HortScience 14(1):56–57. 1979.

A Technique for Propagating Container-grown Citrus on Sour Orange Rootstock in Texas[1]

Norman P. Maxwell[2] and Calvin G. Lyons[2]
Texas A&M University Agricultural Research and Extension Center, Weslaco, Texas 78596

Additional index words. container citrus, propagation, humidity chambers, tree growth

Abstract. **Container-grown sour orange seedlings were cleft grafted in 1975, 1976 and 1977 with 'Redblush' grapefruit, placed in 2 types of humidity chambers (polyethylene tents and sacks) to increase survival, and evaluated for growth under full sun and 60% shade. Cleft grafting resulted in greater than 90% successful graft unions in all years. The type of humidity chamber used did not influence the percent of successful unions between rootstock and scion. In a 60-day period, grafted plants grown in full sun with a windbreak were 47% larger and produced larger and more luxuriant foliage than similar aged plants grown under 60% shade.**

Most of the land in the Lower Rio Grande Valley suitable for growing citrus nursery stock has a prior history of citrus and is considered undesirable as a nursery site because it often is infected with citrus nematodes, foot rot, and noxious weeds. It is becoming increasingly difficult for citrus nurserymen to find suitable land for field growing of nursery trees near their center of operation.

Several Valley nurseries are growing nursery trees in containers. Advantages of container-grown citrus over field-grown trees are: (a) the same site can be used each year for a container nursery using soilless or fumigated potting mixtures, (b) nematodes, foot rot and noxious weeds are not transferred into the new grove site, (c) less equipment is needed in a container nursery than in a field nursery, (d) the operation is concentrated in a halfshade or greenhouse complex where partial control of the microclimate is possible and freeze protection is feasible, (e) container trees start growth faster after being transplanted into the field because they have an undistrubed root system (1).

T-budding on field-grown sour orange rootstock is the usual technique for propagating citrus trees in Texas. However, in container growing of trees, nurserymen have found several problems with T-budding on sour orange. The bark must be slipping (tree actively growing) to insert a T-bud into the rootstock. As not all container seedlings growing under Texas climatic conditions will have the bark slipping at any one time, a nurseryman must go over a block of trees several times before all trees can be budded. Another problem of container-grown trees is that even though the buds have united and appear healthy, it is often difficult to force them into shoot growth.

This experiment was designed to find a propagating technique that would be satisfactory for container growing of citrus on sour orange rootstock.

In the Spring of 1974 and 1976, sour orange seed were planted in a raised bed containing peat moss and perlite in a shadehouse covered with polypropelene shade cloth (60% actual shade). Seedlings were transplanted into 5.8 liter plastic containers and allowed to become established before propagation was initiated. The pots were fertilized periodically with iron chelate and a fertilizer containing N-P-K plus minor elements.

The 1974 seedlings were ready for use as stocks in early January of 1975 and the 1976 seedlings in October of 1976 and January 1977. Seedlings were tip grafted as described by Richards et al. (6) with 'Redblush' grapefruit, but a cleft graft was used. Budding rubbers were wrapped over the polyethylene tape at the graft union to apply constant pressure. Similar methods have also been used in avocado propagation (4,5). It was possible to graft all seedlings except those below 0.3 cm in diameter.

The completed grafts were placed in a humidity chamber to prevent desiccation of the exposed scion and to maintain a temperature of 24 to 35°C. This controlled environment promotes callus growth of both scion and stock which unite to result in a successful graft union (2,3,7). Two types of humidity chambers were used: a clear polyethylene bag over the graft secured with a flexible wire, and a chamber supported with a wire framework covered with 4 mil clear polyethylene (Fig. 1). The grafted plants were periodically inspected for moisture requirements and suckers were removed from the rootstocks. Grafts made in October and January healed satisfactorily in polyethylene tents and under individual plastic bags. All grafted trees started growth without any forcing problems experienced with T-budded trees. The mean percentage of successful grafts was high in all 3 years (Table 1). There were no significant difference (1% level) between grafts placed in the polyethylene tent and those in plastic bags.

Fig. 1. The 2 types of humidity chambers. Foreground, clear polyethylene bags secured with wire over the grafts. Rear, humidity chamber constructed of 4 mil clear polyethylene supported with a number 9 wire framework.

Plants were removed from the humidity chamber after graft unions were complete and new growth had started (about 30 days after grafting) as shown in Fig. 2. Grafted trees were removed from the chamber late in the afternoon or on a cloudy day so the foliage had a chance to harden to half-shade conditions before exposure to the sun. A single scion shoot was tied to a stake as soon as growth was large enough to do so. The rubber bands and polyethylene wraps were removed about 30 days after the trees were taken from the humidity chamber.

Several thousand trees were cleft grafted in December 1975 in the Texas A&M University Hoblitzelle Ranch

[1]Received for publication June 2, 1978. Texas Agricultural Experiment Station and Texas Agricultural Extension Service, respectively. The authors wish to state their appreciation and thanks for the help of Mr. Early Robertson and the use of Texas A&M Hoblitzelle Farm labor and facilities in conducting the container citrus research tests in 1976 and 1977 and to Mr. Manuel Gautreaux for helping with the statistical analysis of the data.

