The Influence of Viruses on the Transpiration of Citrus Plants

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NUCELLAR CLONES of citrus plants in non-irrigated orchards of the State of São Paulo, Brazil, suffer from drouth much more than do the old clones carrying one or more viruses. Mendes (2) found that potted plants of virus-free Barão sweet orange [*Citrus sinensis* (L.) Osb.] on sour orange (*C. aurantium* L.) rootstock lose two and one-half times more water by transpiration than do tristeza-infected plants.

These experiments were conducted to determine the effect of exocortis, xyloporosis, and psorosis virus infections on the transpiration of Baianinha navel orange (*C. sinensis*) trees on two tristeza-tolerant rootstocks under greenhouse conditions.

Materials and Methods

Baianinha navel orange budded on seedlings of Caipira sweet orange and Troyer citrange [*C. sinensis* (L.) Osb. x *Poncirus trifoliata* (L.) Raf.] were inoculated in the nursery with the exocortis, xyloporosis, and psorosis viruses, singly and in combination. The tristeza virus was present in all plants of the experiment. Uniform plants, 2 years old, were transferred to pots of 20 liter capacity, 1 plant per pot, 3 plants per treatment. The pots were filled with well-mixed red lateritic soil and covered with 2 plactic bags to permit loss of water only through the aerial part of the plants. Air temperature in the greenhouse varied from 10 to 23.4°C. To avoid excess moisture in the soil, the plants were carefully irrigated before the beginning of the weighing period. Water lost by transpiration was determined as loss in weight on a torsion balance, as in previous work on coffee plants (1). The weighing period started August 4, 1966, and 10 weighings were made during the subsequent 15 days. The rate of transpiration per square decimeter of foliar surface was calculated after measuring the foliar area of each leaf of the plant with a planimeter.

Results and Discussion

The results indicate that the rate of transpiration of citrus trees is influenced by the rootstock variety and by the viruses infecting them. The transpiration of Baianinha orange trees on Caipira sweet orange rootstock was reduced as follows: 39 per cent when infected with xylo-

porosis, 30 per cent with psorosis, and 34 per cent with exocortis, psorosis, and xyloporosis viruses together, compared to the healthy controls. The transpiration rate of the trees infected with exocortis was not significantly different from that of the controls. It has been reported that the exocortis virus does not occur in the leaves of infected trees or occurs there only as mild strains (4). This fact may explain the similar rates of transpiration of leaves of healthy and exocortis-infected trees. The same is not true for the psorosis and xyloporosis viruses which are known to occur in the leaves of infected trees (3, 5).

Different results were obtained with trees on Troyer citrange rootstock. The transpiration rate was 44 per cent higher in trees infected with exocortis, showed no significant rate change with xyloporosis, was 20 per cent less with psorosis, and was 26 per cent less when infected with all 3 viruses.

A comparison of the results on both rootstocks indicated that the presence of psorosis, singly or in combination with the other 2 viruses, always decreased the rate of transpiration of the tree. Xyloporosis severely reduced transpiration of trees on sweet orange rootstock, but showed no significant effect on those on citrange. On the other hand, exocortis virus markedly increased transpiration of trees on citrange, but had no significant effect on those on sweet orange. The intolerance of Troyer citrange to the exocortis virus may explain the increased transpiration of exocortis-infected trees on that rootstock.

Because all trees were infected with tristeza virus, the effect of that virus on transpiration could not be evaluated. Also, the effect of exocortis, psorosis, and xyloporosis viruses on transpiration in the absence of tristeza is not known.

The average transpiration per square decimeter of foliar surface of the plants in each treatment during 15 days is summarized in Table 1.

Conclusions

The three virus diseases investigated were found to influence the rate of leaf transpiration of citrus trees in different ways. Psorosis virus reduced the transpiration of Baianinha orange trees on both Caipira sweet orange and Troyer citrange rootstocks.

Exocortis virus did not significantly affect transpiration of trees on Caipira sweet orange rootstock, but increased the transpiration rate of trees on Troyer citrange rootstocks. Xyloporosis virus did not significantly affect transpiration of trees on Troyer citrange, but markedly reduced transpiration when trees were budded on Caipira sweet orange.

TABLE 1. WATER LOST BY TRANSPIRATION OVER A 15-DAY PERIOD IN GRAMS PER SQUARE DECIMETER [G/10^{-1} M] OF LEAF SURFACE OF BAIANINHA NAVEL ORANGE TREES ON CAIPIRA SWEET ORANGE AND TROYER CITRANGE ROOTSTOCKS, INFECTED WITH EXOCORTIS, XYLOPOROSIS, AND PSOROSIS VIRUSES, SINGLY OR IN COMBINATION, 3 PLANTS PER TREATMENT

Treatments	Caipira sweet orange	Troyer citrange
Exocortis	151.5 g	187.9 g
Xyloporosis	95.2 g	127.5 g
Psorosis	109.4 g	104.9 g
E + X + P	102.1 g	96.7 g
Control	155.9 g	129.3 g

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