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Grafting Deciduous Fruit & Nut Trees

Produced by the Texas AgriLife Extension Service•••Galveston County Office•••4102B Main Street ((FM 519) •••La Marque, TX 77568

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Grafting Deciduous Fruit & Nut Trees

By Herman Auer, Galveston County Master Gardener (Class of 1983)

Gather all **dormant,** scions, budwood, or graftwood before new growth starts, or the buds begin to swell. Cut last year's wood about 6-12 inches long and about 3/8 inch diameter. You may want or need smaller or larger diameter budwood.

- Wrap scions in moist paper towels or cloth
- Store in a plastic bag, sealed and labeled with variety and date
- Refrigerate between 32°F and 40°F. *Do not freeze*

This wood may be used later that spring.

Stone Fruit Scion Gathering Dates

Gather peach, plum from late December until buds start to swell.

Pecan Scions Gathering Dates

Gather February 15 or before with plump buds that are not too close together.

Grafting Dormant Rootstock with Dormant Scion

When the rootstock and the scion are dormant, (Before any growth or buds start to swell, you may use the whip and tongue, wedge, cleft, or bench graft. You may also graft dormant scions on rootstock that has started to grow. After grafting dormant scions on the rootstock, do not permit any growth from the rootstock. If scion bark withers, re-graft.

Grafting Rootstock with Bark Slipping

When new growth starts on the rootstock and the bark is slipping, (April 1 on some rootstocks) you may use the stored dormant scion to graft, using the four flap, inlay bark, rind graft, patch bud, and T-budding. This may be done in to June before it gets too hot or dry. Watering well before a planned graft can be helpful.

June Budding, T-Budding (peaches, plum, apple, pear)

Grafting with this year's new growth may be done in late May and early June. The bark of the live bud wood will have a rustic or mature appearance. The bud stick may be cut and the immature younger growth removed. Use the buds on the lower part of the buds stick. Clip leaves off, leaving a short stem. Graft your rootstocks.
This bud stick, keep cool and wrapped in a moist cloth will hold for a few days.
After T-budding in the spring, wait three weeks to remove tape. If the bud is the same color now, as it was when you put it in, you may force the bud to grow by cutting the rootstock off about two inches above the T-bud.

T-budding Dormant Buds on Rootstock with Bark Slipping

T-budding in ***the early spring with dormant buds*** from storage onto rootstock with the bark slipping can be done. The first three buds after each flush of growth is blind. Do not use them.

Fall T-Budding

In late September and early October with the bark slipping on the rootstock and temperatures below 90°F, live buds can be used for T-budding. After T-budding in the fall, wait four weeks to remove tape. If the bud is the same color now as it was when you put it in, a bond has been made. Do not force this bud now. In January, you may force the bud to grow by cutting the rootstock off about two inches above the T-bud.

Don't Force This Bud Out in the Fall

Unhealthy rootstock stunted or growing in the shade are not good candidates for grafting. They can reduce your success rate. The bark may not slip on rootstock grown in pots with uneven watering. Before grafting on rootstock with the bark slipping, water regularly for a couple of weeks to promote good bark slippage.

It may be wise to check each rootstock to see if the bark is slipping before trying to graft it.

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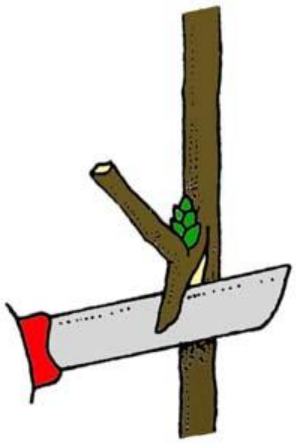
T or Shield Budding

T budding or **shield budding** is a special grafting technique in which the scion piece is reduced to a single bud. As with other techniques of asexual propagation, the resulting plants are clones (*genetically identical plants reproduced from one individual entirely by vegetative means*). The plant being propagated (represented by the bud) is referred to as the **scion**, while the plant being grafted onto is referred to as the **rootstock**, or simply **stock**. A small branch with several buds suitable for T budding on it is often called a **bud stick**.

Successful T budding requires that the scion material have fully-formed, mature, dormant buds, and that the rootstock be in a condition of active growth such that the "*bark is slipping*". This means that the vascular cambium is actively growing, and the bark can be peeled easily from the stock piece with little damage. T budding can be performed on certain fruit trees (peaches, for example) in June using cold stored budsticks and field grown seedling rootstocks. Many deciduous trees are budded in late July or early August after the current seasons buds have developed fully and are dormant using field grown seedlings that have slipping bark.

