



# **BUDDING AND GRAFTING**

## ***Fruit Trees in the Home Garden***

Division of Agricultural Sciences  
**UNIVERSITY OF CALIFORNIA**

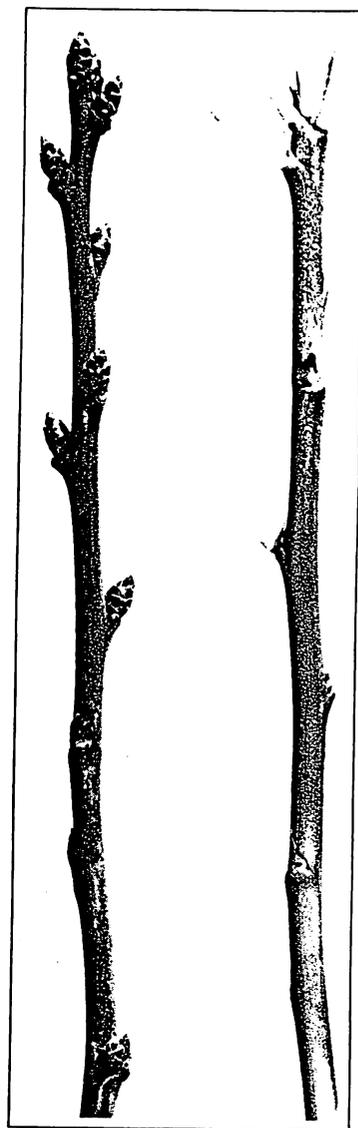
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**COVER PHOTO:** A budded pear tree (arrow) 4 months after budding. The seedling was budded in the spring, the top was cut off 3 weeks later, and the Bartlett (bud) top grew during the summer. The next step is to cut off the stub just above the bud so the Bartlett top can grow over the seedling to make a strong union and to produce a tree of a desirable variety.



*Figure 1. Ideal bud wood of several fruit species.  
Left to right: Almond, apricot, cherry, pear, and plum.*



*Figure 2. Almond shoots.  
Left: Flower buds; do not use for budding.  
Right: Leaf buds; ideal for budding.*

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## WHY GRAFT SEEDLING TREES?

When you plant seeds of any named variety of fruit—Elberta peach, Santa Rosa plum, Bartlett pear, or others—the individual trees that sprout from the seeds will all differ from one another and will be unlike the parent tree from which you obtained the seeds. For example, all Elberta peach seedlings produce peaches (or nectarines, which are essentially peaches without fuzz on the skins), but the fruit is unlike that of the parent tree in flavor, color, date of ripening, and many other characteristics.

More than 99 percent of all seedling trees bear fruit that is inferior to that produced by the parent trees. For this reason, it is necessary to graft or bud most kinds of fruit tree seedlings to the desired variety to obtain a true-to-name tree of any known variety. You can propagate the desired varieties of a few kinds of fruit or vines, such as fig, olive, grape, pomegranate, and quince, by rooting shoots in soil. However, cuttings of most kinds of fruit trees do not root easily.

For example, if you have one peach tree in your yard and want to extend its fruit-bearing season, you can bud or graft more than one variety of peach on it. This is fairly easy to do. You can bud several varieties of peach on a young tree or graft two or three additional varieties onto an older tree or add a pollinating variety to a tree by grafting.

Within a limited amount of space, you can grow several varieties of fruit on a few trees. However, you can usually grow only like kinds of fruit on the same tree: apple varieties only grow on apple trees; walnuts on walnut seedlings; pears on pear seedlings; and cherries on cherry rootstocks. There are a few exceptions to this rule. For example, you can grow plums, apricots, almonds, nectarines, and peaches on peach seedling roots, but the growth habit of each differs, so it is difficult to manage these different species on the same tree. The safest method is to put varieties of like fruits (species) on one tree and varieties of another species on a separate tree.

It is often difficult to locate bud or graft wood of the desired variety unless you can obtain it from neighbors or friends. In general, nurseries, government

agencies, colleges, and universities **do not** sell or give away small quantities of bud or graft wood of fruit or nut tree varieties. Often the best way to obtain a new variety is to purchase a budded tree from a nursery.

