and other decline-causing factors in many groves, tree losses in these groves were probably primarily due to blight. In this survey, we did not observe high blight levels in sour-, Cleo-, or sweet-rooted trees, but higher levels have been observed in other groves (personal observations by Young and Cohen). Blight seemed to be a major cause of tree losses on trifoliate rootstock. Since we surveyed limited numbers of groves on Cleo, sweet, and trifoliate rootstocks, additional groves on these rootstocks will need to be surveyed throughout the industry to establish a more representative sample. Foot rot was more prevalent on Cleo-rooted trees in the south central area, which may have accounted for some of the recent tree losses, and it appeared that other factors, including tristeza, were involved in recent losses of trees on sour orange.

Blight incidence was higher in the eastern and southern areas than in the south central and north central areas, which is consistent with general observations. The percentage of blight in any grove varied within the range reported by Grimm et al. (4) and others (3, 6). However, those reports summarized observations made only in rough lemon-rooted groves.

The results of this survey should be considered to be preliminary. Although the average percentage of blight was significantly lower in Carrizo-rooted than rough lemon-rooted trees, high levels of blight were found in some groves on Carrizo. Evaluation of Carrizo and other rootstocks is required over a period of time to establish rates of decline and overall adaptation under conditions of high blight pressure. One of the objectives of this study was to locate groves that could be reevaluated periodically, and to establish blight rates on Carrizo and other major rootstocks. Results of these reevaluations will be the subject of future reports.

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THE BLIGHT SUSCEPTIBILITY OF 'PINEAPPLE' ORANGE TREES ON *CITRUS MACROPHYLLA* ROOTSTOCK

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Abstract. **Declining and healthy 9-year-old 'Pineapple' orange (*Citrus sinensis* (L.) Osbeck) on *C. macrophylla* Wester rootstock in a grove in the Indian River area were tested for blight. The healthy trees absorbed 12 times as much water in injection tests as declining trees. Zinc, K, and water-soluble phenolics were higher in the outer trunk wood of declining trees. The trees carry tristeza, but the results of the analyses clearly show that the affected trees are declining because of blight. Visual symptoms appeared on 2-6% of the trees when they were 8 years old, 2 years later than on trees on rough lemon (*C. limon* (L.) Burm. f.) rootstock in the same grove.**

The incidence of citrus blight varies greatly among trees on different rootstocks. Trees on rough lemon, *Citrus limon* (L.) Burm. f., are very susceptible; trees on sour orange (*C. aurantium* L.), sweet orange (*C. sinensis* (L.) Osbeck), and Cleopatra mandarin (*C. reticulata* Blanco) show less effect. There is little information on the blight susceptibility of rootstocks which have recently come into use as substitutes for rough lemon. One of these stocks is *Citrus macrophylla* Wester, which has long been used as a rootstock for lemons in the western United States (1), and which is known for its resistance to foot rot (5). It was seldom used for other scion varieties because of the low Brix of the fruit of trees on this rootstock. Most of the commercial plantings of trees on *C. macrophylla* in Florida are under 10 years old and little is known about their blight susceptibility. When 6-year-old commercial plantings and 12-year-old trees on *C. macrophylla* in a rootstock test did not show any blight (3), this rootstock acquired the reputation as being blight resistant and was planted widely. Our report shows, however, that 'Pineapple' orange trees on this rootstock can get blight at about the same rate as trees on rootstocks known as susceptible when they get 8 to 9 years old.

Materials and Methods

'Pineapple' orange trees on *C. macrophylla* rootstock were planted 4.5 x 8.1 m (15 x 27 ft), 257 trees/ha (107 trees/acre), 4 rows to a bed in the Cloud Grove near Fort Pierce in 1971. A total of 1360 trees on 4 beds were used in this survey. The Riviera soil, extensively modified by dredging, had a pH of 6 to 6.5 in the upper 30 cm (12 inches) and pH 7.0 at 45 cm (18 inches). The cation exchange capacity of the surface soil was 4.2 m.e./100 g; that of the subsoil was 2.0 m.e./100 g. Irrigation was by overhead gun and a 17-3-16-2 fertilizer was applied twice a year to supply 196 kg/ha (180 lb/acre) of N and K. Foliar Mg sprays were applied to correct a persistent Mg deficiency. Herbicides were used within the tree rows; the middles were in grass. The trees were visually inspected in May 1980 and three commonly used blight tests were used on declining and healthy trees (2, 4, 6).

