

Propagation of Woody Ornamentals by Grafting and Budding ¹

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Grafting is the joining of parts of plants together in such a way that they unite and continue their growth as one plant. The part of the graft combination which becomes the upper portion, or top, of the new plant is termed the scion, and the part which becomes the lower portion, or root, is termed the stock (understock, rootstock).

All methods of joining plants are termed grafting, but when the scion is a small piece of bark or wood containing a single bud, this form of grafting is called budding.

Some of the reasons for grafting are: (1) to change the size of the resultant plant by dwarfing or increasing growth; (2) to increase plants that cannot be reproduced by other asexual methods; (3) to produce nematode or disease resistance; (4) to change the form or variety of a plant; (5) to produce earlier flowering and fruiting; (6) to develop a plant tolerant of a wider range of environmental conditions; and (7) to repair damaged plants.

Grafting is a rather difficult method of propagation and requires considerable skill. It takes an experienced grafter to obtain a high percentage of

success. For any successful grafting operation there are these five requirements:

1. The stock and scion must be compatible. Otherwise they cannot unite. Graft only closely related plants such as two camellia varieties, not a live oak and citrus.
2. Cambial regions of scions and stock must be in intimate contact. Cut surfaces should be held tightly for proper healing and flow of water and nutrients.
3. Grafting must be done when the stock and scion are in the proper physiological stage. Scions for all grafting operations except budding must be dormant. Scions for budding can be either dormant or actively growing, depending on the budding method. Rootstocks can be growing or dormant, depending on the grafting method.
4. After grafting is completed, all cut surfaces must be protected from desiccation or drying out. This can be done by covering the graft with wax or tape or some moist material such as sphagnum moss.

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- Proper care must be given to the graft until it unites. Shoots from the stock must be removed because they can choke out the scion. In addition, shoots from the scion can grow so vigorously that they break the scion off unless staked or tied.

Cleft Grafting

Cleft grafting is one of the oldest and most widely used types of grafting. It is used as a field technique primarily to convert old varieties of plants into newer more desirable varieties. Cleft grafting is useful with both large and small plant materials. Follow this procedure:

- It is best to do cleft grafting in early spring after buds swell but before growth starts.
- Saw the rootstock off close to the ground by cutting at right angles to the grain. Except for unusually large plants which are to be top-worked, leave a stump 3 to 6 inches high. It must be smooth to get a straight split. Use stock 1 inch or more in diameter.
- Using a heavy knife or special grafting tool, make a vertical split 2 to 3 inches down the stock to be grafted (Figure 1). Hold the split in the stock open with a wedge or screwdriver.
- Use scions with 3 buds and about 3 to 4 inches long collected from dormant 1-year-old wood. Cut them just above the top bud (Figure 2).
- At the base of the lower bud make a sloping cut about 1 to 2 inches long. Leave the scion thicker on the bud side. Pressure on the stock should be greatest where the cambium touches.
- Slip the scion down so the lower bud is close to the cut surface of the stock (Figure 3). The two cambium layers **MUST** contact (Figure 4). Contact is improved by leaning the scion toward the outside of stock. **IMPORTANT!** In all grafting operations except budding, scions or buds must be right side up.
- This is a general guide for the number of scions per stock: stock less than 3/4 inch in diameter--1 scion; 3/4 to 1 inch--2 scions; 1 1/2 to 3 inches--4 scions; more than 3 inches--6 scions.

- Withdraw the wedge from the stock. Scions must be tight enough so that they cannot be pulled out by hand.
- No tying is needed unless very small branches have been used. This is often necessary with camellias.
- Thoroughly wax the graft. Stocks should also be waxed as far as the split goes. And the tips of stock and scions also should be waxed.

