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Avocado Topworking Update 1990

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Abstract. **As total avocado acreage shrinks in California, due in part to rising land values and increasing cultural costs, any shift in varietal preference away from the dominant 'Hass' variety will require the implementation of efficient, low-cost field propagation know-how. In combination with new materials, various field grafting methods have been devised that offer alternatives for commercial propagators to increase output. Recent trends in field topworking have seen some traditional techniques abandoned in favor of more timesaving methods. Such changes may be expedient and economically attractive, but there are unforeseen problems.**

LARGE TREES (more than 25 cm in diameter)

Past

Historically, large trees were "notch" ("sawkerf") grafted in early spring. A skilled propagator can achieve excellent results with this graft; tree growth is vigorous, percent take is high, and the scion/stock union is strong and well-healed. However, this propagation technique is quite difficult and requires specialized tools. The procedure is slow, and also is best performed with large-diameter scion wood.

Present

Bark grafting. Bark grafting using large-diameter trees has not generally been very successful. It helps to reduce the thickness of the bark using the edge of a pruning saw blade, or other shaving tool, to make the bark less brittle for scion insertion. Also, the standard one-inch wrapping tape generally does not provide adequate pressure on bark and scion to create a strong cambium attachment. Roofing staples have been successful in binding the scion tightly, but as the scion grows and enlarges, the staples pinch, restricting expansion, and creating a permanent weakness at the graft union. Small nails or brads have been used with limited success. This procedure requires more time and labor.

Summer shoot grafting. To commercially graft large acreage quickly and economically, Mr. Richard Marocco, of Fallbrook Ag-Laboratories, Inc., Fallbrook, CA, has popularized a successful summer shoot grafting technique (Whitsell *et al.,* 1989). The method is not

entirely new; in the past, commercial propagators frequently used a similar procedure for their non-take notch grafts.

The summer shoot grafting technique requires stumping trees at about 60 cm early in spring after the danger of frost has passed. From the mass of shoot regrowth, both from the stump and the rootstock (below ground), 3 to 4 vigorous shoots are selected, of which two or more are grafted with a modified splice graft in mid- to late-summer. Success rate with this graft is high, but it is not without some disadvantages. First, grafting late in the year requires the use of freshly picked summer wood. Unlike dormant wood used for spring grafting, summer wood cannot be cold-stored for prolonged periods of time. Second, there may be erratic stump regrowth from any of several causes: inherent tree variability, excess soil moisture accumulation during a period of no evapotranspiration requirement, and soil moisture deficit after regrowth activity. Third, very late-season grafting frequently does not produce sizable trees before the cold of winter. Thus, danger of cold damage is more likely on summer-grafted trees. Grafts must be firmly staked; the stock shoot attachment and the fragile scion/stock attachment is vulnerable to breakage early in the graft development.

Future

Grafting over-wintered suckers. A promising new approach is to stump the trees as for summer shoot grafting, but to delay the grafting until the following spring. By allowing the tree to regrow for about one year, the original stumping shock is past, and initial graft growth response is vigorous. (Conversely, summer shoot grafting failure can weaken the tree so that it is permanently injured by summer heat stress or later winter cold.)

Similar to summer shoot grafting, two or more over-wintered shoots should be bark-grafted in early spring. The shoot will have green bark, and will generally slip year-round. Early season grafting will establish a long growing season for the young graft, although grafting too early may result in freeze damage. By keeping one or two nurse limbs until graft growth is healthy and about a height of 30 cm, the vigor of the tree and growth cycle of the stump is sustained. Additionally, although stakes are still required to prevent top-heavy shoots from breaking, staking is not as critical as for other graft methods; the active cambium development of the young shoot combined with a full season of growth usually produces a smooth and complete stock-graft union that is quite strong.

Currently, there are no production data comparing summer shoot grafting with over-wintered shoot grafting. In one trial using the 'Gwen' cultivar, some fruit was observed on the summer shoot grafted trees less than one year from grafting. The economic value of this crop is relatively small, and may retard early tree development; vegetative growth is suppressed by the burden of maturing fruit and so these fruit should probably be removed.

