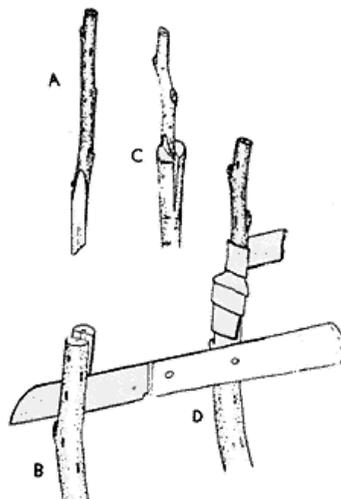


Fundamentals of Grafting and Budding Fruit Trees in Afghanistan



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What is Grafting:

- Techniques in which a section of stem with leaf buds is inserted into the stock of a tree.

Why Grafting:

- Some cultivars (varieties) of plants do not come from true seeds.
- This is way to change a large tree from an old variety to a new one.
- This is a method of using the better root system (adapted to site, well-established).
- This is way to produce dwarf plants.

What Trees Can be Grafted:

- Young, vigorous fruit trees up to 5 years old.
- Young trees should have 30-60 cm of branch between truck and the graft
- Plants of the same botanical genus and species.
- Plants of different genera are less successfully grafted..

When is the Best Time to Graft:

- Late winter or early spring before new growth begins
- Scion wood can be collected during winter (stored succulent and dormant)

Common Terms

- Cambium**: The growing part of the tree; located between the wood and bark. At the season when the bark separates freely, the cambium will be both on the wood surface and on the inner bark.
- Budding**: A type of grafting that consists of inserting a single bud into a stock. It is generally done at the latter part of the growing season.
- Scion**: A piece of last year's growth with three or four buds; the part inserted on the understock.
- Budstick**: A shoot of the current season's growth used for budding. Leaves are removed, leaving 1.5 cm of leaf stem for a handle.
- Dormant**: The condition of a live tree at rest (as in the winter).
- Rootstock**: That part of a tree which becomes the root system of a grafted or budded tree.
- Understock**: That part of the tree on which the scion is inserted; the part below the graft.
- Cultivar**: Identifies a cultivated type of plant ("variety")

What Materials are Needed:

- 1. Knife. Good-quality knife, able to hold a sharp edge.**
- 2. Grafting Wax. Used to cover the graft to keep it from drying out. Hand wax or brush wax may be used.**
- 3. Grafting tape. This is a special tape with cloth backing that decomposes before girdling can occur (masking, electrical can be used).**
- 4. Budding strips. These are elastic bands (wide rubber bands that have been cut). These hold several types of grafts with small stocks and scions.**
- 5. Nails. Bark, bridge and inarching grafts require long, thin nails.**
- 6. Grafting tool. These are specially designed tools used in cleft grafting.**
- 7. Paper bags. In dry country, these are used to encapsulate the graft to keep it from drying out.**

Reasons Why a Graft Fails:

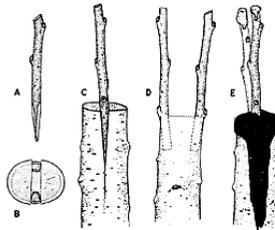
1. The scion and stock were incompatible (apple will not unite w/ plum).
2. The grafting was done at the wrong season.
3. The understock was not healthy.
4. The scions were not vigorous.
5. The scions were dry or injured by cold temperatures.
6. The scions were not dormant.
7. The cambium of scion and stock were not meeting properly.
8. The scions were upside down.
9. The graft was improperly covered with grafting compound; dried out.
10. The scions were displaced by wind, birds, or storms.
11. The graft was shaded too much after growth began.
12. New growth was damaged by aphids or other insects.
13. New growth was killed by disease (fire blight).
14. The union was girdled because the bindings or tape were not released in time.

