THE PRESENT STATUS OF TRISTEZA IN ARGENTINA

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The bitter orange, *Citrus aurantium* Linn., was first used as a rootstock in the Argentine littoral, especially in the province of Corrientes [1][2] in 1920 in order to counteract the damage caused by *Phytophthora* gummosis to the commonly-used sweet orange rootstock. Within a few years the bitter or sour orange stock was in general use over all the areas of the country where citrus was grown.

Thus in 1930, the year "tristeza" was discovered in Argentina, 90 per cent of the citrus plantations were already grafted on bitter orange stocks. It is estimated that more than 18 million orange, grapefruit, and mandarin trees were propagated on bitter orange stocks.

In 1945, fifteen years after the appearance of tristeza in the locality of Bella Vista [1], province of Corrientes, plantations throughout the Argentine littoral, provinces of Misiones [5, 7, 8, 9], Corrientes [1, 2, 3], Chaco [20], Santa Fe [19, 21], Entre Ríos [4] and the Delta of Paraná River [13], had been destroyed by the disease. In this extensive zone of the littoral, more than 10 million trees were lost, all of them in full production.

In 1947, this serious disease appeared in the Argentine northeast, in the localities of Chicoana, Campo Santo, and Betania, province of Salta [11]; in 1950, in Ledesma, and in 1951, in Calilegua, province of Jujuy [10]; in 1954, in Urundel, and in 1955, in Tabacal, province of Salta [12]. In 1957, it also made its appearance in Santa Rosa [12], where 200,000 plants had remained free of tristeza, probably because of their isolation from the main centers of disease. Tristeza is now spreading rapidly through these provinces, where 2 million trees will be lost within a short period.

The province of Tucumán [5], where more than 4 million trees are in full production, and where citrus growing is second in production only to sugar cane, remained apparently untouched by the disease for many years. Up to October, 1957, there was no official information on the presence of the disease in Tucumán, but an inspection made during the latter part of October to obtain information for this report revealed its existence, both in tests made at the Tucumán Agricultural Research Station and in most of the plantations of this province (figs. 2 and 3). In view of the great number of infected trees, a rapid decline in orange, grapefruit, and mandarin trees on bitter orange stocks is expected in the citrus plantations of that province.

There now remain in the Argentina Republic a few small isolated citrus areas, where nothing points to the existence of the disease. These are the plantations in Santiago del Estero [16], with about 250,000 trees on bitter orange stocks; in Catamarca [15], with about 200,000 trees; and in the area of Villa Dolores [17], province of Cordoba, with approximately 150,000 trees, all of them on bitter orange stocks.

It is interesting to point out that notwithstanding all the present and past damage

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[2] Numbers in brackets refer to geographical locations shown on the map (fig. 1).