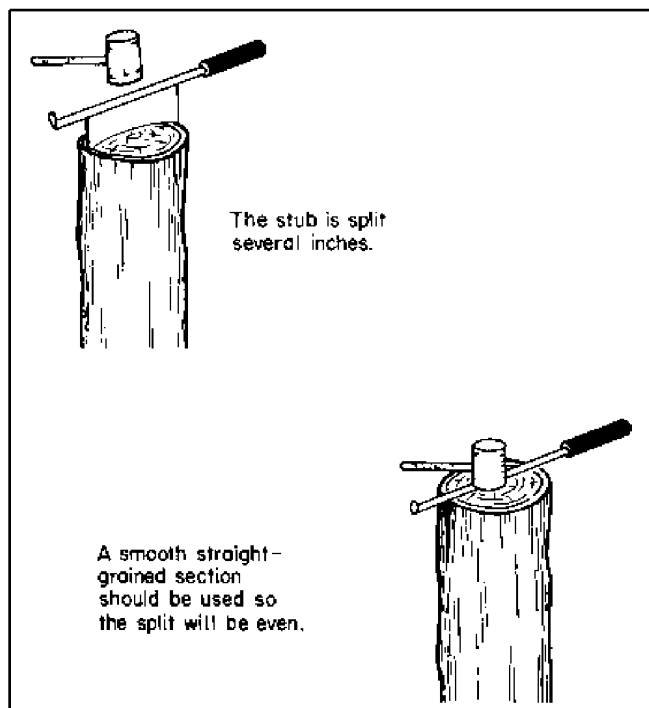


Figure 1.

Check in 2 to 3 days and rewrap to assure that the graft takes.

Whip Grafting

Whip (also called tongue or splice) grafting is particularly useful for grafting relatively small material 1/4 to 1/2 inch in diameter and where the scion and stock are of about the same size. It heals quickly and makes a strong union. The procedure in whip grafting is as follows:

- Use scions and stocks of equal diameter. This gives maximum cambial contact.
- Collect scions while plants are dormant. Scions should be 1/4 to 1/2 inches in diameter, 1 foot in length, and contain a minimum of 2 to 3 buds.

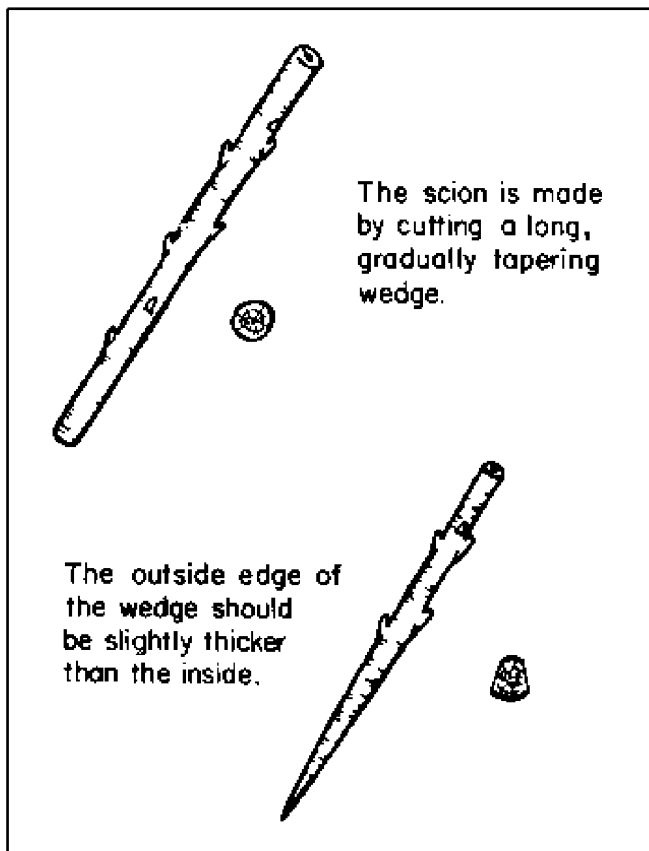


Figure 2.