SMALLER FIELD TREES (« 20 cm in diameter)

Here the bark graft works well on the original stump cut. Grafting is generally done after the danger of frost and requires slipping bark. Commercial propagator Mr. Alvin Lypps of Hemet, CA, now successfully achieves "dormant-season" grafting with non-slipping bark, using a blade-like tool to force the bark open. The tool is valuable throughout the grafting season because it cuts away obstructions under the bark that might prevent complete scion attachment. Grafting in early spring allows for a long growing season of the graft, but some recent work using a heat-protective aluminum wrap (see Coverings) suggests that by grafting later in the season (April-August), when the cambium is very active, scion take is increased and vigorous. Mr. Lypps uses a center-style placement of the scion in order to get callus attachment from both sides of the scion. Our experience has shown that other placements are inferior, unless the bark is green or near green then healing is rapid and somewhat forgiving. Additionally, long tapered scion cuts are vital for the best scion attachment and overall performance. As with most topworking, this graft requires strong staking for the first few years until attachment of the scion is complete.

Budding

Budding is generally not recommended for avocado, particularly in topworking. The protruding nature of the avocado bud is susceptible to physical damage from the plastic tape wrap required to protect the small bud-shield from seasonal dry heat. Yet, if performed successfully, budding can be a relatively easy propagation method, and can utilize buds from immature or green succulent shoots, not typically suitable for grafting. It requires young bark, such as on sucker shoots.

A successful procedure is to use a standard ‘T' bud cut, wrapping the bark over the bud-shield with plastic tape, leaving the bud eye exposed. Then, second-wrap with a light-mil (1 mil) tape that is elastic enough to prevent bud damage. The second wrap is removed after a period of about 2 weeks to prevent sealed moisture from causing rot and after enough time for the bud-shield attachment to be complete. At such time, the budded shoot is cut 15 to 20 cm above the bud to force bud growth and to remove growth competition from the terminal dominant shoots. A cut through the bark just above the bud may additionally be helpful in forcing the bud to grow.

GRAFT CARE

Wrapping

Perhaps one of the most important contributions to the success of grafting since plastic tape and asphalt emulsion is a wax-like stretchable tape called 'Parafilm’^{R}. The material is now used by propagators on different species, but its usage on avocado owes its popularity to Rick Marocco of Fallbrook. Although there are many different techniques using the Parafilm product, the common use is to wrap the entire scion, stem and buds (Fig. 1). Buds grow through the Parafilm and therefore removal is not required (Fig. 2).

In one large-scale experiment (Fig. 3), by 10 weeks after grafting, Parafilm treatment had resulted in almost twice as much graft growth, an average length of 11.6 cm compared with 6.1 cm for the controls ($P < 0.001$).

More experience is needed to utilize the full potential of the Parafilm product. For example, Mr. Marocco wraps not only the scion but also the scion/stock cuts, thus making the usual plastic wrapping unnecessary, and therefore eliminating the need to return at a later date to cut plastic from the expanding graft. Mr. Marocco's results have been excellent, but Parafilm is not as strong as plastic and is not as effective for all grafts. Other nurserymen have combined the use of Parafilm with budding rubber bands. Placing the rubber bands over the Parafilm helps to reinforce the scion/stock union. Like Parafilm, rubber bands break down with exposure to heat and light. In order to prevent too quick decomposition, the film must be shielded from direct exposure to light. Typically, white paper or paper-backed aluminum are placed over the material. Dilute, light-colored, water-base paint on the outside of the Parafilm tape has been used with varying degrees of success. Parafilm comes in three types: clear transparent, white opaque, and green translucent. We know very little about the response of white and green Parafilm at this time.

Wound Compounds

Using Parafilm on small-diameter scion/stock grafts eliminates the need for asphalt emulsion as a seal. But, when grafting larger-diameter stocks, asphalt emulsion is necessary to prevent sapwood drying and cambium injury. Typically, asphalt is used at a consistency designed by the manufacturer. It is easy to apply and is an excellent sealant for cut surfaces and exposed cambium. But, the effectiveness of this sealant can encourage *Poria* fungal rot to travel through the heart of the tree causing structural weakness. Therefore, it is advisable to dilute the asphalt emulsion for general application, using the thicker full-strength material to fill larger gaps. This treatment has been found to minimize both desiccation and disease.

Asphalt emulsion is black and tar-like. If it is exposed to direct sunlight, heat can transfer to the tender scions and cause severe damage, even if the scions themselves are not directly exposed. Therefore, cover all asphalt sealant with a white (or light-colored) water-base paint. We are searching for a light-colored sealant to replace asphalt emulsion, so far unsuccessfully. It is also advisable to paint the bark of the stock, which is now exposed to the sun because of tree top removal.