Grafts

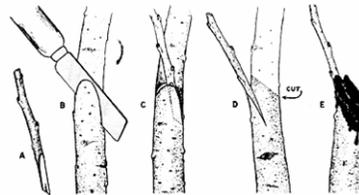
1. Whip Graft



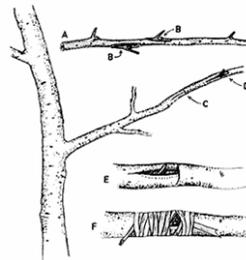
2. Cleft Graft



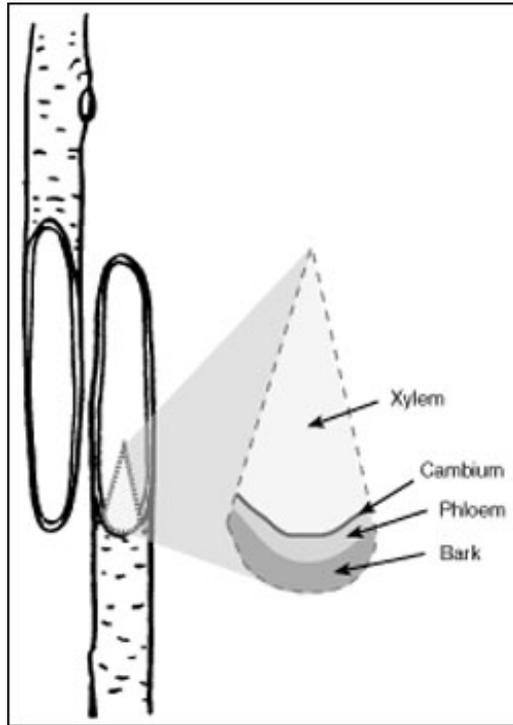
3. Side Graft



4. "T" Bud Graft



Whip Graft

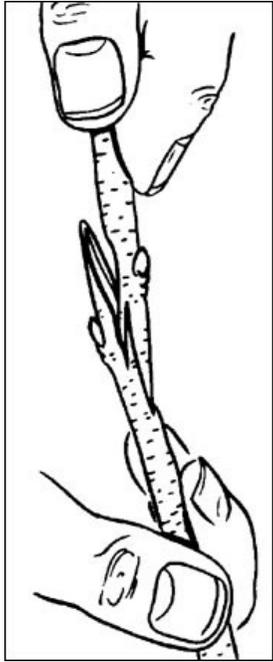


1. Most effective on young apple or pear trees when branches are small. Cuts for both the stock and scion should match. Cuts should be smooth, even, sloping 4-6 cm in length.

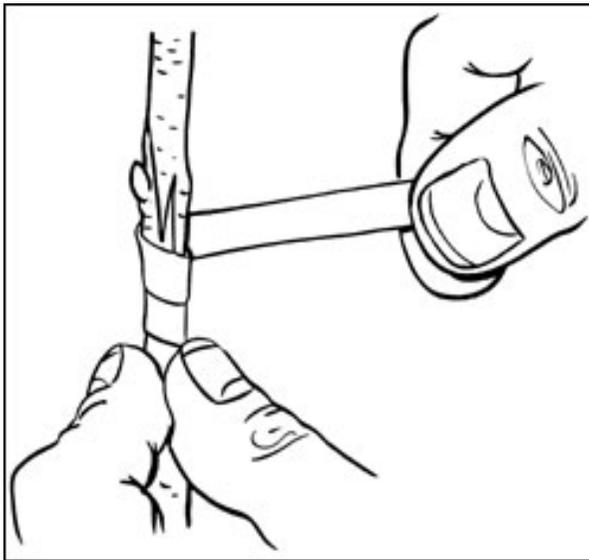
2. The strongest is the whip-and-tongue graft. To form the tongue hold the one-sided, slanting cut facing you, and support it with your finger. About one-third from the tip of this cut, make a downward cut about 1 cm long as close as parallel with the grain of the wood as possible.



Whip Graft



3. After the cuts are made on both parts, push them together tightly enough so that the cut surfaces match as closely as possible. The cambial area of both pieces must be aligned for a union to develop. If the toe of either the stock or scion extend beyond the heel of each other, cut off evenly.