This publication is intended for those who have access to propagation wood of the varieties desired. Simple methods of budding and grafting are described: For more information, refer to *Propagation of Temperate-Zone Fruit Plants* and books on plant propagation (page 8).

## BUDDING VERSUS GRAFTING

In budding, you place a detached bud of the desired variety under the bark of a seedling tree. In a few weeks, the bud shield and the seedling heal together. Then the bud of the desired variety grows to produce the new tree, which is genetically like the parent tree from which the bud was taken and which produces fruit true to the variety. Nurserymen use budding to propagate most nursery trees sold to orchardists and home gardeners.

In grafting, you insert a short section of a shoot taken from a tree of the desired variety into a limb or trunk of a seedling tree.

### Budding

In California, the season for budding is April through August. If you bud trees during June through August, select bud wood from the current season's growth. Take wood that is  $\frac{1}{4}$  to  $\frac{3}{8}$  inch in diameter and cut off the leaves. If you plan to bud in April, collect the same size wood from dormant trees in January. Wrap the dormant wood in moist (not wet) paper and place it in a plastic bag in a refrigerator at  $32^{\circ}$  to  $35^{\circ}$  F. until needed.

Good bud wood is firm and has narrow, pointed leaf buds, not plump flower buds. (See figure 1.) To get good leaf buds, take only wood 2 to 10 months old that is easy to cut. Remove all leaves as soon as possible to prevent the bud wood from drying out. When you cut off the leaves, leave a  $\frac{1}{2}$ -inch-long petiole so the bud is easier to handle during the budding operation.

Use a sharp knife for cutting bud and graft wood. It is best to use a knife that has a straight-edged blade with a rounded point. However, you can use any sharp, thin-bladed knife.

The tree limb or shoot on which you place the bud is called the **stock**. Select a limb or shoot that is  $\frac{1}{4}$  to  $\frac{3}{4}$  inch in diameter and actively growing so the bark slips (separates easily from the wood). Find a smooth section on the limb or trunk of the stock and make a vertical cut  $1\frac{1}{2}$  inches long through the bark. Do not cut through buds on the stock. At the top of the vertical cut, make a horizontal cut and twist the knife to raise the bark at the intersection of the vertical and horizontal cuts. (See figure 3, A.)

Next take the bud wood of the desired variety and make a round, tapered cut, starting  $\frac{1}{2}$  inch below the bud. Cut upwards to obtain a 1-inch-long bud shield with a thin sliver of wood attached underneath. (See figure 3, B and C.) Then slip the bud

under the bark at the T on the stock (figure 3, D). Shove the bud down under the bark until the upper end of the bud shield is just below the horizontal cut. Finally, to hold the bud securely in place, wrap the entire T area with rubber bands, thin plastic tree tape, or even  $\frac{1}{2}$ -inch-wide cloth strips. When wrapping, leave the bud "eye" exposed (figure 3, E).

After 2 to 4 weeks, the bud will heal to the stock. At that time, cut off the top of the stock just above the bud. This forces the bud to grow, which is desirable for trees budded in April, May, and June. However, when you bud trees in August, do not cut off the top of the seedling until the following spring so the bud will remain dormant. In March, cut August-budded trees above the inserted bud to force growth of the bud. (See cover photograph.)

Four weeks after budding, cut the ties around the bud so they do not girdle or choke the growth of the tree. Use a sharp knife and start the cut on the

