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Growth of Mechanically Planted Nectarines Planted at Various Depths[1]

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Additional index words. *Prunus persica*, leaf size, wind rocking, air pockets

Abstract. **High-budded trees of nectarine [*Prunus persica* (L.) Batsch] that were mechanically planted with the bud union as a depth guide resulted in poorer growth when compared to those planted with the crown roots within 5 cm of the surface. Deeper-planted trees had smaller leaves and less total increase in trunk cross-sectional area, and were more susceptible to the formation of air pockets around their bases.**

Mechanical tree planters have increased in popularity in recent years since trees may be set at lower costs and in less time. Faster planting can be of major benefit in years where weather conditions prevent early site preparation or delay planting. Proper depth of planting with tree planters must be gauged by the person setting the trees in place. Over the years, the time-honored tradition of setting the root system at or within 2.5 cm of the soil surface (4) has been ignored, and the bud union is used a guide for planting depth by either burying it or having the union slightly above ground. Where low-budded trees (5 cm or less) are used, this could fall within the recommended range (1, 4). However, where trees are high-budded (up to 20 cm), using the bud union as a guide would result in trees planted excessively deep. Preliminary investigations (2) indicated that deeply planted peach trees were poorly anchored and were more susceptible to loss from wind rocking, excess soil moisture, or possible root diseases.

To study the effect of using the bud union as a planting guide, a trial was established in a commercial orchard. 'Red Gold' nectarine trees on 'Lovell' rootstock that had budded at about 17 cm were selected for the May 1980 trial. Four treatments of 7 single-tree replicates in a completely randomized design were established as follows: 1) crown roots to 5 cm below soil surface, 2) crown roots 5 to 10 cm deep, 3) crown roots 10 to 17 cm deep, and 4) crown roots 3 cm below soil surface with the trees planted in a concave depression 1 m diameter and 12 cm deep. Treatment 4 was included at the grower's request as a possible corrective measure for trees already set too deep. Treatment 4 was accomplished by planting trees 15 cm deep, then excavating to form the depression. The site was a well-drained sandy clay loam with a deep slope.

Trees were uniformly pruned and fertilized according to the growers normal production schedule (1). No irrigation was used in 1980, but in 1981 a trickle irrigation system was installed on the entire plot.

Measurements of trunk cross-sectional area were made at 5 cm above the soil surface. Visual observations of the trees in 1981 suggested that there were differences in leaf size among the treatments, so the largest fully expanded leaf on 5 randomly selected shoots per tree was measured for leaf area on May 18, 1981.

Growth in 1980 was poor (Table 1); however, differences did occur. After trickle irrigation was installed, growth was improved. For either 1980 or 1981 the only statiscally significant difference in growth was between trees planted at the 0–5 and 5–10 cm depths. The cumulative increases for both years showed better growth for the shallow planting than for both deeper treatments. Treatment 4 (roots at the bottom of a depression) did not significantly affect growth as compared to the shallower-planted trees. At the end of the second growing season, most of the original depression had filled in. This was probably accentuated because of the steepness of slope.

The lack of significant differences between the shallow and 10- to 17-cm planting depth is difficult to explain. The variation in individual trees was large and probably due to external factors beyond the control of this experiment. The cumulative differences for the 2 years were significant and indicate an

Table 1. Effect of planting depth on trunk growth and average leaf size of nectarine trees.

Depth to crown roots (cm)	Increase in trunk cross-sectional area (cm^2)			1981 Avg leaf size (cm^2)	No. trees forming air pockets in soil
	1980	1981	1981 + 1981		
5	1.2a[z]	7.7a	8.9a	39.7a[y]	1a
5–10	0.1b	4.2b	4.3c	28.6b	3ab
>10–17	0.6ab	5.4ab	6.0bc	28.3b	7c
Soil removed to 5 cm	1.0ab	7.3ab	8.3ab	31.7ab	5bc

[y]Leaf size measured May 18, 1981.

[z]Mean separation in columns by Duncan's multiple range test, 5% level.

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additive effect for the first 2 years of planting depth.

Measurements taken May 18, 1981, indicated a significant difference between the size of leaves on trees with shallow vs. deep root systems on trees in their second leaf (Table 1). This was probably due to better growth during the first growing season.

Fruit growers of this area have often complained of loose trees with openings (air pockets) in the soil around the base of the trees. An earlier study (2) indicated that this problem was more prevalent in deep-planted trees. At the end of the second growing season in the present study, we decided to test this hypothesis by mechanical means. Each of the trees was shaken vigorously by hand to determine if these air pockets could be created. We observed that depth of planting influenced the formation of air pockets (Table 1). Two of the more frequent reasons given for deep planting are to put the roots in moist soil for better growth and to give better anchorage to prevent loose trees. Our results do not support this. Poorer growth was observed even during the dry year of 1980, when roots were placed more than 5 cm deep and the deeper-set trees had significantly more air pockets around them.