4. Wrap the graft with rubber budding strip, grafting tape, or a plastic tape. Then cover the union and binding material with grafting compound. Start wrapping on the stock and work up onto the scion. Remove wrapping as soon as the scion has started to grow to prevent girdling of the tree.

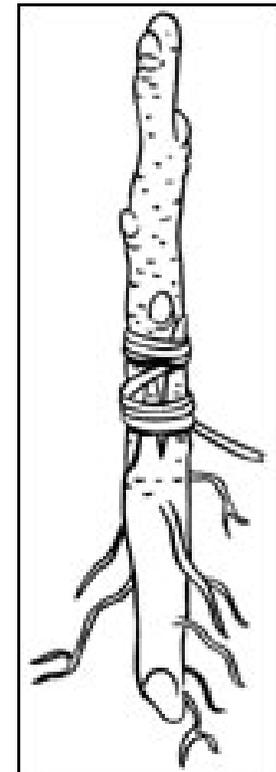
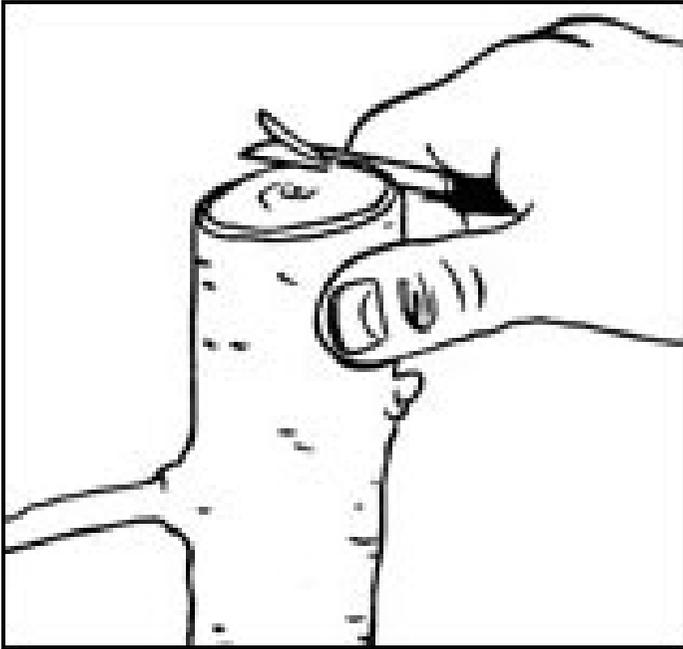




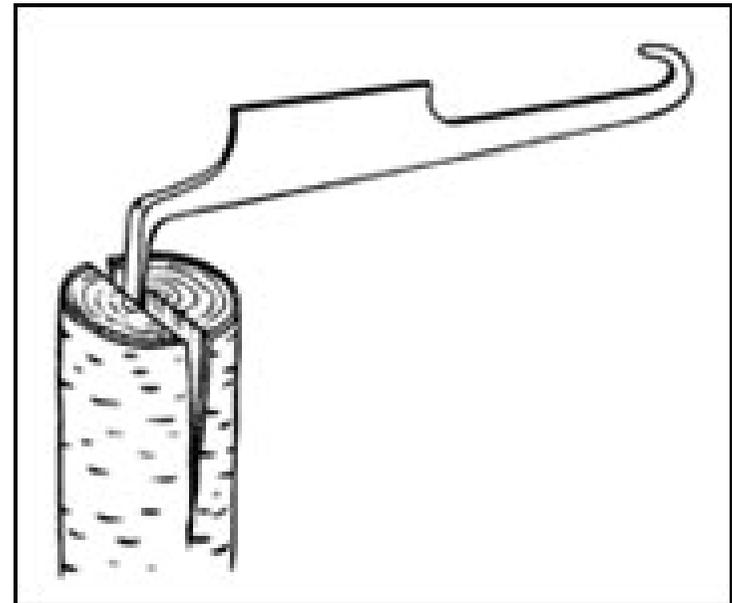
Photo of successful Whip and Tongue Graft (August of first year)