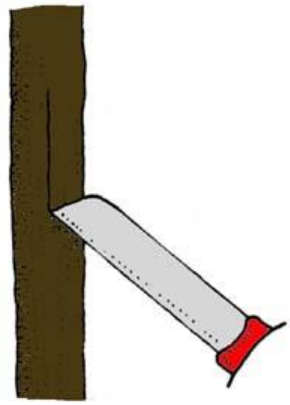
Bud sticks having plump, healthy buds are suitable scions. These budsticks should be on branches that exhibited good growth during the current season, rather than ones from the interior of trees that have slender stems and closely spaced, small buds. Thick water sprouts that grew very vigorously are often poor scions. Leaf blades are clipped from the budsticks, leaving the petiole intact. This leaves a convenient "handle" for holding the bud while it is cut from the budstick.



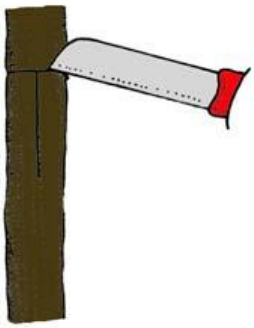
The bud and a small sliver of the wood underneath it are cut from the budstick using an upward slicing motion. The cut should begin about 1/2 to 3/4 inch below the bud, and should go deep enough into the wood so that when the cut is finished about 1/2 to 3/4 above the bud, the bark and a small sliver of wood are cut off. A perpendicular cut across the top of the upward cut will separate it from the bud stick.

Budding knives should be kept very sharp, so that as little damage as possible is done to the bud. Dull knives strip and tear the wood, leaving cuts that do not heal properly. Buds must be cut from the bud stick just prior to grafting, otherwise they will dry out. Some grafters put the bud in their mouth for the time between when it is removed from the stick and when it is grafted in place, but this practice is not recommended. Speed in grafting is a more suitable solution.

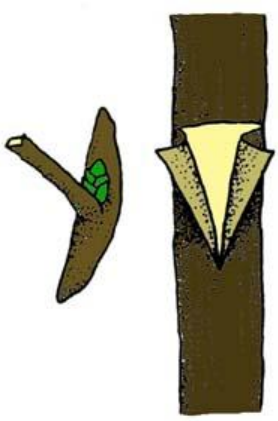
Some grafters make a downward cut as the second cut to remove the bud from the budstick. This works well as long as it does not result in too much of the underlying wood being removed with the bud.



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



The "T is then crossed." That is, a perpendicular cut is made at the upper end of the vertical cut. In areas with heavy rainfall during the grafting season, or in species in which the rootstock is likely to "bleed" heavily, an upside down, or **inverted T bud** can be used to prevent water or sap from pooling in the graft.



The bark is carefully slipped from the stem of the rootstock exposing a "pocket" into which the bud shield can be placed. Care should be taken not to tear the flaps of bark in the process of spreading them.

If the bark does not slip easily, this indicates that the stock is not in active growth and the process should be conducted later when active growth has resumed.

An alternative method for budding which does not require the bark to slip is the technique of chip budding in which the bud is cut out with a "chip" of the underlying wood. This requires that a chip of corresponding size be cut out of the stock piece in order to align the cambia for proper graft healing.

The bud shield is carefully slipped in between the bark flaps. The top of the bark strip on the bud shield is trimmed to fit tightly against the horizontal cut (the cross of the T) so that the bud fits within the "pocket" snuggly.

The bark flaps are held tightly against the bud as they are wrapped with a budding rubber, grafting tape or other suitable closure. This closure must either breakdown by weathering (as budding rubbers do), or must be removed in 2 to 3 weeks after the union has healed. If the material does not break down, it will girdle the rootstock.

After the union has healed, the upper part of the rootstock plant can be cut away to force the bud to grow (as would be the case for June budding). If the grafting is done in the late summer, the bud likely will need to overwinter prior to resuming growth. In this case, the upper portion of the rootstock is usually removed during the dormant season, either in late winter or early spring.

