



COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS
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GRAFTING THE MANGO IN HAWAII

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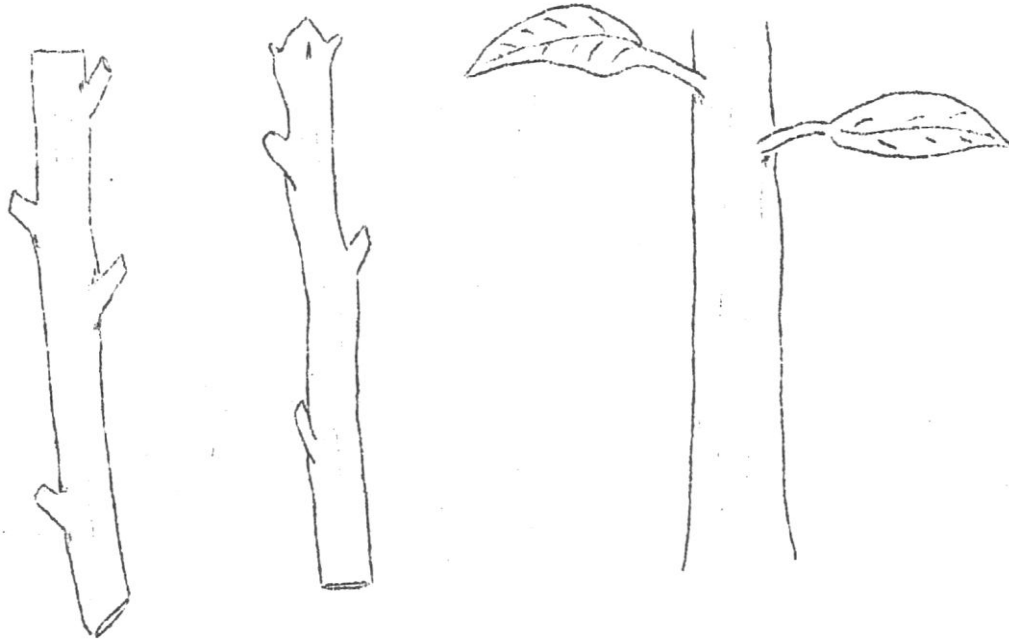
Grafting is the principal method of propagating mango trees. It is a process in which the cambium tissues of the scion and the stock are brought in close contact to unite and grow. The success of grafting is entirely dependent upon the fulfillment of this basic principle. The cambium is a single layer of cells which gives rise to new tissues.

There are many ways in which mangoes are grafted. Some of them are the side wedge, side tongue, side paste (same as the side tongue without the tongue), whip, stump bark, inarching, cleft, and modified chip bud. The more popular methods of grafting are the side wedge, side tongue, and the stump bark. Regardless of the technique used, the basic principal with regard to selection and treatment of scion and stock and the pure mechanics of grafting should always be followed.

Scion

The term scion applies to the bud or piece of stem that is to be attached to the root stock. The following precautions are suggested in the care, treatment, and selection of scions for good results.

- a. The scion should be clean, full and firm and should measure about 3/8 inch in diameter.
- b. It should be taken from a tree selected for high quality fruit of the desired variety.
- c. The terminal growth is usually used, but if grafting material is scarce, a second cut back of the terminal growth may also be used as illustrated in Figure 2 A.
- d. The scion wood should be 4 or 5 inches long and the leaves should be removed with a clean sharp knife or pruning shears up to the base of the leaf petiole or stem.
- e. The scion should be used as soon as possible. If not, it may be packed in damp sphagnum moss and wrapped in wax paper, or placed in a plastic bag which has been sprinkled lightly with water. Scions kept in this manner and placed in a cool place will be good for 1 week or longer.