Cleft Graft

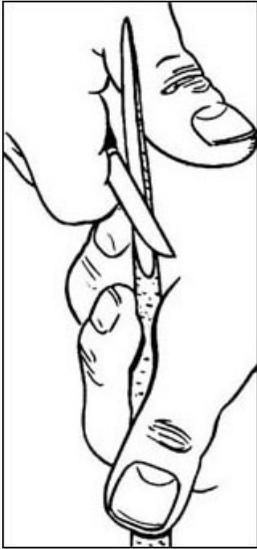


1. Used to change from one variety to another. Make a cut at a right angle to the grain. Use a knife to trim off rough edges. The bark must be tight to form a successful graft.

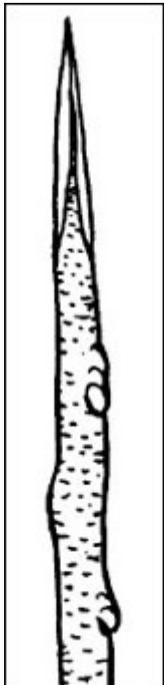
2. With a grafting tool or heavy knife, split the stock through the center. The split should extend about 5 cm into the branch.



Cleft Graft

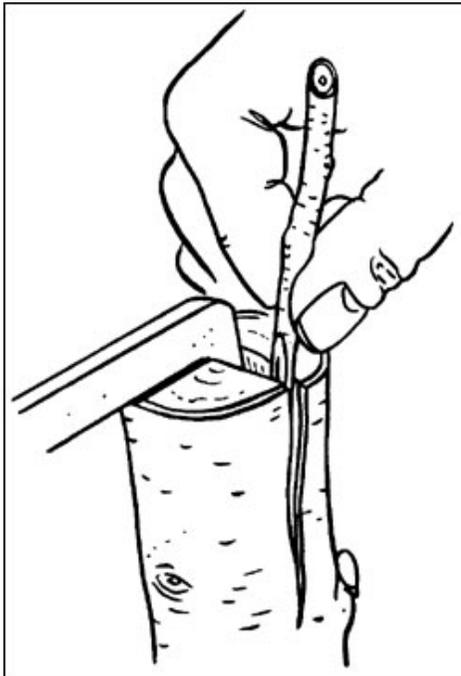


3. The scion for the cleft graft should be made from 1 yr old wood, about .5 cm diameter. It is best to cut the scion long with three buds so it can be inserted with the lowest bud just above the stock. Make sure to insert the scion right-side up.