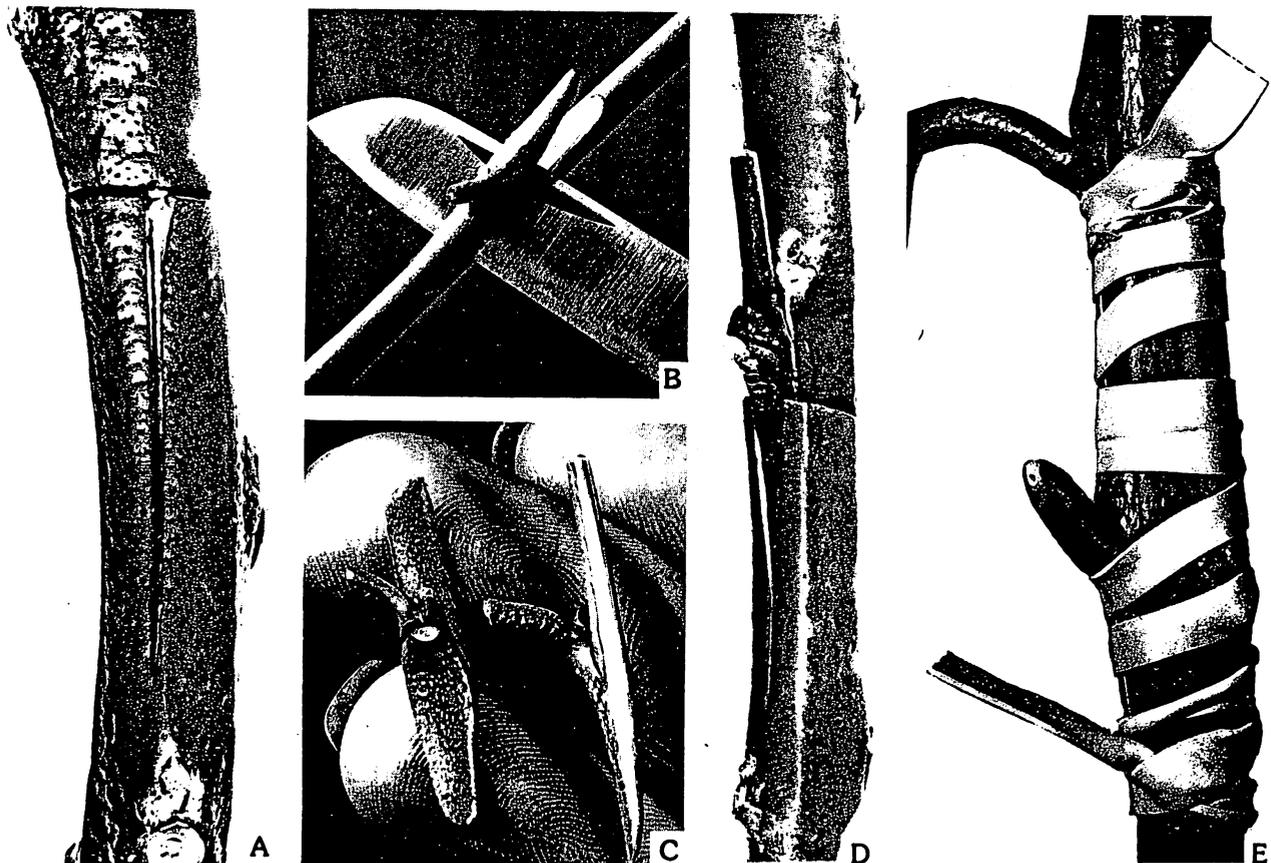


Figure 3. Budding. A. Make a T cut in the stock. B. Cut the bud from the stock. C. Front and side view of cut buds. D. A bud partly inserted in the stock. E. A wrapped bud.

side opposite to the bud. Cut through the tape to the bark of the tree. Remove sucker shoots that grow on the stock after budding. This practice allows the bud to develop fully into the new tree top. To protect the new top against breakage, pinch back new growth or stake to support the new, growing shoot.