After the upper portion of the rootstock is removed, the scion bud grows vigorously.

http://aggie-horticulture.tamu.edu/propagation/propagation.html

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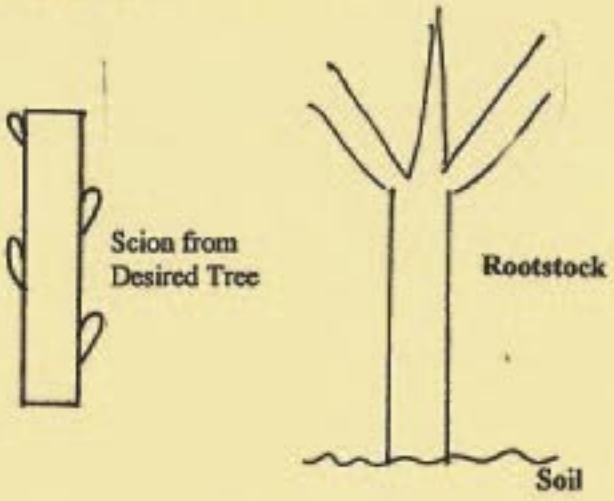
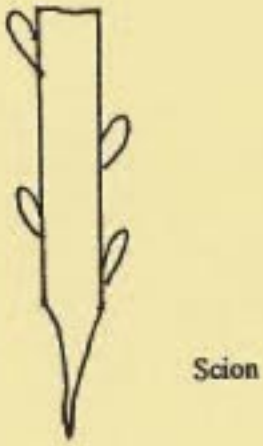
Wedge or Cleft Graft

This is often used when scions (cuttings) are grafted directly on to portions of rootstock. Apply the wedge graft in late winter while the scion and the rootstock are dormant - before any growth begins in either the scion or the rootstock.

The size of the scion may be of the same or less diameter than the rootstock. However, a greater instance of success will be realized if the scion and the rootstock are the same size.

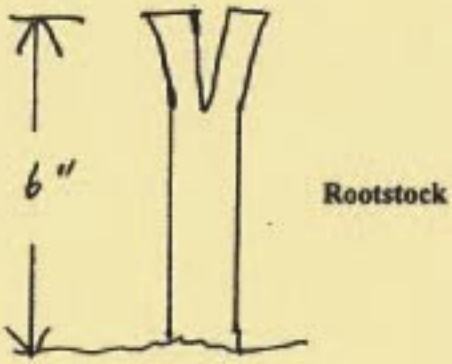


Prepare the scion from the desired tree:
The scion is prepared by cutting its basal end on both sides to form a wedge.



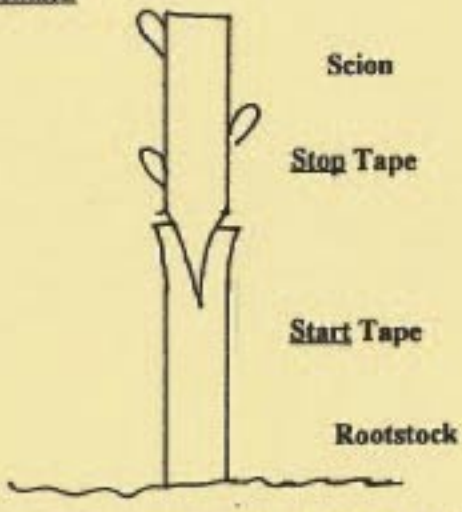
Prepare the rootstock for grafting:
Cut the tree off at least 6 inches above the soil line. Make a smooth, flat cut being careful not to splinter the outside edges of the cut.

Split the flat, top end of the rootstock to the depth of the wedge of the scion.



Insert the scion so that the cut surfaces of the scion are just visible above the flat cut surface of the rootstock.

Make sure that the cambia layers of both the scion and the rootstock are aligned. At least one side of the cambia of the scion and stock must be in direct contact.



The graft requires taping. Tape from below the split in the rootstock to above the cut on the scion.
Place a stick taller than the combined height of the rootstock and scion for a bird roost thus giving the graft some added protection.

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Texas Inlay Bark Graft

by George Ray McEachern, Sammy Helmers, Larry Stein and John Lipe
Extension Horticulturists
Texas Cooperative Extension
Texas A&M University

Inlay grafting is one of the best and most popular systems of propagating pecans in Texas. It has been successfully used when other systems have failed because of heat, drought and wind. It has also been successfully used on walnuts, apples, pears, grapes, rabbiteye blueberries and persimmons.