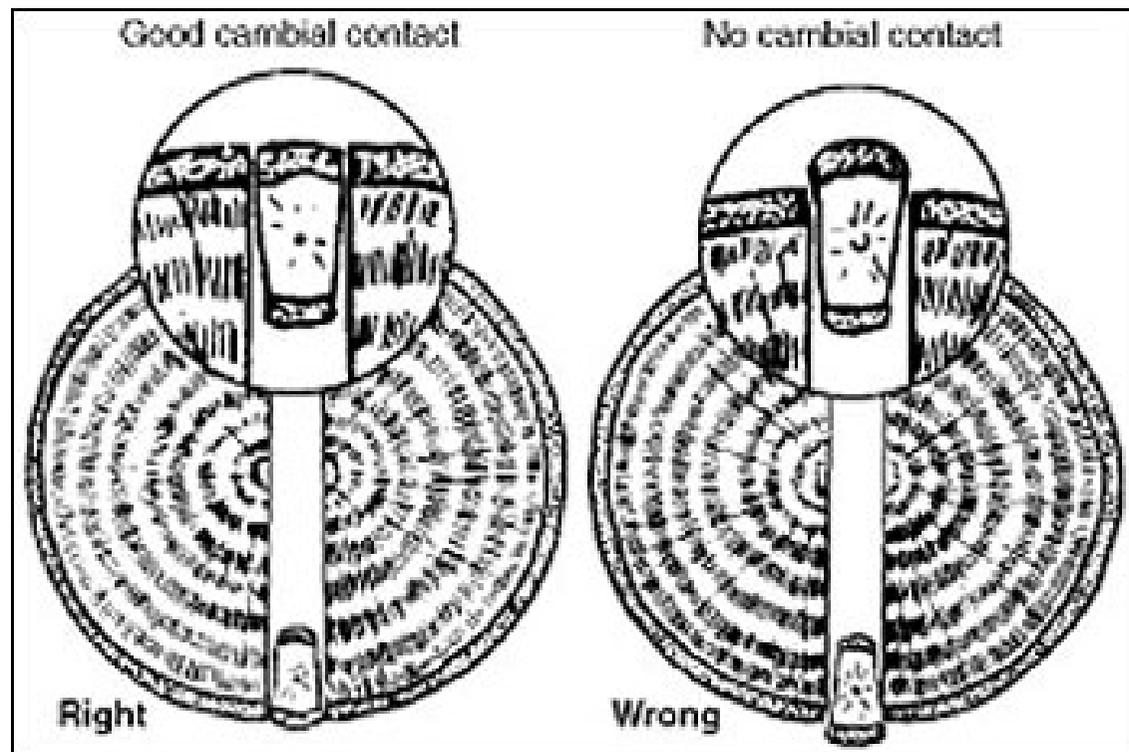


4. Start below the lowest bud and make long, smooth cuts toward the base. The cut should have a surface 2-4 cm long. Turn the scion to the opposite side and make a second smooth cut of the same length so that one side (the side containing the lowest bud) is slightly thicker than the other side. The wedge that is formed does not need a sharp point. Do not use more than three buds.

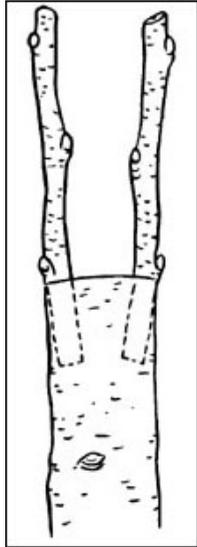
Cleft Graft



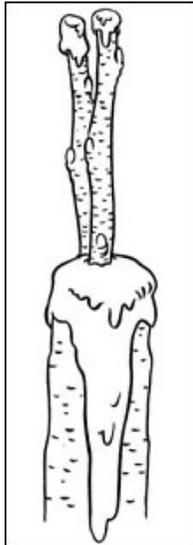
5. With a small wedge, open the crack wide enough to insert the scion easily. Insert the scion with the thicker side toward the outside with the cambiums in contact. Two scions are usually inserted in each slit, one at each side.



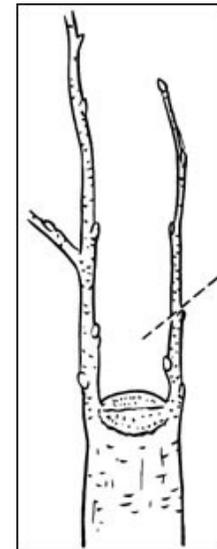
Cleft Graft



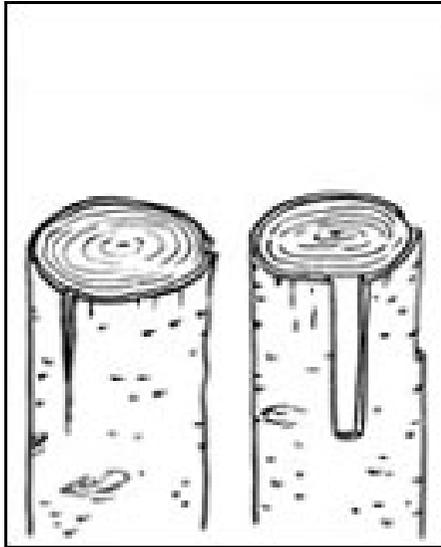
6. Although maximum contact is obtained with straight positioning, a slight slant may help ensure contact. The best contact point is about 1 cm below the shoulder of the stock. After properly positioning the scion, remove the wedge. The pressure of the stock should be greatest where the cambiums touch. When the scion is placed in the crack, the cut surface should be almost hidden.



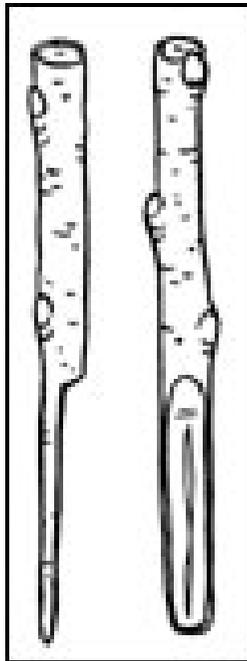
7. The cleft graft should be waxed so all cut surfaces are covered. Cleft grafts grow vigorously; and need only light pruning.



Bark Graft

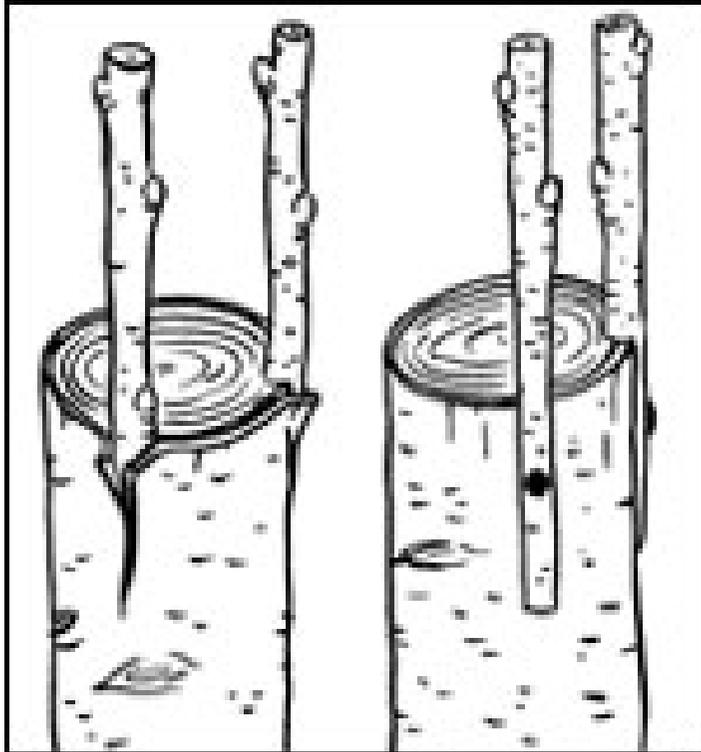


1. The stock is cut off at a right angle in the same manner as the cleft grafting. The bark graft can be made only when the bark separates easily from the wood. This is in early spring as growth begins. Make a slit in the bark about 2 cm long. Make two slits in the bark separated by the width of the bark.



2. The scion should be dormant, and 10-15 cm long, with two or three buds. Prepare the base of the scion by cutting inward 2-3 cm from the base them downward, forming a shoulder and a long, smooth cut. The cut should extend about 1/3 through the twig, keeping its base strong enough to insert. On the opposite side of the long cut, make a small cut to form a wedge.

Bark Graft



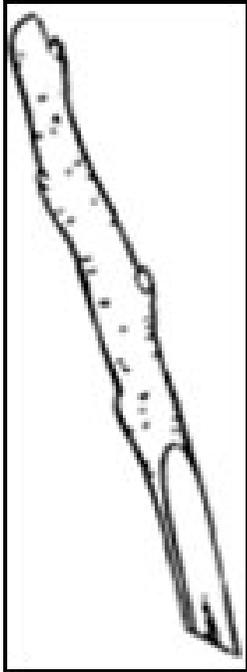
3. A knife may be used to lift the bark at the top of the slit, but may not always be necessary. Push the scion down and center it in the slit or between both slits if the double slit method is used. Insert the scion until the shoulder rests on the stub. Tape or small nails may be used to tighten the scion to the stock. The graft should be thoroughly protected with wax over all open surfaces after it is completed.

