



EXTENSION FOLDER

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TOP WORKING FRUIT TREES



BY STAFF MEMBERS OF THE DEPARTMENT OF HORTICULTURE

MICHIGAN STATE COLLEGE
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EAST LANSING

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Top Working Fruit Trees

Purposes

1. To change the top of an undesirable variety or a worthless seedling to some preferred variety.
2. To introduce varieties for pollination purposes.
3. To overcome varietal weaknesses, as susceptibility to disease and winter cold, by top working the desired varieties on certain disease-resistant, hardy body stocks.
4. To grow several varieties of different ripening seasons on a single tree.

Methods Used

Top working is accomplished by grafting and budding.

The two plant parts joined together in grafting are called the scion and the stock.

The **scion** is a portion of one-year-old twig or stem usually bearing two or more buds. From it a branch or a whole tree is produced which will bear fruit according to its own kind.

The **stock** is the tree or portion of a tree in which the scion is inserted.

If scions are grafted in the trunk or in the main branches of a tree so as to eventually change the top of that tree to another variety, the operation is known as **top grafting** or **top working**.

If a single bud instead of a scion is inserted on a stock the operation is known as **bud grafting** or **budding**.

The methods most commonly employed are:

1. **Cleft grafting**—Used for top working apples and pears. Best adapted to branches 1 to 2 inches in diameter.
2. **Tongue or whip grafting**—Used mostly on young apple and pear trees when the branches are relatively small (pencil size) and about the same diameter as the scions.
3. **Budding**—Used for top working stone fruits (peach, cherry, plum). May be used on apples and pears, especially young trees.

Requirements for Success

1. Whatever method is used, it is important that the cambium layer (between the bark and the wood) of the scion or bud is brought into close contact with the cambium of the stock and that the two parts are held firmly together until they unite. Lack of cambial contact is the chief reason why many scions fail to grow.

2. The scion and stock must be closely related. Usually, different varieties of the same kind of fruit can be grafted readily, one on the other, as apple on apple or pear on pear. More distantly related plants, such as the apple, pear and plum, either fail to unite or form weak short-lived unions.

3. The tree should be healthy, vigorous and of suitable age. In general trees of stone fruits which are over 5 years of age are not successfully changed over to a new variety. Apple and pear trees of almost any age can be top worked successfully, but it is doubtful if it is profitable to do so with trees over 20 years old.

4. The work must be done at the proper season of the year so that the parts will unite quickly after they are joined together.

5. Use sharp tools. All cuts should be smooth, even, and without rough or ragged edges.

Tools and Materials Needed

1. Sharp knife with thin blade.
2. Sharp fine-tooth saw.
3. Wooden club or mallet.
4. Grafting tool or other implement to split stubs.
5. Grafting wax. Either standard brush wax or asphalt grafting compound.
6. Wax melter, if brush wax is used.
7. Rubber bands, raffia, or adhesive tape for tying and wrapping buds and whip grafts.

When to Graft

The best time is just as growth begins in the spring. Grafts may be made not only while the scion and stock are still dormant but also as late

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as blossoming time **provided strictly dormant scions are used.**

Budding can be done at any time when the bark will slip readily and when the buds of the current season's growth are mature. The usual time is late July, August and early September.

Selection and Care of Scion Wood

Select scions from well matured wood of the previous season's growth. Twigs about as thick as a lead pencil, which made a growth of 12 inches or more during the last season, are best.

Water sprouts make good scions if they originate above the graft union, if the buds are well developed, and if the wood is well matured.

Scions may be cut any time while they are dormant. It is best to collect them in late fall or during the winter, wrap in damp cloth or sphagnum moss, and store them in a cool moist place where they will remain fresh and dormant until time for grafting in the spring.

If scions are taken at the time of grafting is done in the spring, make certain that they are still dormant and are free from winter injury.

Discard twigs which show evidence of winter injury (brownish discoloration of the pith and bark) or cut them back to sound wood.