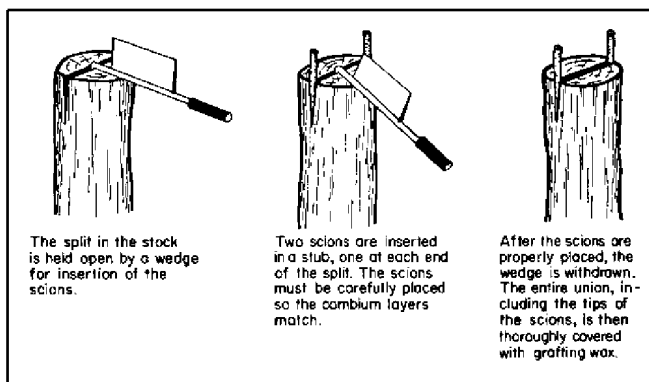


Figure 3.

The scions can be stored in a refrigerator until time for grafting.

3. Cut off the stock with a long, smooth, sloping cut, 1 to 2 1/2 inches (Figure 5 A). This cut should be made with one stroke of the knife to leave every surface smooth.
4. Starting two-thirds the way from the heel or base of the cut, make a second cleft cut through the stock to form a "tongue" (Figure 5 B). The second cut can be made starting one-third of the distance from the tip of the first cut downward to the base.

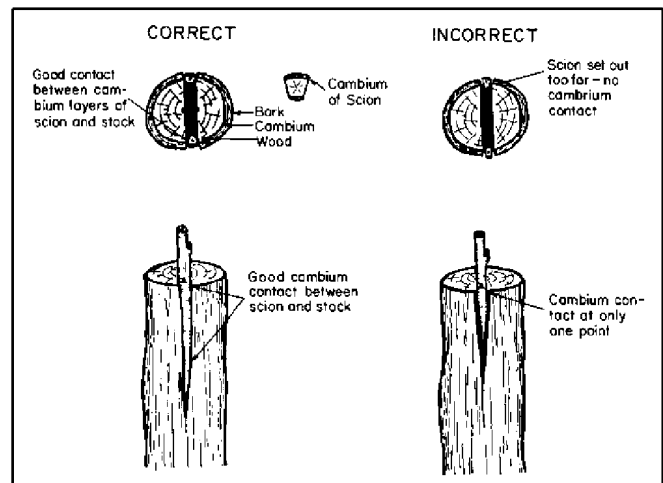


Figure 4.

5. Repeat both cuts with the scion. All buds must point upward and cuts on the scion and stock must match.
6. Slip the tongue of the scion inside the tongue of the understock until the scion is firmly placed (Figure 5 C). It is best if cambiums contact on both sides (Figure 5 D and Figure 5E).
7. Tie the graft to secure it further, then wax the union to prevent desiccation (Figure 5 F).
8. Remove tying material when the graft has united, or growth will be restricted.

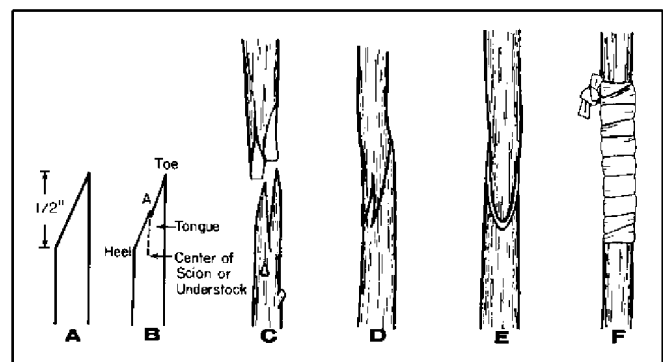


Figure 5.

Cutting Grafts

Many propagators are now rooting and grafting in one operation, especially with roses, gardenias and difficult-to-root junipers. A leafy scion is grafted onto an unrooted stem piece or stock with the terminal removed. To do this, make a simple splice graft by cutting the stock vertically for 1 inch. Insert the scion; tie the graft and place the grafted cutting under mist.

With difficult-to-root junipers, the desired but hard-to-propagate variety is grafted on an unrooted (but easily rooted) stock. By the time rooting has occurred, the graft is healed.

To propagate roses on *Rosa fortuniana* rootstocks, there are some slight modifications of the splice or whip graft as used with cuttings.

