

## **Propagation of Avocado Plants in Cyprus (Comparison Between Budding and Grafting of Four Avocado Varieties.)**

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### **SUMMARY**

Experiments were carried out for three consecutive years in order to find the best method and season for propagation of the two main varieties of avocado in Cyprus, Fuerte and Hass, and their pollinators, Tova and Bacon. Budding in spring or autumn was the best method of propagation for the varieties Fuerte and Tova; whereas for Hass, whip grafting in spring was better. For Bacon, all three methods of propagation were equally successful.

### **INTRODUCTION**

Avocados can be easily grown from seed; but because cultivars are very heterozygous, they should be propagated vegetatively. The usual practice of vegetative propagation of avocados is by budding and, recently, by grafting (Platt, 1976). Budding is a usual method in California and Israel whereas grafting is usual in Florida (Purseglove, 1974; Samish and Gur, 1962). Although avocados can be propagated by leafy cuttings, the rate of success does not allow for an economical propagation. Different treatments were used to increase the rooting rate of avocado cuttings (Frolich and Platt, 1971-72; Reuveni and Ravin, 1976), but this method is not as yet used on commercial scale.

In Cyprus, propagation materials for avocados are seeds of the Mexican and, recently, seeds of the West Indian race. The seedlings from these seeds are grafted or budded in spring or budded in autumn, mainly with the varieties Fuerte and Hass and their pollinators Tova and Bacon. The successful take for each of the above varieties differs with the different method of propagation and the season. The objective of this work was to find out the best method of propagation and the best season for each of the above varieties.

### **MATERIALS AND METHODS**

Seeds of Topa Topa variety of Mexican race were planted in 0.76 mm (3 mil) polyethylene bags 15 cm in diameter and about 40 cm long with several holes punched in the bottom third to allow adequate water drainage. The potting mixture was 3 parts soil and 1 part sand. The polyethylene bags were placed in propagation houses. The houses used for propagation were "walk-in" tunnels of 40m long x 5.5 m wide x 4m

height covered with 47% shade net.

The seed coat was removed and a thin slice was cut from the apical and basal ends of each seed to hasten and give more uniform germination. Seeds were planted in the middle of October with the apical end at the surface of the potting mixture. Seeds germinated in about 5 weeks.

The seedlings were budded in the next autumn, or were whip grafted or budded in next spring, at a height of 20 cm above the soil surface. At that time, the seedlings had 70 cm height and 0.7 cm diameter.

For the experiment, scions of Fuerte, Hass, Bacon, and Tova varieties were used with the following treatment combinations:

- (1) T or shield budding in spring
- (2) T or shield budding in autumn
- (3) Whip or tongue grafting in spring

The experimental design was a randomized block with four replications and each replication consisted of 48 seedlings.

The procedure for T or shield budding was as follows:

The budwood was cut from young, but lignified, branches. The buds were inserted into the green non-suberized portion of the seedling stem. The cut was made in the form of a T. The shield was 2-3 cm long and the leaves had been removed from the bud stick by severing the leaf stems, or petioles, about  $\frac{1}{2}$  cm from the buds.

The procedure for whip or tongue grafting was as follows:

The scion used consisted of a short section of a shoot 6 to 8 cm long and of the same diameter as the seedlings. At the base of the scion and the top of the stock, sloping cuts 3 to 4 cm long were made. The cuts were adjusted to the size of the seedlings being grafted; they were longest on the seedlings with the largest diameters. On each of these cut surfaces, starting about one third of the distance from the tip, a reverse cut 1-2 cm deep was made. This second cut was not with the grain of the wood, but tended to parallel the first cut. The two pieces were then fitted together.

In both two methods of propagation, grafts were tied with rubber bands. Care was taken to wrap the bands tight enough to hold the graft, but not so tight as to injure the succulent seedling stem.

After 3 to 4 weeks, the grafts were untied and the tops of the stocks were cut off to force the scion into growth. Exposed cut surfaces of stock and scion were covered with asphalt emulsion.