Coverings

In hot climates, it is best to protect the newly grafted scions with something like a multiple-layered white paper cone wrapped around the stump, bound with twine or stapled, and supported with small bamboo stakes or the equivalent. The stakes keep the paper from sagging from moisture or bird perching. Before summer heat, cut vents in the side of the cover to prevent heat buildup. Paper-lined aluminum has been used very successfully as a cover; the reflectivesurface of the aluminum reduces heat

buildup. In a simple test, paper-backed aluminum maintained inside temperatures more than 6.67C cooler than did brown paper wraps, under conditions of sun exposure averaging 37.78C. The aluminum cover permits successful bark grafting as late as mid-summer. The aluminum cover may alter the optimum grafting season in our area (conventionally early March to mid-May) to April-August, when the rootstock is more actively growing.

Pruning

Frequently, no training (other than staking) is given to successful grafts. This is a cultural-care oversight. Neglected topworked trees appear on the surface to be healthy, but examination reveals competing structural limbs or weak crotches likely to break under the strain of a crop load or high winds. After grafting, the newly developing scion commonly has more than one shoot. At a height of about 15 to 40 cm, it is advisable to pinch terminal portions of all but the best-placed, dominant shoot to create a strong central leader. Sometimes repeat pinchings are desirable to enhance the central leader. In a month or two, the dominant trunk becomes the established tree and secondary shoots are removed entirely.

After the above procedure has produced a single strong trunk, upright growing varieties like ‘Gwen’ can be height controlled by a switch in logic: remove the tip of the central leader to encourage tree spread. How this response, or other pruning treatment combinations, will affect tree height and yield is the purpose of an ongoing study.

LITERATURE CITED

Whitsell, R.H., G.E. Martin, B.O. Bergh, A.V. Lypps, and W.H. Brokaw. 1989. Propagating Avocados. University of California, Division of Agriculture and Natural Resources, Publication 21461.