The Texas method of inlay grafting, developed by B.G. Sitton, L.D. Romberg, F.R. Brison, B.G. Hancock and others in the 1950s, follows the basic fundamentals of the standard bark graft. However, this technique uses an inlay cut and employs an entirely new system of covering the graft and stock. The inlay occurs when tow parallel cuts are made through the stock bark forming a scion inlay pattern on the stock. Aluminum foil is used as a stock cover, reflecting sunlight and reducing temperatures around the graft. The Foil is covered with polyethylene film to assure constant high relative humidity around the graft. This system not only results in a high percentage of growing grafts, but it is easy to use. All necessary equipment can be carried in an apron since the need for a burdensome wax melter is eliminated. The more stressful the grafting conditions, the more important this grafting technique becomes. This method gained popularity and wide use throughout the pecan industry following numerous method demonstrations and promotions by B.G. Hancock and his many students.

Anyone can successfully use the inlay graft by following these instructions and practicing to develop skill in the basic techniques.

Figure 1. Use rootstock trunks or major side limbs that are 1 1/2 to 3 1/2 inches in diameter. Leave one or two side branches below the cut to keep the tree vigorous, to protect from sunburn and to keep the graft form overgrowing and blowing out. Cut straight across the trunk or limb with a sharp saw above a straight section of the trunk or limb. Make the cut 7 or 8 feet above ground if cattle or horses are grazing in a native grove.

Figure 2. Select a section of stock with a **flat surface** so the flat cut surface graft stick will fit cambium to cambium without air space separation. Choose a spot on the south or southwestern side so that prevailing winds will blow the graft shoot toward the trunk instead of away from the trunk. If the old bark is rough, cut it down to live bark, forming a clean shield. leave the bark as thick as possible to securely hold the graft. Do not cut through the bark into the wood.

Figure 3. Use a knife with a very sharp blade and a sheepfoot point, similar to that illustrated. Grafting knife blades are beveled only on one side to give a flat cut. Firmly hold the knife in a closed fist and cut the graft stick with numerous thin slices.


Figure 1


Figure 2

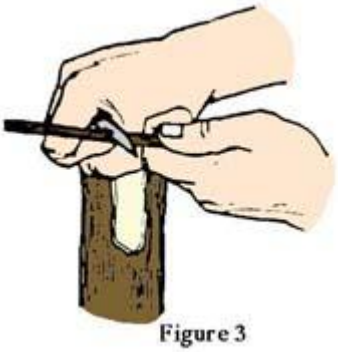
Figure 3

Figure 4. The finished graft stick will have one to three buds and three cuts; a slant cut, a long cut and a back cut. The slant cut should begin 1/2 inch below and on the side opposite the lowest bud. It should extend half the distance through the graft stick at approximately a 45 degree angle. The long cut is the same thickness from the slant cut to the end of the graft stick. Make the long cut perfectly flat at the midpoint of the graft stick. The back cut is chisel-shaped and is 1/2 inch long on the back side and lower end. This makes it easier to insert the graft stick and provides additional cambium contact. The long cut can be 1 1/2 to 3 inches long.


Figure 4

Figure 5. Place the long cut surface f the graft stick against the clean shield of live bark on the stock. Allow the slant cut to extend above the stock. Firmly hold the graft upright with the left thumb. Begin the first inlay cut at the top of the stock on the right side of the graft stick. Cut through the bark down into the wood. Draw the knife straight down the right side of the graft stick to within 3/4 inch of the bottom portion of the graft stick. It is very important to make this cut straight into the bark. Do not angle the knife to the left or right.

Figure 6. Hold the graft firmly in position with the thumb of the right hand. Do not allow the graft to move after the right inlay cut is made.

Figure 5

Figure 6

Figure 7. Bring the left hand around the back of the stock. Catch the graft with the first three fingers of the left hand and hold in exact position. Make the second inlay cut on the left side to the graft stick, cutting straight into the stock as on the right side.

Figure 8. The two parallel inlay cuts through the bark should be exactly the same shape as the long cut section of the graft stick.

Figure 9. Peel the bark flap 1/2 inch down between the two parallel inlay cuts. Slide the graft stick between the bark and wood of the stock. There should be no air space between the long cut and the flat wood surface. If the bark does not easily separate from the stock, the cambium is not slipping and you will need to wait several days, then try again.