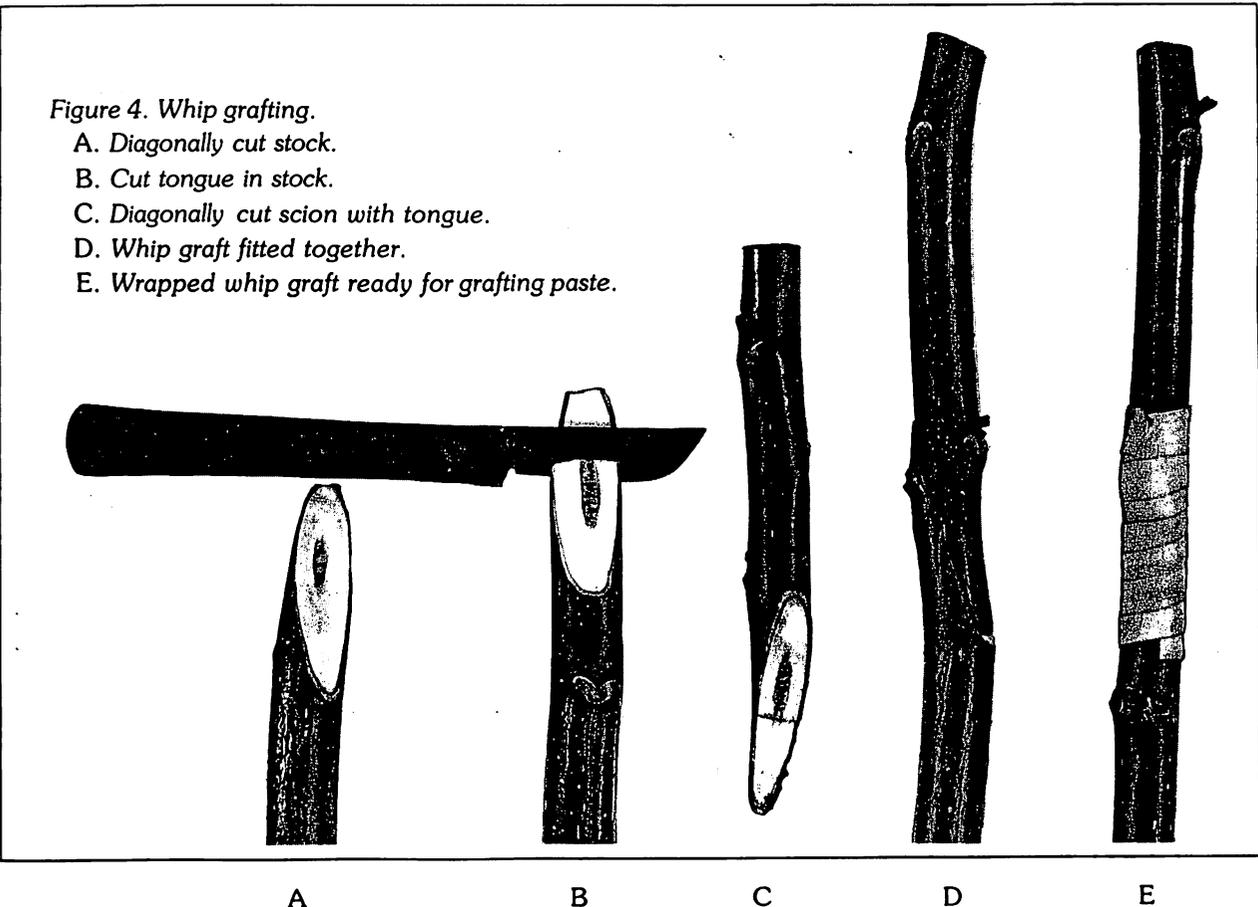
### Whip Grafting

Whip grafting is an easy method for propagating young trees or limbs that are less than 1 inch in diameter. If the budding you did the previous season failed, you can whip graft to establish a scion on a seedling tree. The ideal diameter of stock (seedling limb or trunk) for whip grafting is about  $\frac{1}{2}$  inch. The best season for whip grafting is January through March. Select graft wood, usually called scion wood, of the desired variety that is the same diameter as the stock, although you can use smaller diameter

scion wood. Collect the scion wood in January and use it immediately or store it (wrapped in moist paper and a plastic bag) in the refrigerator for use in February or March.

To whip graft, make a smooth, diagonal cut 1 to  $1\frac{1}{2}$  inches long through the seedling stock at the height you want the graft. Make a similar cut near the base of the scion wood. Check to see if these two cuts make a smooth surface that fits closely together (figure 4, A). If not, re-cut either the stock or the scion wood so the cut on one is a good mirror image of the cut on the other. Then make a  $\frac{1}{4}$ - to  $\frac{3}{8}$ -inch cut to form a tongue. Start this cut from the center of the diagonal cut on the back of the stock; make the cut approximately parallel to the original cut (figure 4, B). Do the same on the scion wood and slide the two tongues together. (See figure 4, C and D.)