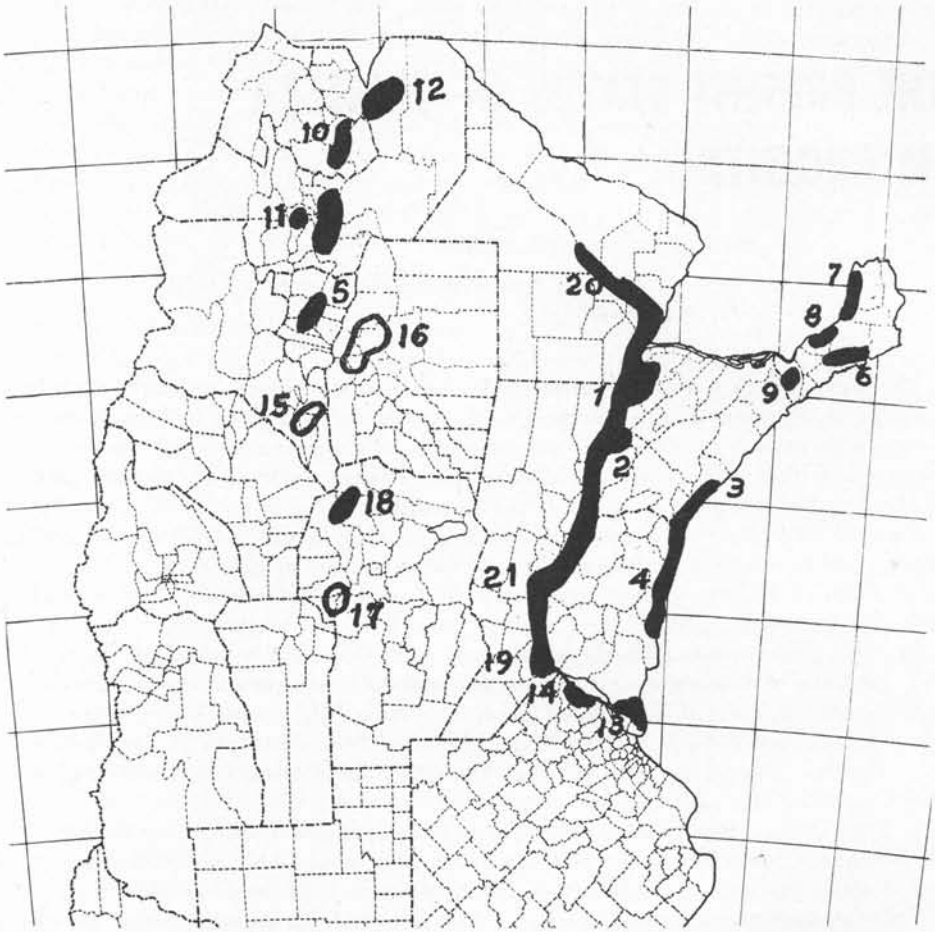

Fig. 1. Geographical distribution of citrus in Argentina and areas where tristeza disease is present. **Littoral zone:** Provinces of Misiones [5, 7, 8, 9], Corrientes [1, 2, 3], Chaco [20], Santa Fe [19, 21], Entre Ríos [4], Delta of Paraná River [13], where more than 10 million trees died between 1930 and 1945. **Northeast zone:** Provinces of Salta [11, 12] and Jujuy [10], where more than 2 million plants will be lost in a short time. Province of Tucumán [5], where tristeza is now well established and a rapid decline of 4 million plants is expected. **Central zone:** Isolated citrus areas, such as [15] in province of Catamarca, [16] in Santiago del Estero, and [17] in Cordoba, are still free of tristeza. The most recent citrus area to be affected by tristeza is that shown at [18].

caused by tristeza, there are optimistic prospects in citrus growing and a steadily increasing interest in its culture.

Throughout the Argentine littoral, tristeza is only a memory, still recent, indeed, but there are already commercial plantations in full production on disease-resistant rootstocks. Trifoliate orange stock, *Poncirus trifoliata* (Linn.) Raf., is used exclusively in the Paraná Delta and the San Pedro area [14] in the province of Buenos Aires, because of its suitability to heavy, wet soils and its resistance to cold. In the Concordia zone of Entre Ríos, 70 per cent of the trees of mandarin orange, *C. reticulata* Blanco, are on trifoliate stock and 30 per cent are on sweet orange stock, *C. sinensis* (Linn.) Osbeck. Orange trees are grown on trifoliate orange; Rough lemon, *C. jambhiri* Lushington; and sweet orange. Grapefruit, *C. paradisi* Macf., is grown especially on Rough