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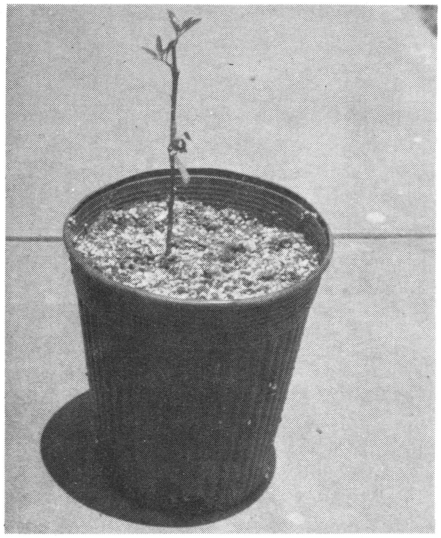

Fig. 2. Stage of growth at which plants were removed from humidity chambers after graft unions were healed.

Table 1. 3-Year summary of cleft grafting 'Redblush' grapefruit on sour orange rootstock in containers.

Type of humidity chamber[z]	No. successfully grafted trees	Total grafts	Successful grafts (%)
Grafted in January 1975			
Polyethylene tent	115	125	92
Polyethylene bag	125	140	89
Grafted in October 1976			
Polyethylene tent	102	112	91
Polyethylene bag	104	116	90
Grafted in January 1977			
Polyethylene tent	460	512	90
Polyethylene bag	463	512	90

[z]Difference between mortality of grafts placed in polyethylene tents of covered with plastic bags not significant, 1% level.

container nursery using the technique described in this manuscript. Seedlings used were grown from sour orange seed planted in March 1975 in raised seedbeds containing peat moss and perlite. Clear polyethylene tents were used as humidity chambers.

In April 1976, 200 trees were selected at random from the nursery. One hundred trees were placed outside the shadehouse in a protected area receiving full sun and the remaining 100 under 60% shade. The heights of the 100-tree sample in partial shade and the 100-tree sample in full sun were compared 60 days after exposure of the latter to full sun. The trees were trained to a single shoot with laterals removed. Plants placed in full sun grew 47% more than those in 60% shade, an average growth of 39 cm compared to 26 cm. Foliage on the trees receiving full sun was larger and more luxurious in appearance.

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HortScience 14(1):57–59. 1979.

Reduction of Rootstock Sprouts on Young Grafted Avocados with NAA[1]

S. B. Boswell, B. O. Bergh, R. H. Whitsell, and J. Kumamoto
Department of Botany and Plant Sciences, University of California, Riverside, CA 92521

Additional index words. Persea americana, growth regulator, naphthaleneacetic acid

Abstract: **Naphthaleneacetic acid (NAA) ethyl ester was applied as 0.5% aqueous spray 7 cm below the grafts of 9-month-old avocado (*Persea Americana* Mill.) prior to graft growth. No growth occurred on the grafts and plants were dead 4 months after treatment. Volatilization of ethyl ester of NAA applied as 0.3% to 1.0% aqueous spray, 7 cm below grafts that had grown out 12 cm, caused the new growth to wilt for 36 hours. The 0.4% spray caused slight bark burn of the seedling trunk. The higher the concentration the greater the burn. Sprays of 0.3 or 0.4% sodium salt NAA did not cause wilting or bark burn. Both formulations of 0.3 and 0.4% gave good control of sprouts on the seedlings trunks. The 0.3 and 0.4% ethyl ester treatments reduced total graft growth.**

Rootstock-scion desiderata for fruit trees generally may be grouped under three headings: a) availability and graftability of the rootstock itself, b) scion productivity, and c) scion fruit quality. The rootstock-scion combination should impart reasonable precocity, high average productivity, longevity, and adequate vigor to facilitate heavy fruit production over a long period. Grafting is practiced on a large scale in the California avocado industry to convert seedlings, or otherwise commercially less desirable trees, to superior cultivars. Trunk sprouts must be removed repeatedly to permit good growth of the grafts until the grafts have grown sufficiently to suppress regrowth by shading of the trunks and by apical dominance of the new top. Removal of sprouts is costly and, in addition, growth of trunk sprouts may inhibit that of the grafts.

Control of unwanted sprouts by NAA[2] on many species of woody plants has been reported (1-7, 9). Translocation of NAA from the treated site inhibited growth of citrus buds several cm distance from the treatment (8). No reference was found to volatilization effects of NAA in literature search and very little information on the use of NAA in production of nursery trees. This work was initiated to determine if rootstock sprouts on avocado seedlings grown under standard commercial conditions could be controlled by NAA without inhibition of growth of the inserted scions.

'Topa Topa' avocado seedlings were planted in 4-liter cans in December 1976. Trunks had an average circumference of about 4 cm at the graft site. Eighty 'Topa Topa' trunks were cut off at about 45 cm above can height and grafted with 'Bacon' scions on Sept-

[1]Received for publication June 26, 1978. Acknowledgments are made to C. K. Huszar for statistical analyses and K. W. Dunster of Amchem Products, Inc. for supplying the NAA.
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