*
Cleopatra mandarin					
7	0	1.2	0.42	0.7	0.3
6	2.1	4.0*	0.01*	26.3*	5.5*

[z]Canopy rating on a scale of 0 = healthy tree and 4 = severely blight-affected tree.
[y]*Indicates means significantly different from the healthy control according to the Student's t-test at P = 0.05.

healthy trees (table 1). The number of amorphous and filamentous plugs was significantly higher in declining trees than in healthy trees. The same differences in zinc, water uptake, and plugs were found in the declining versus healthy Valencia sweet orange trees on Cleopatra mandarin rootstock (table 1). The declining trees on Cleopatra mandarin rootstock often occurred in groups of three to four or more adjacent trees within the same row. However, this distribution pattern was not observed for the declining trees on sweet orange rootstock.

DISCUSSION

From the results presented, it appears that citrus blight can occur on sweet orange rootstock. However, the disease was not found on trees less than 17 yr old. In Florida, blight has not been reported on sour orange rootstock until the trees grow older (9). Therefore, sour orange and sweet orange rootstocks should not be considered as immune to blight, but only tolerant. Cleopatra mandarin also appears tolerant to blight, since only older trees show signs of the disease. The observation that trees on this rootstock in Argentina often decline in groups of three or more adjacent trees within the same row is similar to observations made on this same rootstock in Florida (9).

The results presented here also confirm earlier studies by Gonzalez *et al.* (5) and Garcia *et al.* (4) on declining citrus trees on trifoliate orange, sweet orange, Troyer citrange, and Cleopatra mandarin which resembled citrus blight in symptomatology and zinc and phenolic levels of the trunk wood.

LITERATURE CITED

1. Brlansky, R. H., R. F. Lee, and M. H. Collins
1985. Structural comparison of xylem occlusions in the trunks of citrus trees with blight and other decline diseases. Phytopathology 75: 145-150.
2. Brlansky, R. H., L. W. Timmer, R. F. Lee, and J. H. Graham
1984. Relationship of xylem plugging to reduced water uptake and symptom development in citrus trees with blight and blightlike declines. Phytopathology 74: 1325-1328.
3. Cohen, M., R. R. Pelosi, and R. H. Brlansky
1983. Nature and location of xylem blockage structures in trees with citrus blight. Phytopathology 73: 1125-1130.
4. Garcia, M. A., M. A. Gonzalez, R. J. Tan Jun, G. J. T. Leal, and M. E. B. de Pacheco
1984. Studies of declinamiento in citrus in the northwest of Argentina, p. 290-295. *In* Proc. 9th Conf. IOCV. IOCV, Riverside.
5. Gonzalez, M. A., M. A. Garcia, and R. J. Tan Jun
1984. Similarity between Florida's blight and decline of citrus in the Argentine northwest. p. 296-298. *In* Proc. 9th Conf. IOCV. IOCV, Riverside.

6. Lee, R. F., L. J. Marais, L. W. Timmer, and J. H. Graham
1984. Syringe injection of water into the trunk: A rapid diagnostic test for citrus blight. Plant Dis. 68: 511-513.
7. Smith, P. F. and H. J. Reitz
1977. A review of the nature and history of citrus blight in Florida. Proc. Int. Soc. Citriculture 3: 881-884.
8. Wutscher, H. K., M. Cohen, and R. H. Young
1977. Zinc and water soluble phenolic levels in the wood for the diagnosis of citrus blight. Plant Dis. Rep. 61: 572-576.
9. Young, R. H., L. G. Albrigo, D. P. H. Tucker, and G. Williams
1980. Incidence of citrus blight on Carrizo citrange and some other rootstocks. Proc. Fla. State Hort. Soc. 93: 14-17.