Figure 7

Figure 8

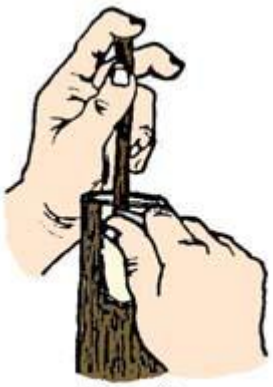

Figure 9

Figure 10. As the graft stick is inserted, press the bark flap against the graft stick with the thumb of the right hand to firmly hold the graft stick in the slot. Apply firm but gentle pressure on top of the graft until it is forced into the inlay slot.

Figure 11. Stop pushing the graft stick when the bottom of the slant cut touches the top of the stock. This exposed slant cut surface will form callus and new tissue, which will cover the top to the stock and securely anchor the graft to the stock in 1 to 3 years. Do not push

the slant cut below the top to the stock because it will separate the graft stick from the flat wood.

Figure 10

Figure 11

Figure 12. The graft can be secured by any one of several methods. Eighteen gauge 3/4-inch nails, 5/8-inch flat point staples in a vertical position, budding tape or flagging tape have all been successfully used.

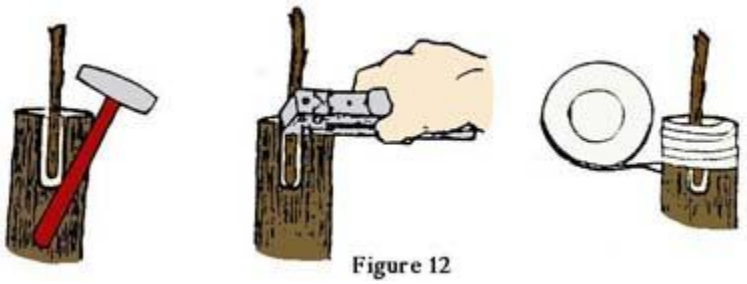

Figure 12

Figure 13. Take a 2-inch square of household aluminum foil and tear a line halfway down to the center of the square. Fold the aluminum foil around the stock so that the bottom of the tear fits right under the lowest bud.

Figure 14. Fold each side of the divided end of the square of aluminum foil. Cover all cut surfaces with the foil, including the slant cut of the graft stick. Crimp the foil to form a loose mod around the stock. All cut surfaces of the trunk and graft stick should be covered.

Figure 15. Cut off one corner of a pint- or quart-sized polyethylene bag. Slip the bag over the graft stick and gently pull it down until the cut corner rests below the lowest bud and above the slant cut.

Figure 13

Figure 14

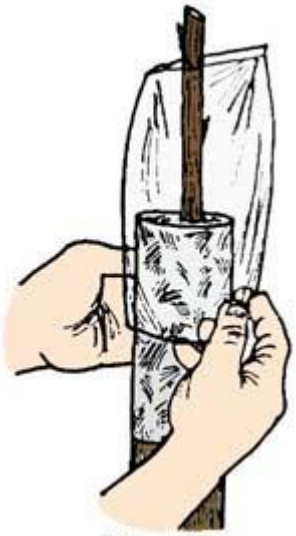

Figure 15

Figure 16. Tie the polyethylene bag at the cut corner around the graft just below the lowest bud and above the slant cut so that no air leaks occur. Tie with one wrap of a rubber band, small rubber strip or polyethylene tape so that the graft will not be girdled as it grows.

Figure 17. Tie the lower end of the polyethylene bag around the stock with foil covering all of the enclosed area. Make a small puncture above the lower tie to allow water to drain out of the bag.

Figure 18. Coat the cut surface of the tip end of the graft stick with orange shellac or white glue.

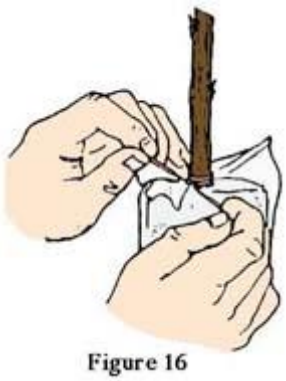

Figure 16

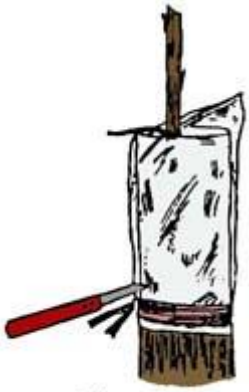

Figure 17

Figure 18

Figure 19. The buds on the graft stick should begin groth in 6 weeks. Remove the polyethylene bag and foil when the shoots are over 6 inches long. Keep these shoots pruned back to only 24 inches to prevent wind blowouts. If maximum growth is needed, in 6 to 10 weeks select the strongest shoot and tie it to a brace to prevent it from blowing out. After one year, select the strongest shoot on the graft stick and remove all others. After 2 or 3 years, when three-fourths or all of the trunk is covered with overgrowth, remove all shoots below the graft.