1. Grafting is done on both rooted and unrooted cuttings, but rooted cuttings often give better results.
2. Use a scion with one bud and leaf.
3. Scions and understocks should be about the same size.
4. Cut both sides of the scion at a slant and place in the 2-inch cut in the understock.
5. Tie the graft and place under mist for about 21 days or until callusing occurs.

Bark Grafting

This method of grafting is rapid and gives a high percentage of success if properly done. It can be used on branches from 1 to 6 inches in diameter. Follow these points:

1. Rootstocks must be actively growing as this graft depends upon separation of bark from the wood. This occurs in spring. Dormant scions are required so winter collection and storage is necessary.
2. **Method 1.** Make a vertical cut from the top of the stock about 1 to 2 inches long through the bark to the wood. Slightly separate the bark and wood on either one or both sides of the vertical cut (Figure 6). The distance between the cuts should equal the width of the scion.

- **Method 2.** Make two parallel vertical cuts 1 to 2 inches long through the bark to the wood. Make a horizontal cut between the two vertical cuts slightly above the base. Remove the bark leaving just the small flap of bark at the base.

3. Scions are made with a long sloping cut (1 to 2 inches) on one side and a shorter cut (1/2 to 1 inch) on the opposite side. Slant the shorter cut to conform to the slope of the bark on the stock. Place the side with the longer cut next to the wood of the stock to get cambial contact (Figure 7).

- **Method 1.** Push the scions down between the bark and wood. Nail the scions in place; two nails should suffice.
- **Method 2.** Insert the scions into the slot made by removal of the bark. Slip the end of the scion under the raised flap of bark. Nail the scions in place making sure that one nail goes through the flap (Figure 8).

4. Thoroughly wax the grafted stub and the areas around cuts (Figure 8).

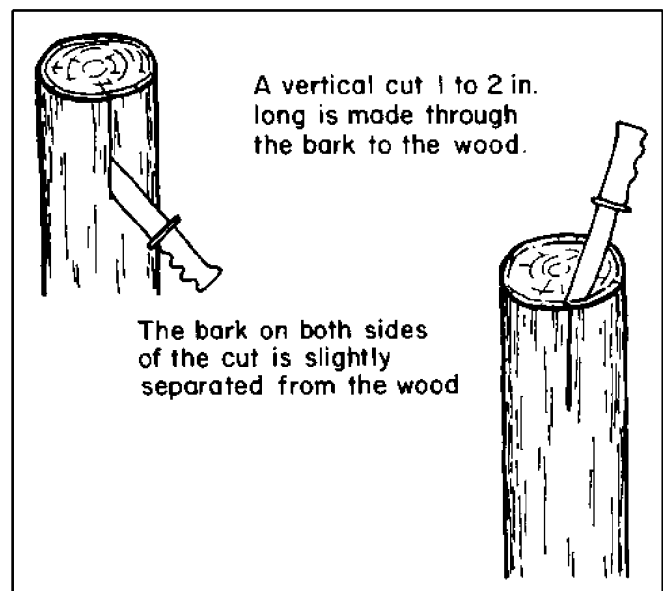


Figure 6.

Grafting Waxes

Grafting waxes serve two purposes: (1) to seal over the graft union and prevent loss of moisture, and (2) to prevent entrance of disease and decay-causing organisms. Good grafting waxes have these qualities:

1. Adhere to plant surfaces and are not washed off by rain.
2. Do not get brittle and crack.

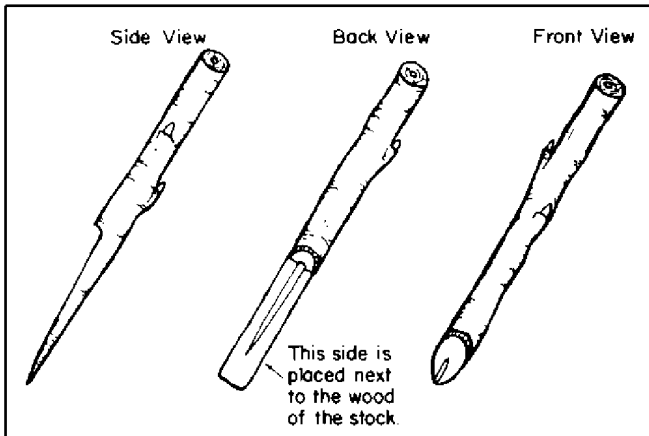


Figure 7.

