stock, especially in the Indian River area with its reputation for the production of quality fruit, is one which must be considered carefully by growers and grower groups.

The data reported in Table 3 indicated that fruit from trees on Rough lemon rootstock were very close in weight per field box to fruit produced on other rootstocks. This is in contrast to the results of Gardner and Horanic (3) obtained by another method. Grower experience suggests that results obtained here are probably more representative.

Rangpur lime is a less familiar stock which has many of the bearing characteristics of Rough lemon on Leon soil and on Parkwood soil was distinctly superior to Rough lemon in quality. On the basis of results obtained in this trial coupled with reports of good performance elsewhere (4) limited trials of Rangpur lime as a rootstock for Valencia orange seem to be justified. It is essential in such trials that scion wood be free of exocortis and other known citrus virus diseases.

The slowness-to-bear which characterized Valencia orange trees on Cleopatra mandarin in these plots has not always occurred in commercial plantings although it has been reported in many of them. Growers who set out plantings on this stock must be prepared for the possibility that their trees will come into bearing slowly.

Valencia trees on trifoliate orange equalled some other common stocks in performance when on Parkwood soil but they were distinctly inferior on the sandy, acid Leon soil.

The varied characteristics of trees on different rootstocks and the impossibility of predicting future outbreaks of disease or future weather conditions suggest that the best course for a grower who desires the most security in an inherently insecure business is to diversify his rootstocks as well as his scion varieties.

Summary

Rootstock trial plantings of Valencia orange and Ruby Red grapefruit trees were set out in December 1950 at Fort Pierce on both Leon and Parkwood soils. Six major rootstocks are involved: Cleopatra mandarin, Rangpur lime, Rough lemon, Parson Brown sweet orange, sour orange and trifoliate orange.

Yield of fruit on the Parkwood soil has been about twice as great as yield on Leon, on the average. Rough lemon rootstock has had the highest cumulative yield of all rootstocks in all 4 plots in boxes of fruit and in pounds of total solids except that, in the Valencia plot on Leon soil, yield of trees on Rough lemon was equalled by those on Rangpur lime. Yield of Valencia trees on Cleopatra mandarin stock was very low during the first 10 years of the experiment but since 1961 has been comparable to yields obtained on sour orange and sweet orange stocks.

The weight of fruit in a full field box has been found to be remarkably uniform regardless of rootstock.

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GROWTH OF SEVERAL BURROWING NEMATODE-TOLERANT CITRUS ROOTSTOCKS IN *THIELAVIOPSIS BASICOLA*-INFESTED SOIL

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Thielaviopsis basicola (Berk. & Br.) Ferr. was described as a citrus root pathogen in California groves by Tsao (2) and Tsao and Van Gundy (3) and its association with sweet orange seedlings in Florida was recently reported by Feder and Ford (1). The following paper contains a discussion of the condition of the root systems of several burrowing nematode-tolerant and -resistant citrus rootstock seedlings growing in *T. basicola*-infested soil and calls attention to the distribution of this fungus in citrus-growing areas of Florida.

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Procedure and Results

Seedlings of five nematode-tolerant citrus rootstocks germinated in a sterile peat-vermiculite mixture were planted simultaneously in a bed of *T. basicola*-infested grove soil (1) and in a comparable bed of steamed soil. Ten plants of each variety were grown for 3 months in each of the two beds and growth was measured at the start and at the completion of the experiment. The varieties used and their relative growth in the two beds are shown in Table 1.

A second experiment was set up using 8″ clay pots of steamed soil. Soil in some of the pots was inoculated with an isòlate of *T. basicola* obtained from the original infested tank (1). The fungus was reared aseptically in 1-liter flasks on an autoclaved mixture of ground carrots and sand to which a small amount of water and 30 grams of glucose had been added. After the flasks had been allowed to incubate for 1 month, 50 ml of wet inoculum was added to each 20 liters of soil and enough soil was inoculated to fill 15 pots. These pots were planted with Sanguine Grosse Ronde sweet orange, Rough lemon, and Duncan grapefruit and placed in the greenhouse. After 1 month, seedlings growing in infested soil showed typical *T. basicola* damage to feeder roots (1, 3) and there was a marked reduction in the number of healthy feeder roots on the *T. basicola*-infested plants as compared to the plants growing in clean soil.

Table 1 shows that plants growing in the *T. basicola*-infested soil in the tank had much smaller root systems as measured by wet weight than plants growing in the steam-sterilized soil. Crown diameters also were smaller in fungus-infested soil. All plants except those of Sanguine Grosse Ronde made less top growth in infested soil. None of the plants exhibited other top symptoms which could be associated with *T. basicola* damage to the roots (3). This lack of symptoms is readily explained by the short duration of the experiment and the high levels of watering and fertilization during the experiment.

Table 1. Comparative growth of seedlings of five nematode-tolerant rootstocks grown in citrus soil infested with *Thielaviopsis basicola* and in steamed soil.

Variety	Per cent reduction in growth			
	Top growth	Crown diameter	Total plant weight	Root weight
Sanguine Grosse Ronde	2.8[a]	11.4	26.4	30.5
Carrizo citrange	18.2	20.0	30.2	38.5
Pineapple 156	24.5	12.8	44.3	40.7
Algerian Navel	26.8	14.3	31.4	36.0
Clone X-hybrid	28.7	21.6	44.6	50.0

a/ Each figure represents the average of 10 plants.

Thirteen 20 to 30-year-old-burrowing nematode-infested citrus groves in central Florida were checked for the presence of *T. basicola* by using a modification of Yarwood's carrot-disc technique (4). Soil samples were dug around the feeder roots to a depth of 1 foot. These samples were placed in clear pastic dishes fitted with tight lids. A piece of carrot was washed with detergent to clean the outer surface before it was cut longitudinally with a sterile knife. The cut side of the carrot was placed on the soil surface in the dish, and the soil moistened before closing the dish. After 5-15 days the cut carrot surfaces in those dishes which contained *T. basicola*-infested soil showed typical blackened areas. These areas contained chlamydospores and endoconidia of *T. basicola*. Seven of the 13 groves were found to be positive for *T. basicola*. A non-nematode infested 25-year-old grove adjacent to the Orlando Laboratory also was tested and found to contain the fungus. In addition, 1 sample taken to date in an unthrifty grove from the east coast area of Florida was also positive for *T. basicola*.

Discussion and Conclusions

The data presented indicate that the burrowing nematode-tolerant or -resistant rootstock varieties tested to date are susceptible to root injury from *T. basicola*. Limited survey data indicate that this fungus is present in older groves which may be replanted with nematode-tolerant rootstocks. While further work is needed to establish the distribution of this fungus in Florida citrus groves, successful replanting of old nematode-infested groves with nematode-tolerant or -resistant rootstocks should probably be preceded by a soil treatment which will effectively control both soil fungi and nematodes in a limited area around the root zone of the replanted tree.

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