Cut the scion to two to three buds (2 to 3 inches long) above the graft. Next wrap the graft union (scion



and stock) tightly with tree-tying tape or rubber bands (figure 4, E). Finally, cover all exposed cut surfaces thoroughly with black asphaltum (grafting or pruning paste) to prevent drying. Be especially careful to cover the top of the graft and any part of the graft union not well wrapped with tape. If you use rubber bands or string instead of tape, cover the top and the union with grafting paste.

A month or so after grafting, the buds on the scion will start to grow. At that time, use a sharp knife to cut through the tying material. It may also be necessary to drive a stake into the soil to support the new top.

### Cleft and Bark Grafting

When seedling trees or limbs are larger than 1 inch in diameter, plan to graft, since it is difficult to bud large diameter wood. Grafting consists of inserting a 1/2-inch by 4-inch shoot (scion) of the desired variety into the stock. There are many methods of grafting, but all require that the cambium of the scion is lined up with the cambium of the stock. The cambium is a layer of dividing cells located between the bark and the wood. The cells in the cambial area produce callus, which heals the scion (new top) to the stock. Only two kinds of grafts—cleft and bark—are suggested because they are relatively easy to do.

Before grafting, cut back the limb or trunk of the seedling tree to the point where you want to make the graft. You can make trunk grafts on small trees—4 inches or less in diameter. On large trees, make grafts in limbs that are 2 to 4 inches in diameter. Make the final, smooth cut on the trunk or limb to be grafted the same day you make the graft so the cambium and bark are moist, not dried out.

Do cleft grafting in late January or February when the trees are dormant. Only do bark grafting in the spring—April and May—when the bark is slipping. Collect graft (scion) wood for either method during January when the trees are dormant. Select wood that is 3/8 to 5/8 inch in diameter from the previous year's growth. If you intend to use the scion wood for bark grafting in April or May, wrap it in moist newspaper and place it in a plastic bag in a refrigerator. If you plan to cleft graft in January or February, use the scion wood immediately.

**Cleft grafting.** Make a fresh, smooth cut at right angles to the trunk or limb. Then make a vertical cut about 2 inches deep down through the center of the stump. Use a large kitchen knife to split small limbs or trunks (1 to 2 inches in diameter); use a chisel or wedge to split large trunks. Be careful to cut the bark, not tear it. Insert the chisel edge or wedge to spread open the cut made by the knife or saw. Then take the knife and smooth up the outside of the cleft where you want to place the scions.

Make a wedge-shaped cut at the base of the scion so the outside edge is slightly wider than the inside edge. Leave two to three buds on the top of the scion so the scion is 3 to 4 inches long. Place the scion so the cambium layer matches that of the stock. To make sure the cambiums of the scion and the stock cross and touch each other (are not parallel to one another), place the top of the scion slightly outside and the bottom slightly inside the cambium of the tree. After placing both scions, carefully remove the wedge and thoroughly cover all cut surfaces with grafting or pruning asphaltum (figure 5).

**Bark grafting.** Use stored, dormant grafting (scion) wood that is 3/8 to 1/2 inch in diameter. Do grafting in April or May when the bark slips easily.

First make a fresh, smooth, saw cut at right angles to the limb or trunk to be grafted. Prepare each scion by making a 1 1/2-inch-long diagonal cut on one side and a 1/2-inch-long diagonal cut on the opposite side. (See figure 6, left.) Leave two buds above the long diagonal cut. Place the scions against the bark of the stock; then make two parallel cuts, spaced slightly wider apart than the scion, through the bark. Raise the strip of bark between the two parallel cuts and remove the upper one-third. Push the scion between the wood and the bark; be sure the longer cut is inside next to the wood and the shorter cut is next to the bark. (See figure 6, right.)