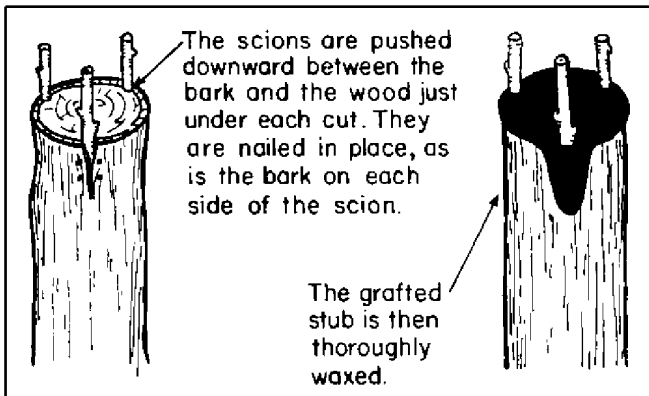


Figure 8.

3. Do not melt in hot weather.
4. Remain pliable to allow for swelling of the scion and enlargement of the stock.

There are three general types of waxes-hot, hard and cold. Hot or cold waxes are the most satisfactory for commercial operations. A hot wax may be made by heating 4 pounds resin, 1 pound of beeswax, 1 pint of raw linseed oil and 1 ounce of lampblack. Hard wax may be made by heating together 4 parts of resin, 2 parts of beeswax and 1 part of tallow. Cold waxes should be purchased commercially.

T-budding

Successful budding operations depend upon the easy separation of the bark separating from the wood (slipping). This condition occurs during a period of active growth of the plant usually in mid spring.

Shield or T-budding is the most widely used budding method in propagation operations. The steps to follow are these:

1. Select actively growing stocks 1/4 to 1 inch in diameter with thin bark so the bark and wood will be separate.
2. Make a vertical slit about 1 inch long in the stock. Be sure to cut through the bark (Figure 9).
3. Make a horizontal cut at the top of the slit to create a "T" (Figure 9). Cut through the bark about one-third the distance around the stock. Slightly twist the knife to open the two flaps of bark. Do not make either of the cuts too long or extra tying will be needed.
4. Cut a bud shield about 1 1/2 inches long from the budwood. Start about 1/2 inch below the bud and make a slicing cut under and about 1 inch beyond the bud. Make a second horizontal cut 1/2 to 3/4 inches above the bud to permit removal of the shield piece (Figure 10).
5. Insert the shield piece into the incision in the stock plant. Push the shield piece under the two raised flaps of bark so that it fits snugly and is covered by the flaps of bark, leaving the bud exposed (Figure 11).
6. No waxing is necessary, but the bud union must be wrapped with budding tape, raffia or plastic tape. Remove the wrapping about 3 weeks after budding. If the bud is green all is well.