Figure 18

June 16, 1992

Hypertext markup and graphics colorization by Gretchen Eagle and Dan Lineberger.
http://aggie-horticulture.tamu.edu/propagation/inlay/inlay.html

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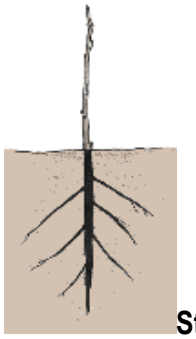
Whip Grafting

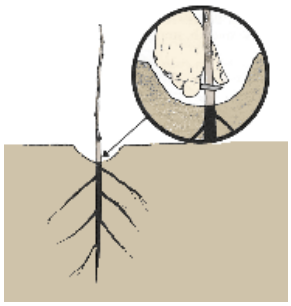
By Bluefford G. Hancock, George Ray McEachern, and Larry A. Stein
Texas Agricultural Extension Service

WHIP GRAFTING (also called splice or tongue grafting) is one of the oldest methods of asexual plant propagation known. It is the predominant propagation method used on apples and is widely used on pear. Although most grapes are grown from cuttings in this country, whip grafting is the standard when they are propagated. Whip grafting has been the primary method employed in propagating pecan nursery stock in the southeastern United States. This technique is also used to some extent in the Southeast and west to Louisiana for top-working larger pecan trees on the above-ground portions. Since successful whip grafting is closely correlated to the presence of high humidity, this method has not been used widely in the drier sections of Oklahoma, New Mexico and Texas. A major strong point for whip grafting nursery stock is the smooth and straight trees that are produced by this method.

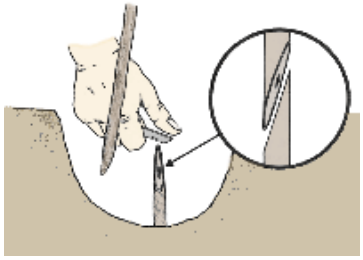


Step 1. Seedling rootstocks, 1 to 2 years of age, are usually used for whip grafting purposes. The diameter at the upper portion of the root generally ranges from 3/8 to 3/4 inch, however, stocks up to 1 inch in diameter can be used. The season for whip grafting is February to early or mid March in most areas, or while the stock is dormant.

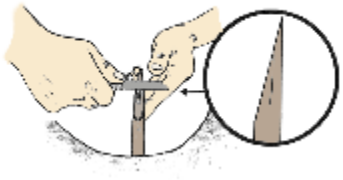
Step 2. Select 1-year graft or scion wood in the dormant season. Size should correspond to size of available root stocks. Each graft stick should contain at least two sets of buds. Graftwood should be selected and stored in late January. A knife with a thin blade shaped as shown above and made from high-quality steel is desirable for whip grafting. Make sure that the knife will take a fine edge and hold it under a heavy work load.



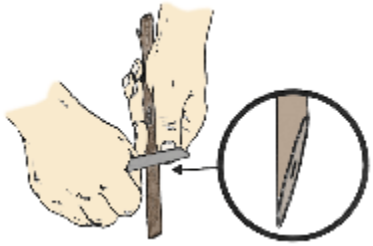
Step 3. Expose about 4 to 6 inches of the upper portion of the tap root. Where only a few trees are involved, the entire process of soil removal may be accomplished by the use of a hoe. However, if the graft is secured with poly tape, the graft can be placed above the soil line as well. Grafter is poised to make initial slanting cut on rootstock. Note the slight angle of the knife blade. The stock of the seedling rootstock fits into the groove or notch formed by the thumb and forefinger of the knife-hand. This serves to stabilize the stock and to provide a guide as the cut is made.