Repeat the process to place the scions about 2 inches apart around the stock. Then use #19 or #20 flat-headed, wire nails to secure each scion in place. Drive one nail into the scion near the top and another nail near the bottom. Cover all cut surfaces with black grafting asphaltum to aid healing and to prevent drying of the scions and the trunk or branch tissues.

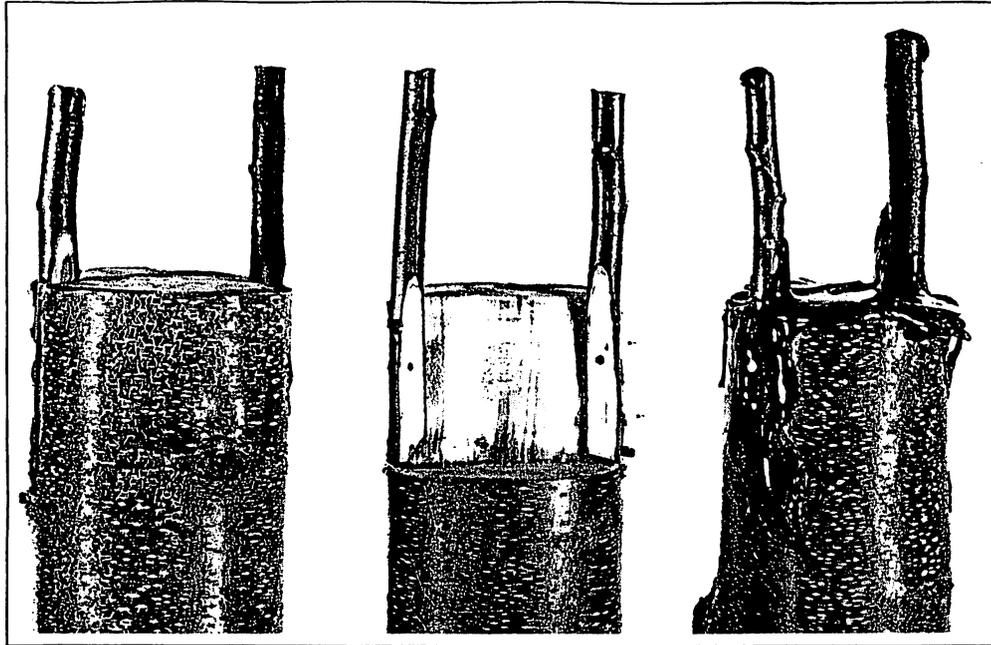


Figure 5. Cleft grafting. Left: Scions inserted in place. Center: Part of the stock has been removed to show how the cambium of the scion is brought into contact with the cambium of the stock. You can place the scions at a slight outward slant to make sure the cambiums touch in at least one place. Right: Completed graft covered with wax.