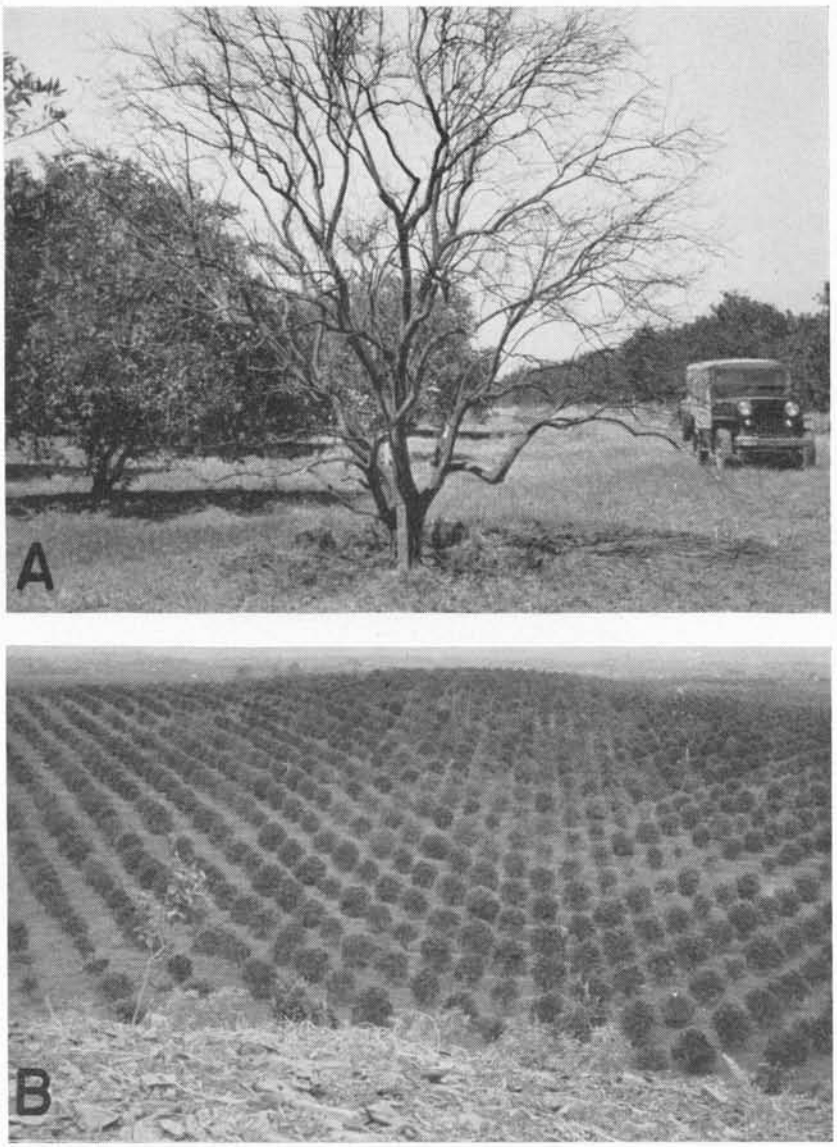

Fig. 2. Tristeza disease in Tucumán province, Argentina: A) Lue Gim Gong sweet orange on Triunfo grapefruit affected by tristeza disease in the orchard of the Agricultural Experiment Station at Tucumán. B) Panoramic view of a grove, showing groups of tristeza-affected trees. (Photographed October 25, 1957.)

lemon.[3] In the provinces of Corrientes and Misiones, the best results are obtained on sweet orange, Cleopatra mandarin orange, and Rangpur lime, *C. limonia* Osbeck, and these are the most widely used rootstocks.

As far as the Argentine northeast is concerned (provinces of Salta and Jujuy), replanting has been carried out wherever plants have died of tristeza. Most of the replants are now on Cleopatra mandarin rootstocks, for those that had been started

[3] Information kindly given by Ing. A. Banfi, Director of Agricultural Research Station, Concordia, Province of Entre Ríos.

Fig. 3. Tristeza disease in Tucumán province, Argentina: A) Lue Gim Gong sweet orange on bitter orange, heavily pruned. Buds were taken from this tree to propagate young trees shown below. B) Three rootstocks (Rangpur lime, bitter orange, and Cleopatra mandarin) grafted with buds from Lue Gim Gong tree shown above. Grafts on Rangpur lime and Cleopatra mandarin grew well, but those on bitter orange (Agrio) failed. (Photographed October 25, 1957.)

on Rough lemon and Rangpur lime had to be given up because of the susceptibility of these stocks to gummosis.

In the province of Tucumán, no decision has yet been made as to which stock is to be adopted. The Agricultural Research Station has a good collection of bearing orange and grapefruit trees on all the disease-resistant stocks, from which information on the advantages and disadvantages of each will be obtained. The trifoliate orange is unsuitable for that province, as already shown by rootstock experiments. However, the best plants of McCarthy grapefruit and Ruby blood orange are obtained on that stock at the Research Station at Tucumán. The grower fears gummosis, but it is possible that it may be satisfactorily controlled even in susceptible stocks through good technical guidance on methods of planting, care of the plants, and treatment as soon as they show any gummosis infection.

In the zones where no tristeza is yet apparent, no preventive measure other than grafting on disease-resistant stocks has been adopted.

The bitter orange stock was declared an agricultural pest in the Argentine Republic on November 29, 1949, in order to prohibit its use as a roostock for orange, mandarin orange, and grapefruit plants.

The insect vector in Argentina is *Toxoptera citricidus* (Kirk.) *Paratoxoptera argentinensis* Blanch.), which was first observed in Misiones and Corrientes in 1937 and was described by Blanchard in 1944.