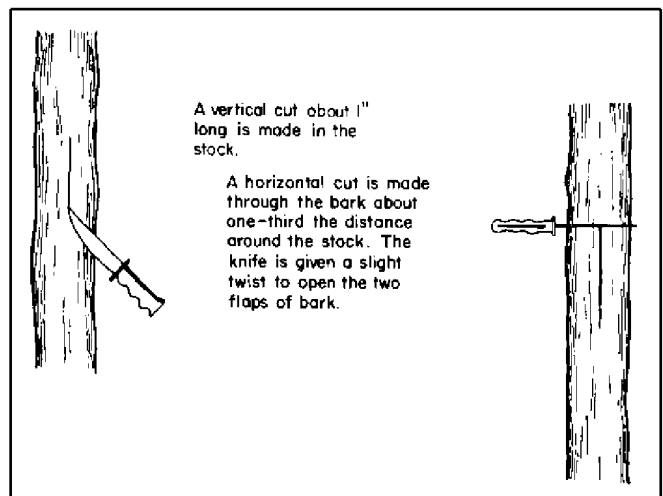
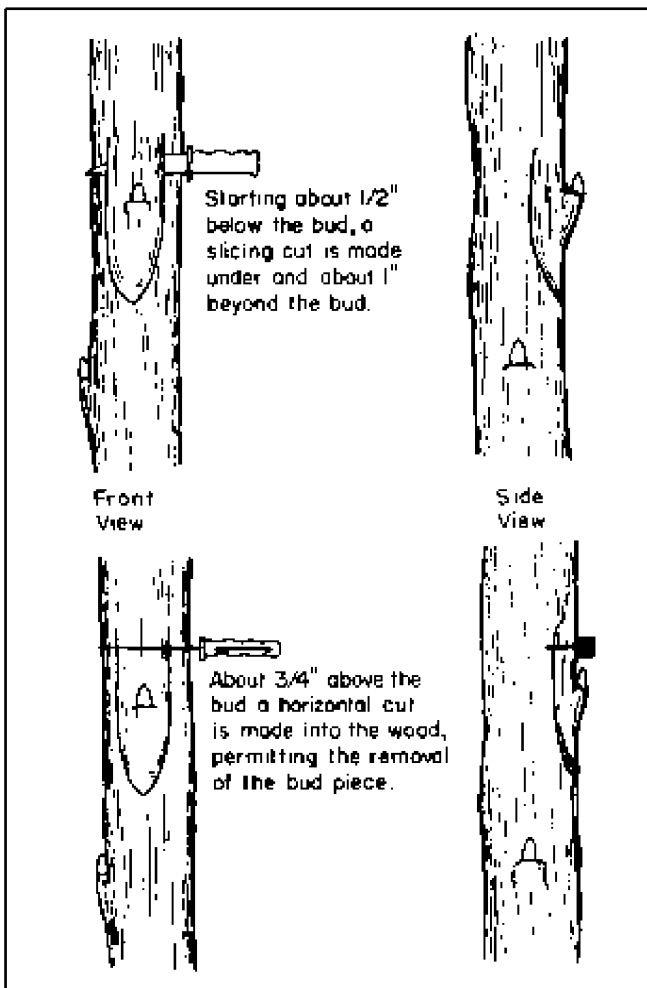


Figure 9.



1. The best budwood is from the second flush of growth from the end of a branch.
2. Budwood should be rounded with plump buds. Leaves should be trimmed to very small stubs as the budwood is cut from the tree.

Figure 10.

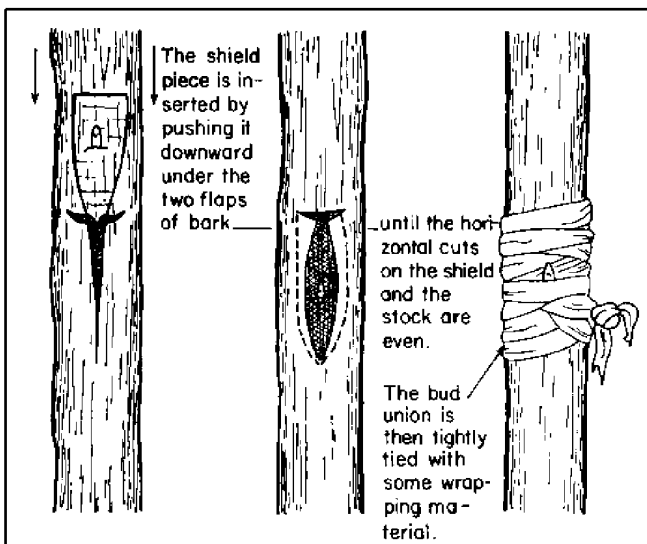


Figure 11.

Collecting Budwood for Shield Budding

In collecting budwood for shield budding, keep these points in mind: