HUTCHISON: SWINGLE CITRUMELO 89

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Abstract. 'Swingle' citrumelo (CPB-4475) was hybridized by Walter S. Swingle at Eustis, Fla., in 1907, from Citrus paradisi Macf. 'Duncan' grapefruit X Poncirus trifoliata (L.) Raf. It is tolerant of tristeza virus and Phytophthora parasitica (root rot) and moderately tolerant of salt. In experimental field plantings, it has proved to be a satisfactory rootstock for grapefruit and sweet orange. Seedlings are uniform and vigorous, with an extensive root system. 'Swingle' citrumelo is asexually reproduced by seeds that are 85 to 95% polyembryonic (nucellar).

On April 1, 1974, the Agricultural Research Service, U.S. Department of Agriculture, released to citrus nurserymen and growers the 'Swingle' citrumelo citrus rootstock, formerly tested as Citrumelo CPB 4475. This rootstock selection was hybridized by Walter S. Swingle at Eustis, Fla., in 1907, from Citrus paradisi Macf. 'Duncan' grapefruit X Poncirus trifoliata (L.) Raf. This paper presents the available information on the performance of this hybrid as a potential commercial rootstock.

In this technical description, all measurements are based on averages: fruit color light yellow; medium sized, diameter 63 mm, height 75 mm; weight 124 g; fruit shape pyriform, stem end col- lared and slightly furrowed; fruit pubescence short and light; external oil glands numerous and slightly raised; rind 2 mm thick, albedo 6 to 8 mm thick; axis closed, segments 8 to 11; vesicles moderately small and juicy; texture moderately fine; flavor highly acid and acid; seeds 20 to 24 per fruit; polyembryony, 85 to 95%. The tree is thorny, vigorous, hardy; medium tall; foliage dense and evergreen; leaves trifoliolate, elliptic, medium dark green; center leaflet, length 68 mm, width 29 mm; side leaflet, length 39 mm, width 18 mm; petiole, length 22 mm, width 3.5 mm. Fruits, seeds, and leaves are shown in Figs. 1 and 2.

Extensive field trial plantings in Florida, begun in the mid-1940's, included 'Swingle' citrumelo as one of the experimental rootstocks under consideration. The scion varieties included 'Pineapple', 'Pope Summer', 'Dream Navel', and 'Valencia' sweet oranges (C. sinensis (L.) Osbeck); 'Temple' (a hybrid of unknown parentage); and red grapefruit. The budwood used in all instances appeared to be from an old-line source and was contaminated with severe strains of exocortis and xyloporosis viruses. As a result, all except two of these plantings were abandoned because of the ravages of these viruses. 'Swingle' citrumelo showed bud-union compatibilities with all the scions.

Of the two remaining experiments, one grafted with 'Valencia' sweet orange was reported by Gardner et al. (10) in 1967. At the end of 19 years, 'Swingle' citrumelo was the most dwarfing stock in the experiment and was very productive per unit of tree size. The other experiment grafted with red grapefruit has now been planted for 26 years. During the past 8 years, fruit production and tree size on 'Swingle' rootstock have been visually observed to equal approximately those of sour orange (C. aurantium L.) rootstock in the same experiment. The 'Swingle' citrumelo produces a bench-type rootstock undergrowth.

In a field trial planted in Florida in 1965 with...
'Pineapple' orange as the scion variety, 'Swingle' citrumelo and sour orange rootstocks have been observed to be about equal in total fruit production, soluble solids, and total acids.

Gardner and Horanic (9) reported on cold injury of 41 rootstocks with 4-year-old 'Valencia' orange tops. They showed that 'Swingle' citrumelo was intermediate between sour orange and 'rough lemon' (C. limon (L.) Burm. f.) in its cold-hardiness. Recently, Yelenosky et al. (19) showed that 'Swingle' citrumelo seedlings are relatively tolerant of freezes. In Florida nurseries, 'Swingle' citrumelo has been observed to have a high germination percentage, produce uniform and vigorous seedling populations with an extensive root system, and be easily maintained and propagated.

Extensive field trial plantings in Texas have used old-line and nucellar red-grapefruit budwood. The results showed that 'Swingle' citrumelo consistently outyielded sour orange and approximately equaled sour orange in tree size, total acids, and total soluble solids with old-line and nucellar budwood (3, 18). The highest yielding trees in Texas of 9-year-old 'Marrs' early orange and 'Orlando' tangelo (C. paradisi X C. reticulata Bianco) were those on 'Swingle' citrumelo rootstock (Wutscher, unpublished data).

Other experimental data (2, 4, 5, 6, 7, 8, 15, 16, 20) in Texas have characterized 'Swingle' citrumelo as follows: low sensitivity to exocortis and xyloporesis viruses; poor tolerance of iron chlorosis; moderate tolerance of salt, boron, and cold; and good tolerance of midrib necrosis and yellow-vein chlorosis.

In California, Carpenter and Furr (1) reported that 'Swingle' citrumelo was outstanding among the citrumelos in its tolerance of root rot (Phytophthora parasitica Dast.). This work has been confirmed in Florida by Grimm and Hutchison (unpublished data).

The Agricultural Research Service, U.S. Department of Agriculture, in cooperation with the Instituto Agronomico, Campinas, and the Limeira Citrus Experiment Station in Brazil, in 1946, began a series of studies in search of tristeza virus-tolerant rootstocks. Results (11, 12, 13) showed that 'Swingle' citrumelo was tolerant of the tristeza virus. Further studies in Brazil (14, 17) on the orchard performance of the tristeza-tolerant rootstocks indicated that 'Swingle' citrumelo was one of the best-yielding rootstocks for 'Valencia' sweet orange.

Information to date on the 'Swingle' citrumelo hybrid warrants its release for further trial plantings as a potential commercial rootstock.

**Literature Cited**

and grapefruit, and as scions over sour orange rootstock when inoculated with the tristeza virus. Proc. Fla. State Hort. Soc. 61:20-33.


ZINC ACCUMULATION IN THE WOOD OF CITRUS TREES AFFECTED WITH BLIGHT

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Abstract. In Florida, blight is primarily a wilt disease of citrus with an unknown cause. Zinc deficiency symptoms are frequently found in the foliage of trees affected with blight. Accumulation of Zn in the wood of the trunk, large limbs, and roots indicates selective absorption from the transport stream. Zn concentrations in the outer layers of wood were about 8 times higher than in healthy trees. There was a slight copper accumulation also, but 9 other minerals were not affected. Interference in Zn transport is assumed to be a result of the affliction and not the cause, since foliar applications of the mental cured the deficiency but did not alleviate the blight.

The term “Blight” has long been applied to a specific chronic wilt and decline of citrus trees in Florida (1, 3, 7, 8, 9). The cause is still unknown. Various names have been applied to describe this, or similar, diseases. Two of the most common are “young-tree decline” and “rough-lemon decline”. Blight has precedence in usage and is therefore used here.

One of the earliest symptoms is induced zinc (Zn) deficiency. Patterns of Zn deficiency often show up in the foliage of one sector of the tree before or at the same time as the symptoms of wilt. The symptoms of Zn deficiency and of drought spread radially until the entire canopy is affected. Foliar sprays of Zn cause the chlorosis to disappear, thereby often masking a relation between the deficiency and the disease.

In 1966, blight started on 9-year-old orange trees in one of my Zn fertilization experiments (5, 6). These trees had been specifically propagated for the experiment from nucellar ‘Valencia’ (Citrus sinensis (L.) Osbeck) budwood and planted on virgin soil in Lake County. The experiment had been underway for several years and there was detailed knowledge available about the status of Zn and other minerals from frequent leaf analysis.

Unexpected patterns of Zn deficiency on a few scattered trees attracted my attention in the summer of 1966. In the spring of 1967, symptoms of wilt and delayed flush were obvious. The chlorosis symptoms disappeared rapidly following a Zn spray, which left no doubt as to the diagnosis of Zn deficiency on the declined trees. In the 8 years between 1966 and 1974, about 15% of 800 trees on rough lemon (C. limon (L.) Burm. f.) rootstock became blighted. However, none of over 200 trees on ‘Cleopatra’ mandarin (C. reticulata Blanco) rootstock were affected.

The incidence of decline was not related to the soil Zn status. High and low rates of Zn had previously been incorporated in the soil in many plots of 12 trees each. Once a tree started to decline, chronic Zn deficiency symptoms developed on all subsequent flushes of growth. Application of several Zn sprays per year for 6 years prevented foliar Zn deficiency symptoms, but the declined trees did not recover.