Bark Graft in Apple Production

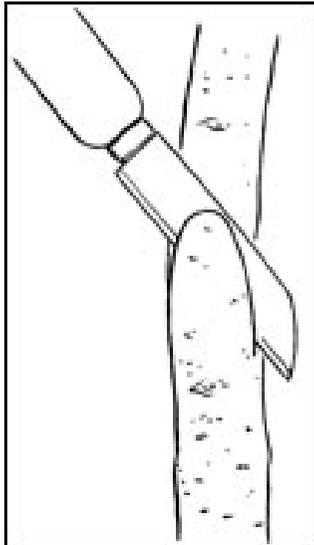


Side Graft

(Suitable for plants too large for
Whip Graft, but too small for Cleft Graft)

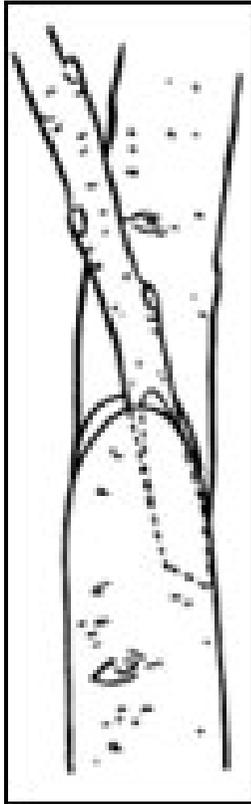


1. Scion should contain two or three buds, and be 8 cm in length. Make a wedge at the end of the scion similar to that for cleft graft. Make one side slightly thicker than the other. All cuts must be made straight and smooth, with a single movement of a knife.



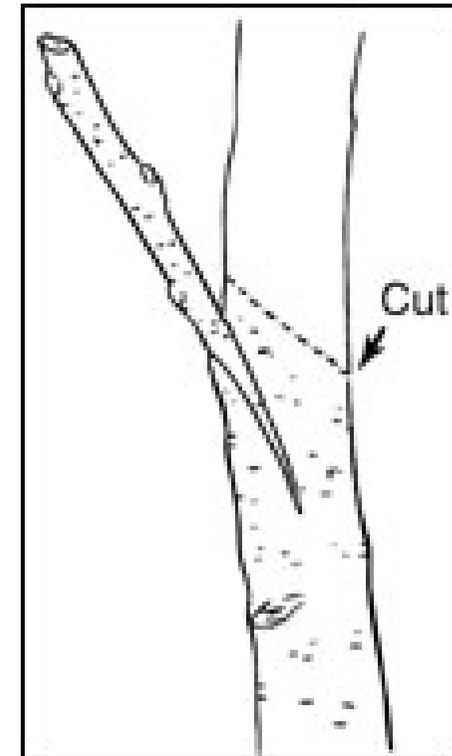
2. Select a smooth area near the base. Use a sharp knife to make a slanting cut into the stock. The cut should angle downward and extend about halfway through the branch.

Side Graft



3. Pull the upper part of the stock back to open the cut. Insert the scion into the open cut with the slightly thicker side lying along the cambium. Set the scion at a slight angle to give maximum contact. When the top is released, the scion should be held in place, so no tacking or wrapping is necessary.

4. The branch should be cut off 10-12 cm beyond the graft. Wax the graft carefully so that all cut surfaces are covered. The tip of the scion, as well as any open wounds made by removing lateral twigs on the branch should be waxed. After several weeks, when the scion has started to grow, the remainder of the stock should be carefully cut closer to the graft, and the new cut should be waxed.