Water was injected into the trunks of 10 declining and 5 healthy trees using Cohen's method (2). We used a 1.3 cm (0.5 inch) drill bit, twice as large as that used by

Cohen (2). Wood samples were taken on both sides of the trunk of 18 declining and 9 healthy trees and analyzed for Zn, K, and water-soluble phenolics (6, 7). The trees carried a mild strain of tristeza (G. D. Bridges, personal communication); therefore, the roots of 4 declining and 4 healthy trees were tested for starch with the iodine method (dipping in 2% KI – 0.2% I_2 solution). The F-test for a completely randomized design was used to determine statistically significant differences.

Results and Discussion

The trees grew rapidly after planting and produced well when they were still young. Yields increased from 21.4 tons/ha (218 90-lb boxes/acre) and 1251 kg solids/ha (1147 lb solids/acre) when the trees were 5 years old to 46.6 tons/ha (475 90-lb boxes/acre) and 2553 kg solids/ha (2340 lb/acre) in 1979 when the trees were 9 years old. These yields were higher than those of trees on rough lemon rootstock in adjacent blocks. Periodic Mg deficiency symptoms were the only abnormality observed in the 4 beds on *C. macrophylla* rootstock until they were 8 years old. In 1979, 2, 6, 5 and 6% of the trees on the 4 beds showed visual symptoms of blight.

Tests for blight in May 1980 showed that healthy trees absorbed more than 10 times as much water as declining trees (Table 1) during 24-hr trunk injections; these absorption rates were somewhat higher than those reported by Cohen (2). This result is probably attributable to the larger water-injection holes we used. The zinc content of the outer trunk wood of declining trees was 3 times greater than that of healthy trees (Table 1). The water-soluble phenolics in the wood of declining trees were 43% higher than in healthy trees (Table 1). With all 3 blight tests positive, there can be little doubt that the decline of the 18 trees checked was due to blight. Potassium was 59% higher in the wood of declining trees than in the wood of healthy trees, and was also an indication of blight (7).

Trees on *C. macrophylla* are tristeza susceptible (5), but the visual appearance of the trees and their performance show that the virus strain present in the trees used in this experiment probably causes little damage. Iodine tests showed large amounts of starch present in the roots of the declining and healthy trees, indicating that tristeza had little effect on the trees.

Table 1. Water absorption and levels of zinc, potassium, and water-soluble phenolics in the wood of declining and healthy 9-year-old 'Pineapple' orange/*C. macrophylla* trees.

	Water absorption[z] (ml/24 hr)	Zn (ppm)[y]	K (%)[y]	Water-soluble phenolics (mg/g)[y]
Declining	77	13	.316	5.4
Healthy	959	3	.199	3.8

[z]Means of 10 declining and 5 healthy trees. Difference significant at the 1% probability level.
[y]Means of 18 declining and 9 healthy trees. Differences significant at the 1% probability level.

The cause of the tree decline was blight. *C. macrophylla* should therefore be considered blight susceptible. The number of blight-affected trees found in the blocks observed indicates that this rootstock is quite susceptible to blight, although the disorder appeared later than in trees on rough lemon at this location. However, 24 15-year-old 'Marsh' grapefruit (*C. paradisi* Macf.) trees on *C. macrophylla* rootstock at another location in the same area show no signs of blight (Mortimer Cohen, personal communication). Discrepancies like this are common with blight and cannot be explained until the cause of the disorder is found.

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SIMILARITIES BETWEEN CITRUS BLIGHT AND PIERCE'S DISEASE OF GRAPEVINE[1]

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Abstract. **Citrus blight and Pierce's disease of grapevine are both wilt- and dieback-type diseases that have many symptoms in common. The common symptoms include leaf mottle, delayed spring growth flush, wilting, decline of vigor, twig dieback, and plugs in xylem vessels with a concomitant reduction in water flow rate. In both diseases, symptoms usually appear first in only 1 branch of the vine or tree. Pierce's disease is found in wild grapevines throughout the citrus-growing areas of Florida, and the leafhopper vectors of Pierce's disease commonly feed in great numbers on citrus. Using the leafhopper vector, the Pierce's disease bacterium was obtained from citrus with blight and was transmitted to grape. In greenhouse inoculations, the Pierce's disease bacterium produced dieback-type symptoms on rough lemon citrus plants.**

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