Stock

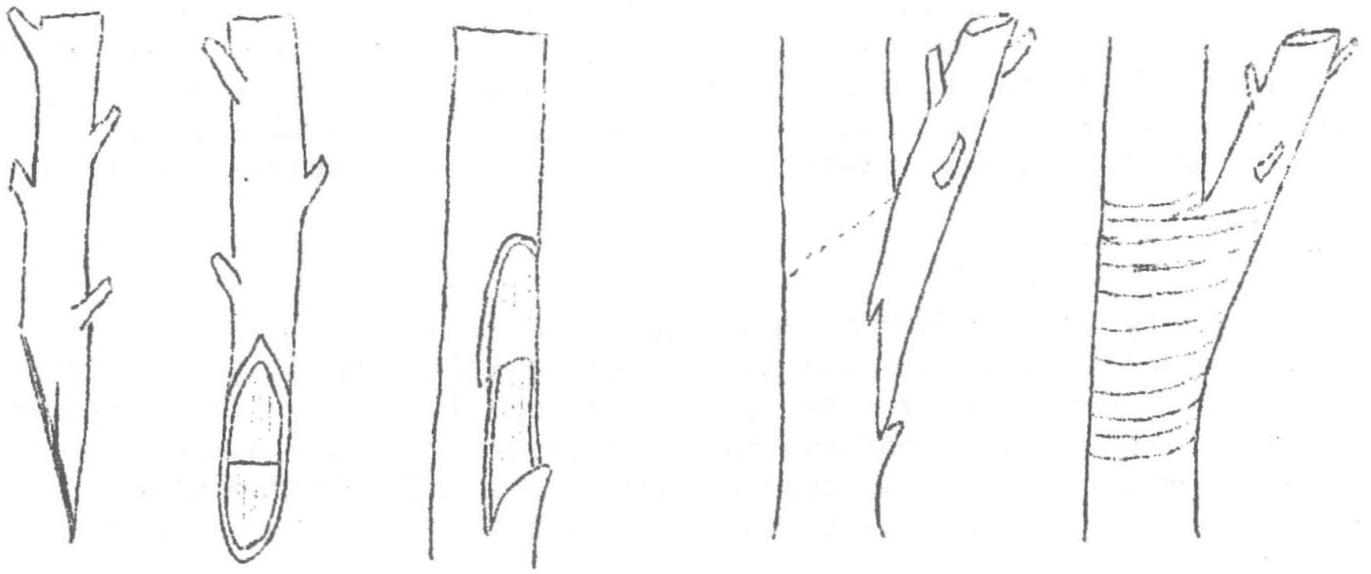
The term stock or rootstock applies to the seedling or tree upon which a scion is to be attached. The following precautions are suggested in the care, treatment, and selection of the stock for good results.

- a. Seedlings or young trees grown from seeds are used as stocks. Young seedlings are better than old, pot-bound seedlings which have lost their vigor.
- b. Seedlings should have a stem diameter of $\frac{3}{8}$ inch or more at the place where the graft is made. This is usually 3 or 4 inches from the ground surface.
- c. The stock should be in a highly vegetative state. This is accomplished by fertilizing the stock with a general garden fertilizer about 1 month before grafting.

Methods of Grafting

Side Tongue Grafting

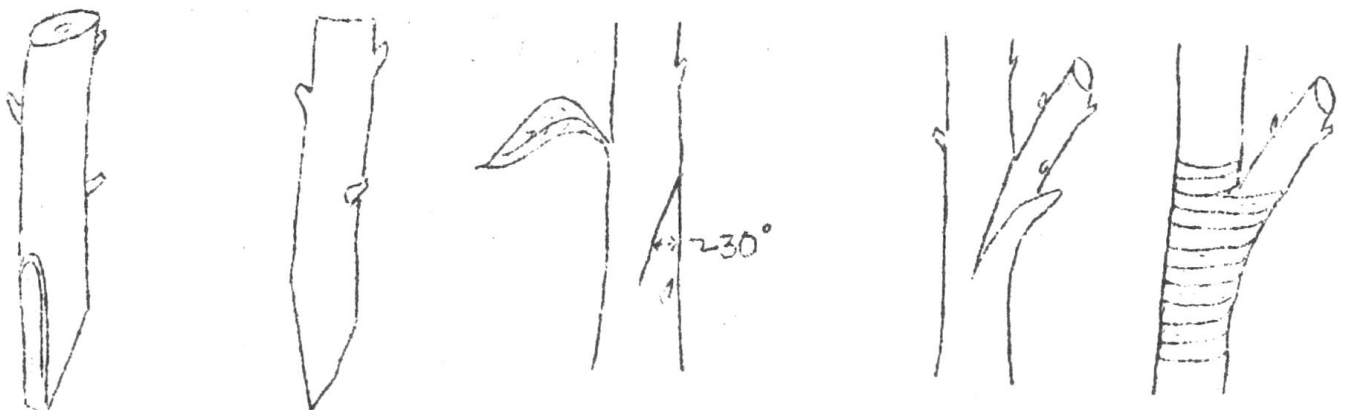
This method is satisfactory for the grafting of young seedlings whose stems are the same size as the scions or slightly larger. All materials should be kept throughout the operation. The entire process should be finished rapidly to avoid excessive drying. Cut surfaces should be $1\frac{1}{2}$ to 2 inches long and should be smoothed off so they will fit perfectly when placed together. Do not bruise the edges of cut surfaces. One fourth to $\frac{1}{2}$ inch tongues are cut in the beveled surfaces of both stock and scion at the right places to aid in holding the parts together while they are being tied and to expose a greater area of cambium where growth unites the stock and scion. The union should be bound firmly with a piece of moist raffia, rubber grafting strip, or any other suitable material. Apply a coating of household paraffin, such as is used for sealing over the surface of jellies, over the graft, completely covering the graft union as well as the entire scion wood. Grafted trees which grow in pots are placed in a shaded area until the scion begins to grow.



When the scion has made good growth and has matured leaves, the top portion of the grafted seedling is removed at an angle just above the union as illustrated by the dotted line in Figure 3 D.