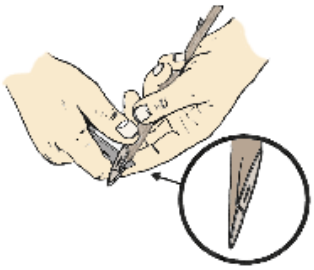
Step 4. Pull the knife upward with the blade angled about 45 degrees, making a smooth and straight diagonal cut. This slanting straight-plane cut should be 2 to 3 inches long. Try to make this cut with one stroke of the knife.



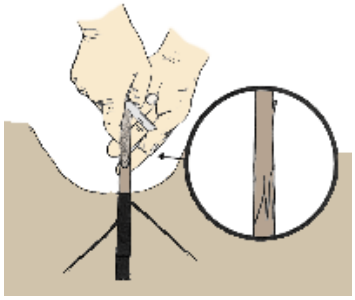
Step 5. Place the knife at a spot on the slant cut approximately one third of the distance from the tip to the heel (or bottom) of the cut. Make a "tongue" cut by working the knife blade downward for a distance of 1 to 1 1/2 inches. Take care to prevent splitting the stock. Use fore-finger of the left hand to brace the stock. Note in the inset that the cut is neither parallel to the grain of the stock nor to the slanting cut, but is actually between the two.



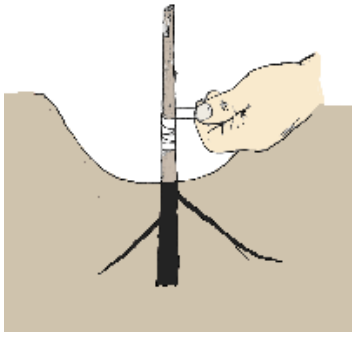
Step 6. Hold the scion wood securely in the left hand, but with care to prevent injury to the buds. Place knife at an angle to the scion and make a slanting cut (see inset) by pushing the blade away from the body. This straight-plane cut should be made as similar to the cut on the rootstock as possible.



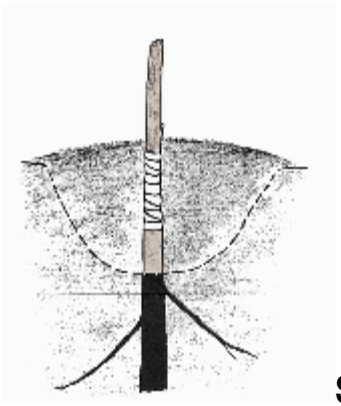
Step 7. Make the "tongue" cut on the scion by placing the knife blade at a point about one-third of the distance down from the tip. Pull the blade downward at an angle that is about halfway between the grain of the scion and plane of the slant cut. (See inset.) Note that the thumb of the knife hand serves as a guide for a controlled cut, while the forefinger of the left hand stabilizes the scion.



Step 8. Slip the plane cut surface of the scion down to the slant cut of the stock until the two "tongue" cuts mesh together. The cambium layers of the stock and scion must be aligned if a union is to be obtained. An uneven or wavy cut will result in gaps between the two surfaces. If the two cuts are made properly, the stock and scion will appear to be one. (See inset.)



Step 9. Wrap the graft securely with masking tape or a special grafting tape. Polyethylene budding tape may be used for this wrap, but may require cutting at a later date to prevent girdling. Make certain that the cambium layers of the scion and stock remain aligned during the wrapping process. Note in the inset that the wrap extends from below the graft union to a point slightly above. This is essential to prevent drying of the cut surfaces before callousing takes place.



Step 10. Firm moist topsoil around the whip graft to prevent drying. Ideally, the soil should cover all of the taped area with the lower bud group on the scion exposed. The cut surface at the top of the scion stick may be coated with orange shellac or with wax to prevent excessive drying. Of course, if the graft was placed above the soil line, this step would not be necessary. Remember, regardless if the graft is placed above or below the soil, the tape which originally secured the graft must be removed. This can be done as late as one year, but preferably after 3 to 4 months.

http://aggie-horticulture.tamu.edu/propagation/whipgrafting
Layout, graphics colorization, and html markup by Christine MacAlpine and R. Daniel Lineberger

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The Four-Flap Graft

Texas Agricultural Extension Service

Grafting is needed to propagate outstanding varieties of fruits. The four-flap graft is an easy-to-do, successful propagation procedure for amateurs and professional horticulturists. It is ideal for small-caliper trees up to 1 inch in diameter before they are large enough for the Texas-method inlay bark graft.