The trees, coming from the scion, were staked, tied, and trained up the stake as they grew.

Irrigation was done by hand sprinkling at the beginning; but after germination, the plants were irrigated through a microtube system to each container, with amounts and frequency depending on plant size and weather conditions.

Table 1. Percentage of successful take for each treatment and each variety for three consecutive years.

a) Fuerte			
Treatments	1981	1982	1983
Budding in spring	79.7 a	87.3 a	78.3 a
Budding in autumn	64.1 a	71.3 a	96.0 a
Whip grafting in spring	43.2 b	69.8 a	37.8 b
S.E.	0.50	0.50	0.51
C.V.%	3.04	3.20	6.12
b) Hass			
Treatments	1981	1982	1983
Budding in spring	19.8 b	29.8 b	41.5 b
Budding in autumn	21.9 b	34.3 b	52.0 b
Whip grafting in spring	60.5 a	80.5 a	77.8 a
S.E.	0.52	0.53	0.51
C.V.%	12.63	15.09	5.51
c) Tova			
Treatments	1981	1982	1983
Budding in spring	51.0 a	72.0 a	79.8 a
Budding in autumn	61.5 a	66.0 a	89.8 a
Whip grafting in spring	25.0 b	40.8 b	27.0 b
S.E.	0.50	0.51	0.50
C.V.%	3.32	6.10	2.34
d) Bacon			
Treatments	1981	1982	1983
Budding in spring	47.9 a	78.3 a	76.5 a
Budding in autumn	38.0 a	69.0 a	82.5 a
Whip grafting in spring	41.1 a	75.0 a	67.0 a
S.E.	0.50	0.50	0.50
C.V.%			

Fertilization was applied prior to planting by adding into each container five gms 0-48-0. During spring and summer, five gms of 26-0-0 were applied into each container every month. Soil application of Fe-chelate was also applied to prevent the young plant from iron chlorosis. Strict sanitary measures were practiced for disease prevention.

The experiment was repeated for three consecutive years (1981-83).

## **RESULTS AND DISCUSSION**

Table 1 shows the percentage of successful take for each variety and each treatment for the years 1981, 1982, and 1983.

For the Fuerte variety, in all three years, budding in spring and budding in autumn gave the best results (Table 1a). No statistical differences were found between these two treatments. The percentage of successful take for whip or tongue grafting in spring was statistically less than the other two treatments in 1981 and 1983. In 1982, there were no significant differences between treatments, although the percentage of successful take was higher for budding in spring and autumn than for whip grafting in spring.

In the case of the variety Hass, the results showed that the percentage of successful take was statistically higher for whip or tongue grafting in spring than for budding in spring and autumn in all three years (Table 1b). Failure in budding in both seasons (spring and autumn) was caused by shedding of buds after budding. The percentage of bud abscission after budding was very high for the variety Hass, compared with that of the other three varieties. For the variety Hass, this percentage was up to 60%; whereas for Fuerte, it was up to 14%, for Tova, up to 12%; and for Bacon, up to 16%.

As many axillary buds were abscised, budding is not a satisfactory method of propagating the variety Hass unless the propagator is able to distinguish the buds most likely to hold. According to Yenning and Lincoln (1958-59), these are the buds formed toward the end of a growth flush.

In Cyprus, the variety Tova is used as pollinator for the variety Fuerte. The results showed that the best method to propagate Tova variety is by budding either in spring or autumn (Table 1c). The percentage of successful take was statistically higher for budding in both seasons than for whip or tongue grafting in spring. These results were the same in all three years.

The Bacon variety is used as pollinator for Hass in Cyprus. There were no significant differences between the three methods of propagation in all three years (Table 1d). Budding in spring and autumn and whip grafting in spring had approximately the same percentages of success. These percentages were quite high for all methods of propagation and in all years except in 1981, when the percentages were relatively low.

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