It also has been suggested that burying the trunk increases the tree's susceptibility to soil-borne diseases (3). This possibility makes it important to keep the root system near the surface and to avoid deep planting.

These data support previous recommendations (1, 4) that peaches and nectarines should be planted with their roots near the same depth as they grew in the nursery. Where growers are using mechanical tree planters, the bud union of uniformly budded stock can be used as a depth guide; however, with no uniform budding height, provisions need to be made to insure a uniform shallow planting. This could be achieved by marking the trunk at the original soil line by some means or by watching for the difference in color or the underground portion of the root system.

A remedy to get young growing trees off to a good start if planted too deep is to remove soil around the tree (treatment 4). This is not a recommended planting procedure but only a stop-gap measure.

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Bench-grafting of Pecan[1]

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Additional index words. *Carya illinoensis*, propagation, rootstock

Abstract. **Pecan [*Carya illinoensis* (Wang.) K. Koch] was successfully bench-grafted by using a whip and tongue technique but success varied by cultivar and rootstock combinations. Polarity of root piece (piece-root grafts) had no significant influence on compatability.**

Bench-grafting would provide a method for rapid multiplication of a pecan clonal rootstock (1, 3, 4, 6). This study was designed to determine whether pecan cultivars could be bench-grafted and successfully transplanted to the field using the bench-grafting technique developed by Shreve for black walnut (5).

Scions from nut-bearing trees of 'Apache', 'Cheyenne', 'Choctaw', 'Comanche', 'Desirable', 'Kiowa', 'Mahan', 'Mohawk', 'Sioux', and 'Wichita' were collected in January and February, 1977 and 1-year-old seedling rootstocks of 'Apache', Kansas native, and 'Riverside' were dug in the winter of 1976 and spring of 1977. Dormant roots and scions were bench-grafted in March 1977, using the method described by Hartmann and Kester (2). The root, 1.2 cm in diameter and 14 to 16 cm in length, was detached from the stem to be the stock portion after grafting. Scions had 3 nodes and were about the same diameter as the proximal end of the rootstocks.

Bench-grafts were made in 2 ways: a standardized manner by inserting the proximal end of the scion into the proximal end of the root and as an inverted graft with the proximal end of the scion joined with the distal end of the roots.

The grafts were placed in milk cartons open at both ends, and placed on a welded wire screen to allow good drainage and filled with a mix of 1 sphagnum peat:1 perlite, 3 to 5 cm above the graft union. Distilled water mist controlled by a Mist-A-Matic controller, was applied to the grafted plants every 6 min for 3 sec during daylight hours, until 12 to 15 cm of shoot growth had developed. Grafted plants were then removed from the mist to a lath-house for hardening prior to transplanting to the field. Surviving plants were transplanted to the field as described by Shreve (5).

Plant survival was determined 60 days after planting in the greenhouse and after 116 days in the field. When averaged over 3 seedling rootstocks, 'Choctaw', 'Apache', 'Sioux', 'Mohawk', and 'Wichita' scions had a significantly better survival rate, 56 to 80%, than did 'Mahan' and 'Cheyenne', which had a 12 to 33% survival rate (Table 1).

All bench-grafts successfully growing in the greenhouse were planted in an orchard near Uvalde, Tex. The majority were under trickle irrigation. No statistically significant difference could be found in field survival due to clone, rootstocks, or clone/rootstock combinations. Only 2 of the 118 trees in the test were lost.

Bench-grafted trees were transplanted to the orchard. Most transplanted, bench-grafted

Table 1. The influence of clone on successful bench grafting of 1-year-old pecan seedling rootstock, grafted on March 2 and 13, 1977. The 3 rootstocks of 'Riverside', 'Apache', and a Kansas native seedling stock were combined to compare the influence of scion on survival in the greenhouse 60 days after grafting.[z]

Clone	No. of grafts	Grafts growing successfully (%)
Mahan	17	12a[y]
Cheyenne	59	33ab
Desirable	41	45abc
Kiowa	32	46abc
Comanche	36	50bc
Wichita	65	56c
Mohawk	12	75c
Sioux	12	75c
Apache	13	79c
Choctaw	8	80c

[z]Each rootstock was grafted 2 cm below the crown and was more than 1.25 cm in diameter.
[y]Mean separation by Duncan's multiple range test (Kramer modification) 5% level.

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