The four-flap grafts most successful when the scion and rootstock pieces are near the same diameter. The best fit is obtained when the scion is slightly larger than the stock.

Collecting and Storing Propagation Wood. Collect scion wood from the desired tree while dormant in late February or early March and store until spring propagation time. Optimum scion wood diameter is 3/8 to 3/4 inch; 1-inch diameter is maximum. Select healthy, 1-year-old wood with prominent, well developed buds. Label all propagation wood by cultivar name and place it in a container with moist paper towels. Polyethylene bags make excellent storage containers. Store the wood in a refrigerator at 32 to 36F.

Figure 1

Grafting Technique. The best time to graft is April to mid-May when the rootstock is actively growing, the bark "slips" freely and leaflets are 1/2- to 3/4-inch long. Take the scion wood directly form cold storage and use immediately. Do not let the scion sticks dry out during grafting procedures.

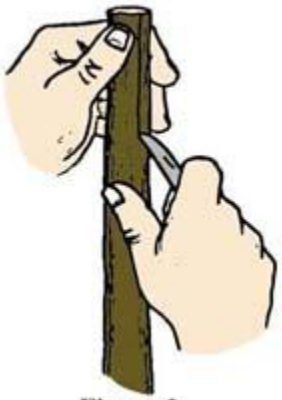

Figure 2

The following outlines the four-flap grafting method:

Use a stock plant with a primary stem or lateral limb of 1/2-to 1-inch diameter. Cut straight across the trunk or limb with sharp pruning shears at the point you wish to graft. If possible, leave one or two side branches below the grafting point, but cut them back to 6 inches. This keeps the tree vigorous, protects it from sunscald and keeps the scion from becoming too tall or whiplike and breaking off. Place the graft 7 to 8 feet above the ground if cattle or horses are grazing near the trees; otherwise place the grafts at a comfortable working height. Roll a rubber band 3 inches down form the top to the stock (figure 1).

On the stock plant where the horizontal cut was made, make four vertical, equally spaced cuts 1 1/2 inches long. Make sure the cuts penetrate the bark down to the interior wood (figure 2).

The Grantham grafting tool can be used to make the 4 vertical cuts (figure 3)

Choose a smooth, straight piece of scion wood that is approximately the same diameter as the stock and about 6 inches long. It should have two or three plump buds, one at each node. Use a sharp knife to cut the scion on four sides. Start the cut about 1 1/2 inches from the bottom end and move the knife away from you (figure 4).

Make cuts through the bark down to the wood but do not remove too much wood. The end view will be square as shown in figure 2. Do not completely "skin" the scion. Leave four thin slivers of bark and cambium at the corners.

Pull the four flaps of bark down 1 1/2 inches on the stock. This is why the graft is sometimes called the banana graft (figure 5).

Remove the inner stock wood and be careful not to damage the 4 flaps on the stock (figure 6).

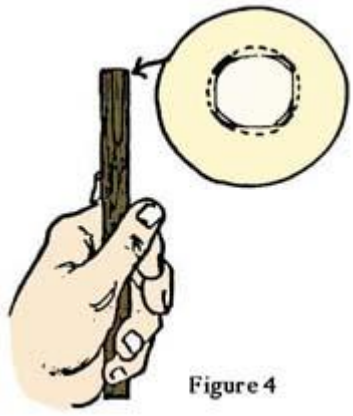
Figure 4

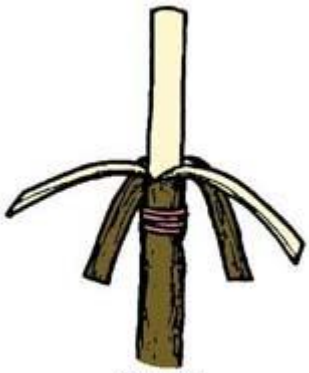
Figure 5

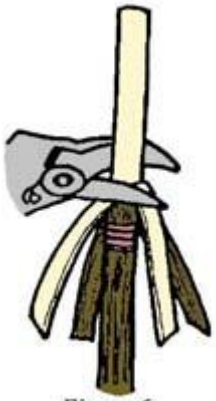
Figure 6

http://aggie-horticulture.tamu.edu/propagation/fourflap/fourflap2.html
Hypertext markup and graphics colorization by Gretchen Eagle and Dan Lineberger.
http://aggie-horticulture.tamu.edu/propagation/propagation.html