Making the Cleft Graft

1. Select branches that are not more than 2 inches in diameter at the point where the graft is to be made. Make the grafts within 2 or 3 feet of the trunk, or main scaffold or secondary branches and not more than 8 feet above the ground. Otherwise, the new top will be too high and the fruit will be borne at the ends of long pole-like branches.

2. Cut off branch to be grafted at a point free from large knots and scars and where the grain of the wood is straight. Make the cut straight and at right angles to the grain of the wood. Avoid tearing or loosening the bark at the edge of the cut. If possible, leave a small lateral branch as a "feeder" about a foot below the cut. Leave stub long enough (at least 8 or

10 inches) so that if the scions fail to grow it may be cut off and regrafted the next spring.

3. Split stub through the center to a depth of 2 or 3 inches with grafting tool or heavy knife. Keep cleft open with wedge for the insertion of the scions.

4. Cut scion to include three buds. Shape the lower end into a wedge about 1½ inches long (Fig. 1). Start the cut at one side of the lowest bud and make the inner side of the wedge thinner than the outer side. Make the two bevels of the wedge continuous and uniform to insure cambial contact along the entire length of the beveled cuts. Cut top of scion off with a sloping cut about ¼ inch above the upper bud.

5. Set the scion by inserting it into the edge of the cleft so that its cambium coincides and is continuous with that of the stock (Fig. 2). Since the bark of the stock is thicker than that of the scion it is necessary to set the scion in somewhat, so that the outer edge of the wood of the scion

is even with outer edge of the wood of the stock (Fig. 3). The tops of the bevel cuts should be level with the top of the stub and the lower bud on the outside. If the stub is less than an inch in diameter only one scion will be needed. In larger stubs, two scions of about equal size are set, one on each side of the stub.

6. Remove wedge and carefully cover all cut or exposed surfaces including the top ends of the scion with grafting wax.

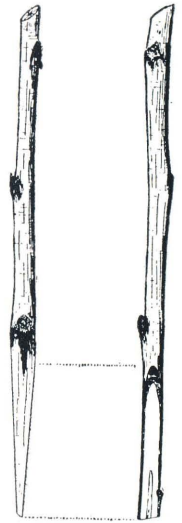


Fig. 1. Scions trimmed for cleft graft.

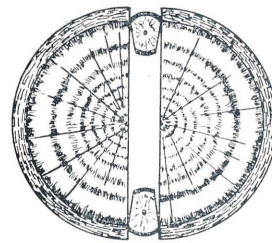


Fig. 2. Cross-section of stub and scions properly made and properly set. Note inset of scions to bring the cambium of the stock and scion in contact.

7. The following spring cut back one scion to a few buds to check its growth and force the growth into the other remaining scion. Leave both scions until the union is completely healed; then the weaker one should be removed.

Because of the severe pruning incident to cleft grafting, large trees should not be completely top worked in one year. Usually the top or north and east portions of the tree are worked over the first year and the remainder the second and third years.

Tongue or Whip Grafting

1. Stocks for whip grafting should not be more than $\frac{3}{4}$ -inch in diameter. Best results will be obtained with smaller stocks, $\frac{1}{4}$ - to $\frac{3}{8}$ -inch in diameter, and when the scion and stock are nearly the same size. Avoid using scions that are larger than the stocks.

2. Prepare scion by making a long sloping cut through the scion about 1 to $1\frac{1}{2}$ inches long. On the surface of this cut about $\frac{1}{3}$ the distance from the toe (sharp end) to the heel make a slit or tongue about $\frac{1}{2}$ inch long (Fig. 4a and b). This is done by making a downward cut partially across the grain and in the direction of the heel. Leave scion about 4 inches long.

3. Prepare stock in the same manner as that described for preparing the scion.

4. Join the stock and scion by placing the two cut surfaces together and slipping the tongue of the scion inside the tongue of the stock (Fig. 4c).