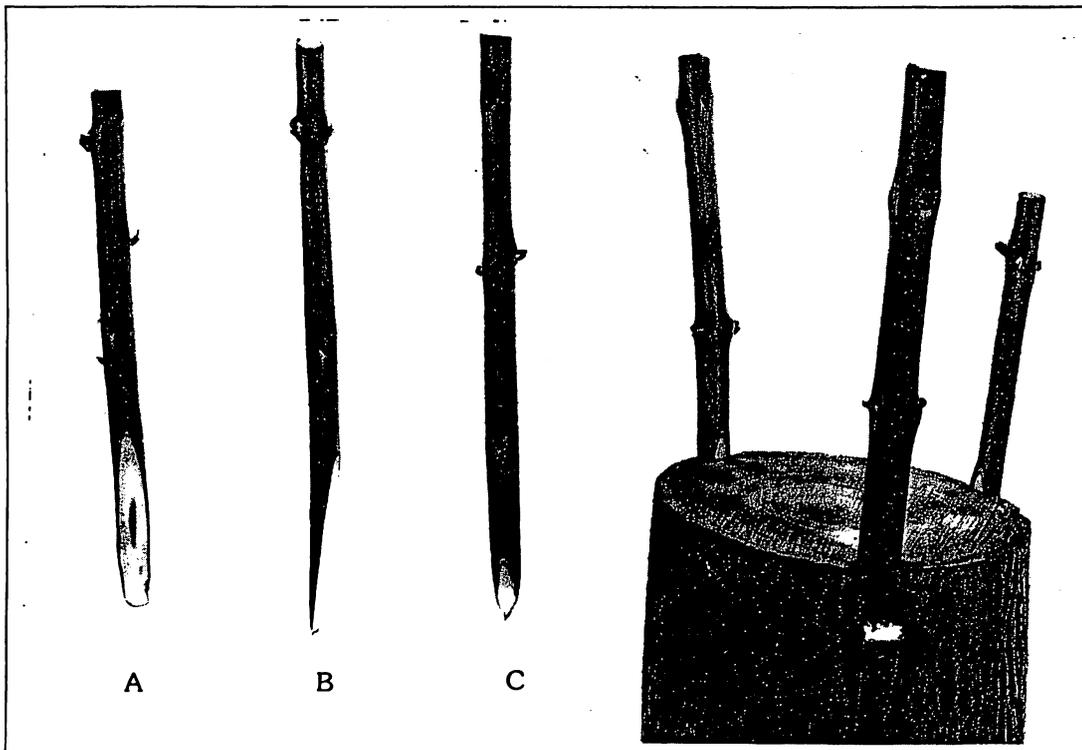


Figure 6. Bark grafting. Left: Scions prepared for grafting—A) side of scion that is placed against the wood of the stock; B) side view of scion; and C) side of scion opposite to that shown in A. Right: Scions inserted and nailed into the stock; graft is now ready to wax. Cover all exposed cut surfaces, including the tops of the scions, with grafting asphaltum compound.

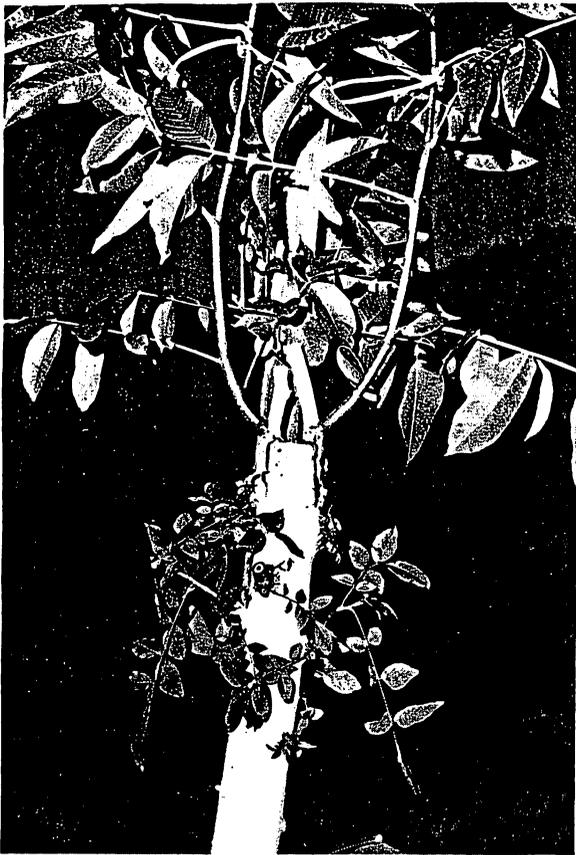


Figure 7. Tie the graft to support it and to prevent breakage. Note the stake in back of the trunk and the limbs tied loosely to the stake near the top of the photograph.



Figure 8. A 4-year-old grafted pear tree where each limb is a different variety. Leaving one shoot growing on each limb results in even healing over of the graft union.

### Care of Grafted Trees

To prevent sunburn, paint all stock and scions with white, water-base, household paint (latex, acrylic, or vinyl).

After grafts begin to grow, you may need to stake and tie them to prevent breakage. You can nail lath or 1-by 1-inch stakes to tree trunks to provide good support for grafts. (See figure 7.) If you do not stake, cut back new growth to minimize leverage for breakage. Remove all growth from the stump once the scions start to grow.

After 3 to 5 years, the grafted tree should have healed over completely at the graft union and should be a healthy, fruit-bearing tree. (See figure 8.)

### SUGGESTED REFERENCES

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