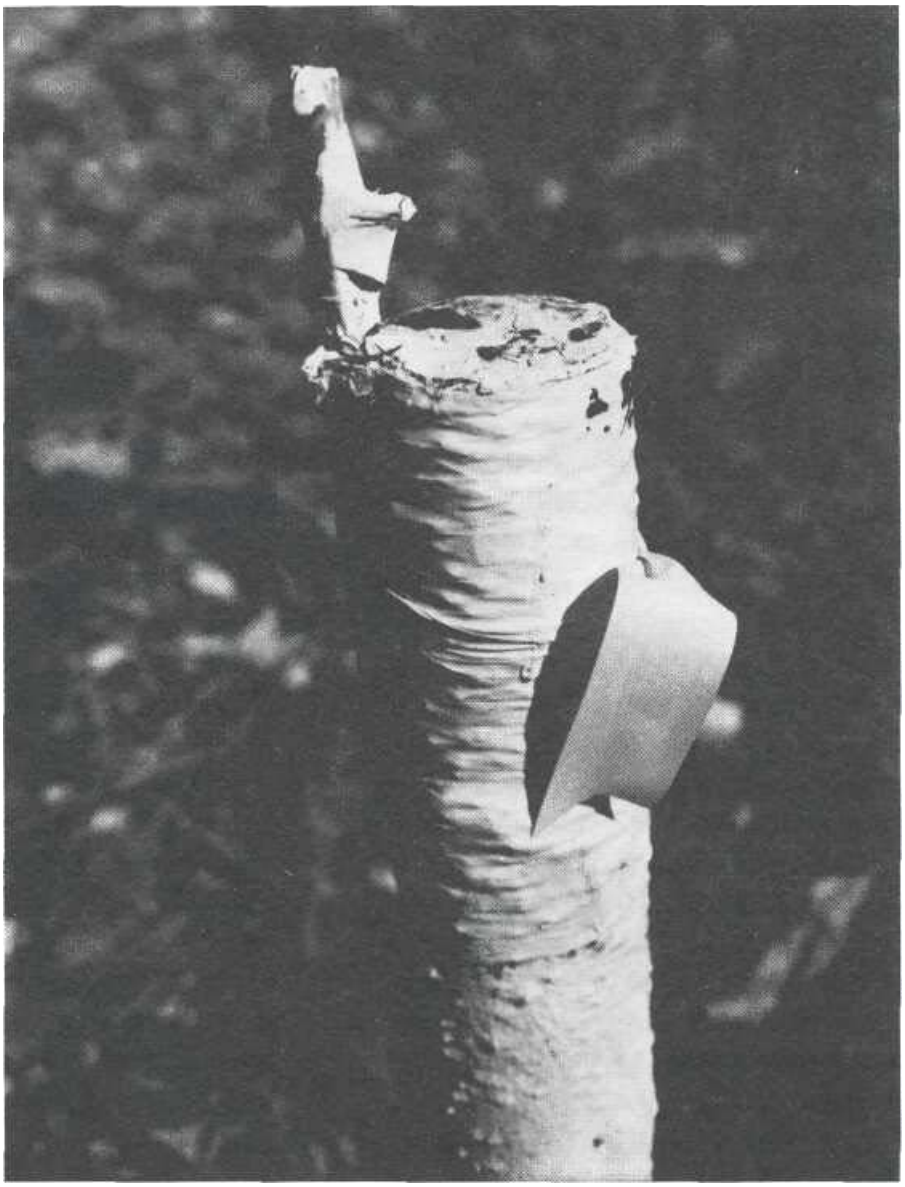

Figure 1. Parafilm wrapping stem and buds of avocado scion.

Figure 2. Avocado shoot growth through Parafilm two months after grafting.

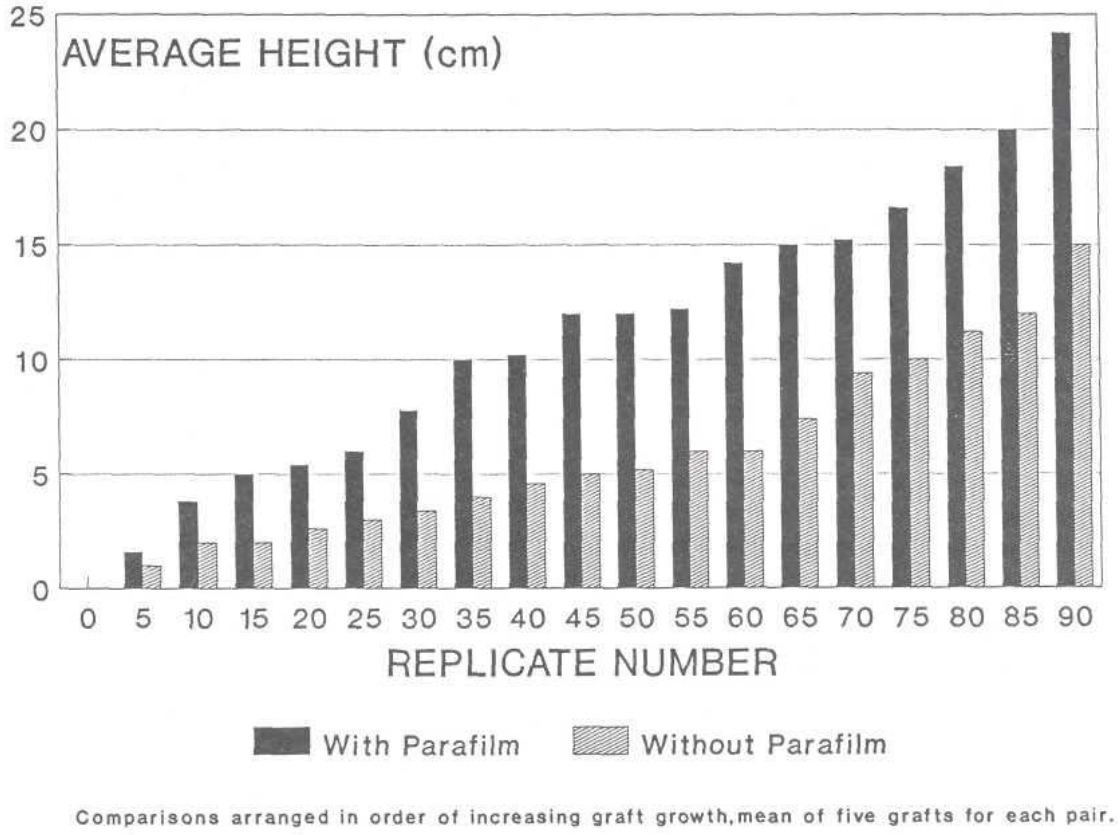

Figure 3. Comparative effect of Parafilm treatment on growth of 'Gwen' grafts.