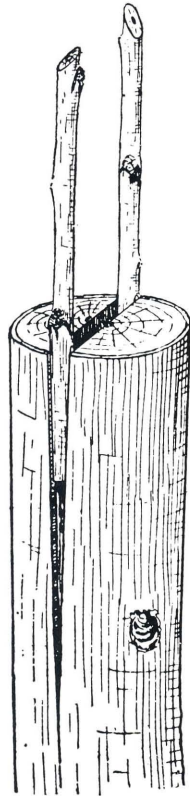


Fig. 3. Cleft graft complete except for waxing. Note correct position of lowest bud on the scion. The scion is set so that its cambium coincides and is continuous with that of the stock.

If the scion is smaller than the stock set it on one side to secure cambial contact. Should the toe of either the stock or scion extend beyond the heel of the other, cut it off evenly.

5. Wrap stock and scion firmly together with raffia, waxed string or adhesive tape. Cover union and binding material with grafting wax. Remove wrapping as soon as the scion has started to grow well to prevent girdling of the stem.

Budding

1. Cut well-hardened shoots of the season's growth bearing buds of the desired variety shortly before they are used. Trim leaves off, leaving about $\frac{1}{2}$ inch of each petiole as a handle for the bud (Fig. 5a).

2. Cut bud with an oval or shield-shaped piece of bark about 1 inch long from bud stick (Fig. 5b). In doing this hold bud stick upside down. Start cut about $\frac{1}{2}$ inch below the bud and draw the knife cutting slightly into the wood to a point $\frac{1}{2}$ inch above the bud. Remove bud by making a cross cut through the bark at the upper end.

3. Select a smooth place on the branch to be budded. Make a T-shaped incision in the bark by first making a cross cut and then a vertical cut about 1 inch long (Fig. 5c). Loosen bark at edges of incision carefully with knife.

4. Insert bud by pushing it down under the bark of the T-shaped opening (Fig. 5d). If the bark of the bud extends beyond the vertical cut of the incision, cut it off evenly so that all of the bark of the bud will be covered with the bark of the stock.

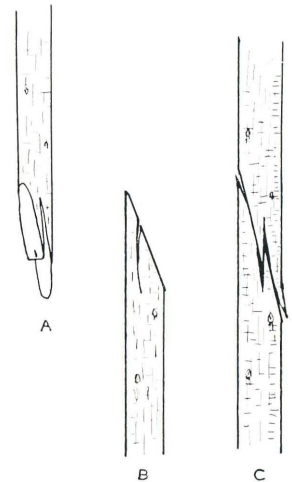


Fig. 4. Tongue or whip graft. A and B, scion and stock ready for grafting; C, scion and stock joined together and ready to be tied or wrapped.

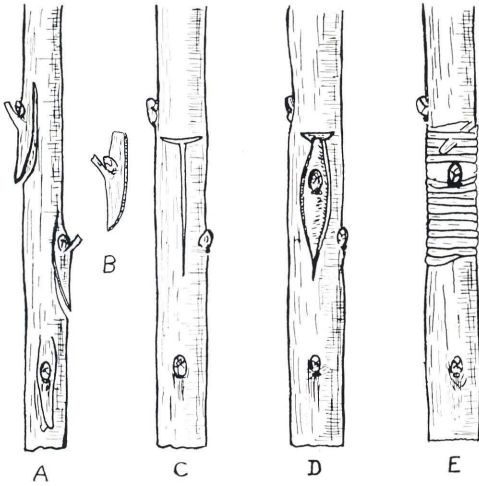


Fig. 5. Budding. A, prepared bud stick; B, bud removed; C, T-shaped incision in stock; D, bud inserted; E, bud tied in.

5. Wrap bud firmly above and below with common string, raffia or preferably rubber budding strips (Fig. 5e). Waxing is not necessary. Ten days to two weeks later, cut binding material on the side opposite the bud to prevent constriction and girdling.

6. Cut stock or branch off just above or beyond the bud after it starts to grow the following spring. When used for propagating young trees, the budding operation is done in the same manner as that described for top working except that the buds are inserted close to the ground on seedling trees in the nursery row.