CONTRIBUTION TO THE STUDY OF XYLOPOROSIS IN ALGERIA

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Xyloporosis was reported in Palestine by Reichert and Perlberger (*8*) in 1934, in South America by Fawcett and Bitancourt (*5*) in 1937, and by Moreira (*6*) in 1938; in the United States it was reported in Florida by DuCharme and Suit (*4*) in 1951. Reichert and Perlberger (*8*) attributed it to a physiological cause. Wallace (*10*) suggested that it might be hereditary under certain conditions. Childs (*1*, *2*) proposes that it is due to a virus and that xyloporosis is the same disease as cachexia because of the close similarity of host reactions.

The citrus varieties reported to be affected by xyloporosis are Palestine sweet lime, *Citrus limettioides* Tanaka, when used as a rootstock for sweet orange, *C. sinensis* (Linn.) Osbeck, for the Shamouti variety in Palestine (*8*) and for the Hamlin and Lue Gim Gong varieties in Florida (*3*). At the Fourth International Congress of Mediterranean Citriculture in Tel Aviv in 1956, Reichert pointed out the presence of xyloporosis on rootstocks of sweet lime and Rough lemon, *C. jambhiri* Lushington, and, to a lesser extent, on Bigaradier, *C. aurantium* Linn. Sweet lime that was not grafted also showed symptoms of this disease. It now appears that sweet lime as a rootstock always develops some degree of xyloporosis regardless of what scion variety is used on it. The Shamouti orange is considered to be a virus carrier since scions taken from a diseased tree have apparently transmitted the virus to more than ten different rootstocks other than sweet lime (*9*).

It should be noted here that if Childs' hypothesis is correct, that is, if xyloporosis is the same as cachexia, the foregoing host list should be extended to include the following varieties, in which some cachexia symptoms have been observed: tangelo, *C. paradisi* X *C. reticulata*; mandarin, *C. reticulata* Blanco; kumquat, *Fortunella* Swingle; calamondin, *C. mitis* Blanco; limequat, *C. aurantifolia* X *Fortunella japonica*; and tangor, *C. reticulata* X *C. sinensis* (*1*, *2*, *3*, *7*).

In our own groves we have also noticed the symptoms of a disease similar to xyloporosis on Wekiwa tangelo grafted on a Bigaradier seedling. In 1942, in a grove at Boufarik (Algiers), we grafted three Bigaradier seedlings with scions of pink Wekiwa tangelo from a tree of the experiment station at Boufarik. As far as we know, this tree had developed from a scion which came from the Institut d'Agronomie Coloniale of Nogent sur Marne, France. Our three trees grew well (fig. 1) at first, with a normal growth pattern similar to that of other tangelos planted in the same plot, namely, Williams, Orlando, Seminole, and Minneola. The first harvests were considered satisfactory. Two years later, since we were interested in the fruit of this Wekiwa tangelo, we propagated about 300 trees of this variety by grafting Bigaradier seedlings with scions taken from the first three trees. These young trees were planted in 1950 in one of our plantations of Orleansville (Cheliff Valley).

In the meantime, in 1948, we had planted in another plot at Boufarik five Wekiwa tangelos on Bigaradiers of the same origin.

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Fig. 1. Six-year-old tree of Wekiwa tangelo on Bigaradier rootstock at Boufarik, Algeria, showing excellent growth and production prior to appearance of symptoms of xyloporosis.

In 1950, the first three tangelos, then eight years old, began to show signs of weakness, with excessive yellowing of the leaves, a heavy fall of leaves making the trees look as if they were attacked by dieback, and a heavy drop of the fruit. The symptoms became worse during the following years until one tree (fig. 2) is now (in 1957) almost dead. The other two trees are still living, but they also seem doomed to die. An examination of the diseased trees, at the level of the graft and above it, shows, under the bark, some canal-like deformations and a kind of pitting of the xylem. The bark is heavily impregnated inside with gum, even though it appears normal on the outside. These symptoms, clearly visible above the graft union, are not present on the Bigaradier stock below it.

In 1955, the same symptoms appeared on the five Wekiwa trees planted in 1948. Their development stopped, the leaves turned yellow, and the trees began to lose their foliage. The trunks showed the same symptoms as in the trees previously described. In the same row are five Sampson tangelo trees on Bigaradier, also dating back to 1948, and these are almost double the size of the Wekiwa trees.

Fig. 2. Fifteen-year-old tree of Wekiwa tangelo on Bigaradier rootstock at Boufarik, Algeria (one of three trees like that shown in figure 1). Xyloporosis symptoms began to appear on this tree when it was eight years old.

As to the 300 young trees planted at Orleansville (Cheliff Valley) in 1950, in an area having a continental climate (high temperatures of 42° to 45° C. in the summer), they began to decline in 1953, only three years after they were planted. So bad was the appearance of these trees that after we detected the disease symptoms in 1955, we pulled them all out and destroyed them.

The causal agent of this disease, which until now has appeared only in this line of Wekiwa tangelo obtained by successive grafts, certainly seems to have been carried directly by the scions. If it had been transmitted by insects or by other means, Orlando, Sampson, Seminole, Williams, and Minneola tangelos growing in the immediate vicinity of the Wekiwa trees should have been attacked also.

Webber (*11*) states that the culture of Wekiwa tangelo has not been recommended in Florida "because of its weakness," whereas the tests of this variety at Indio and Riverside, in California, seemed more promising.

We can now also add that the tangelo declined more rapidly in the Cheliff Valley (Orleansville), with its continental climate, than in Boufarik in the Mitidja, which has a more temperate climate. Perhaps the weakness referred to by Webber (*11*) can now be explained by the susceptibility of this hybrid to xyloporosis virus and the fact that it became infected soon after it was developed. This hybrid was created by crossing a grapefruit with Sampson tangelo, itself a hybrid of grapefruit and tangerine.

To conclude, we may fear that this first appearance of xyloporosis in Algeria may be followed by others in the future. Since we know more about its symptoms, we can reasonably think that we will be able to detect it more easily in the orchards as it appears.

A better knowledge of virus diseases will alone make possible 1) a careful selection of the scions and rootstocks which are not carriers of xyloporosis virus, and 2) the complete destruction of all trees that may carry the virus, before the damage spreads.

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