“T” or Shield Budding



1. Bud sticks have healthy buds. Leaf blades are clipped from the bud sticks.

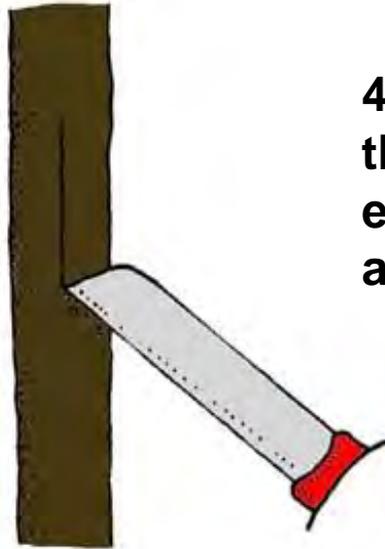


2. The bud and small sliver of wood underneath it are cut from the bud stick using an upward slicing motion. The cut should be 1 cm below the bud, and should be deep enough into the wood so that when the cut is finished about 1 cm above the bud, the bud and small sliver of wood are cut off.



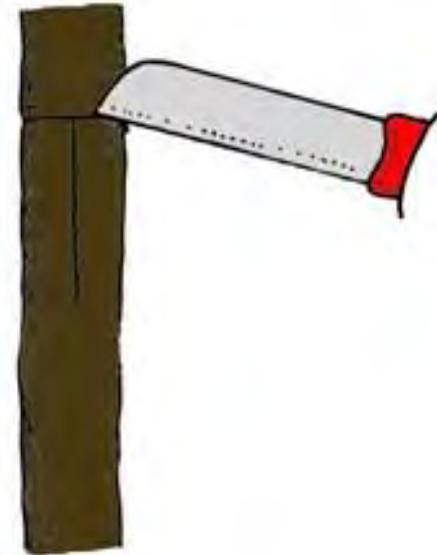
3. A perpendicular cut across the top of the upward cut will separate it from the bud stick. Some grafters make a downward cut as the second cut to remove the bud from the budstick.

“T” or Shield Budding

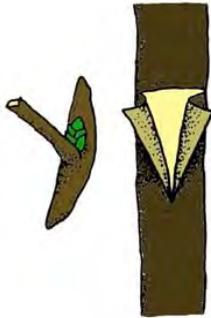


4. A vertical cut is made on the stem of the root stock. The cut should be deep enough to insure the bark will separate at the cambium.

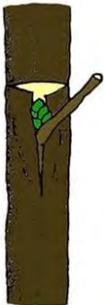
5. The “T” is crossed. A perpendicular cut is made at the upper end of the vertical cut.



“T” or Shield Budding



6. The bark is carefully slipped from the stem exposing a “pocket” into which the bud shield can be placed. Take care not to tear the flaps of the bark in the process of spreading them.



7. The bud shield is carefully slipped between the bark flaps. The top of the bark strip on the bud shield is trimmed to fit tightly against the horizontal cut so that the bud fits within the “pocket” snugly.



8. The bark flaps are held tightly against the bud as they are wrapped with budding rubber or grafting tape. The wrap must be removed within 2-3 weeks to prevent girdling.



Photo of successful T-bud graft (August of first year)



Using paper bags (held in place with rubber bands) to encapsulate the graft on the branch will help prevent the graft from drying out. It will allow light to enter, and reduce moisture loss. Once the graft has started growing, remove the bag.

Grafting Tips

Scion wood should always be dormant. Scion wood should be made from the previous season's growth and have a diameter of .6 – 1 cm. Store scion in a sand or plastic bag in a cool place (1-3 C). It must be kept moist and cool until used.

All cuts should be smooth and even.

After the cuts are made, scion wood must be inserted immediately, or cuts should be kept moist until used.

The best time for grafting is in the spring just as growth starts.

The stock and scion must have cambial contact for union and growth to take place.

All cut surfaces must be kept covered and kept covered with grafting wax until complete healing has occurred.

After the graft has taken and growth has started, cut off any side shoots or competing twigs that would shade or compete with development of the new graft.

Acknowledgements:

***Grafting and Budding Fruit Trees.* University of Minnesota Extension, Publication MI-00532. 1993.**

***Grafting and Budding Fruit Trees.* North Dakota State University Extension.**

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