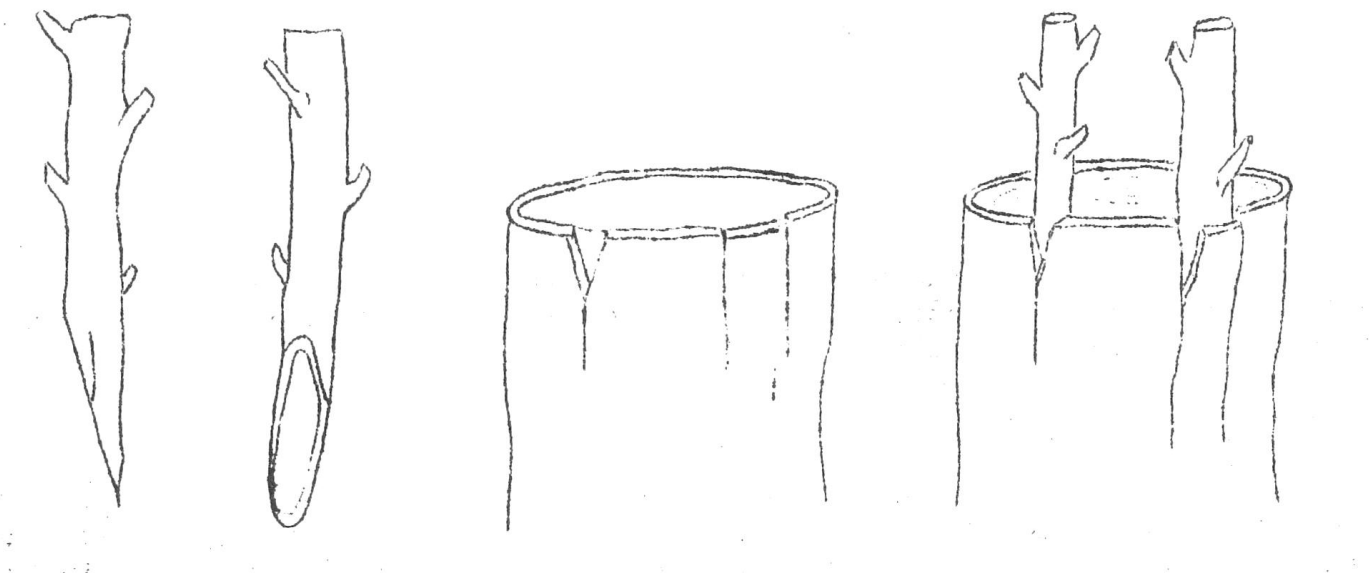
Side Wedge or Side Graft

The side wedge is a popular method of grafting seedlings of various fruit trees. It is a simple and a fast method. A slanting cut of 30 degrees is made into the stock 4 to 4 inches from the ground with a clean sharp knife as illustrated in Figure 4 C. The cut is made deep enough so that the stock will bend without splitting down the middle when the cut is opened to insert the scion. Usually a cut two thirds to three fourths of the way across the stock is necessary. The scion is prepared by cutting the bottom end in the shape of a wedge. The side of the wedge that faces the stock is cut longer and cut at a smaller angle that the opposite side. Figure 4 A illustrates this point. After the wedge is made on the scion, the cut in the stock is opened by bending the stock back. The wedge end of the scion is then inserted into the opened cut of the stock. After the wedge is in, the top of the stock is released and allowed to bend back to hold the scion in place. The grafting is completed by binding the union securely with raffia and coating the entire surface of the scion and the graft with melted household paraffin.



Stump Bark Graft

The stump bark graft is often used on old mango trees which are top worked. Top worked is accomplished by cutting off the larger branches and then either bark graft the stumps of the branches or wait until strong young suckers develop on the stumps. These suckers are then grafted by the usual method, such as the side tongue method. The remaining branches are left to provide shade and food for the new growth. After the grafts have grown, all branches are removed.



The stump bark graft consists of merely cutting a slit downward from the top of the stump and pushing the scion down in along the slit and under the bark. One or more bark grafts can be placed on a stump, depending upon the size of it. If there are more than one, they should be spaced as far apart as possible. Figure 5 illustrates the stump bark graft method. Figure 5 D illustrates two ways the scion can be inserted into the stock.

If the stump is large, it may be necessary to bind the graft with a piece of strong cord or have the scion nailed to the stump with brads.

The graft is protected in the same manner as the side tongue. Paraffin is painted over all surfaces of the scion and the complete section where the stock and scion are bound together.

Inarching

Inarching is a grafting technique that differs from the other methods. It is a method whereby two plants are united while growing on their own roots. The seedling stock, grown in a container, is taken to a tree of the desired variety and firmly supported alongside a small branch which has scions the same size as the stock.

In inarching a straight deep cut is made with a clean sharp knife on one side of the stock at a convenient place. This cut should be at least 2 inches long, but not deeper than one half of the diameter of the stock stem. A similar cut is made on the scion (still attached to the parent tree) so that the two cuts will be about the same size. It is important that the exposed cambium layers fit together evenly. The scion should be tied carefully and tightly in place so that there is no space between it and the stock. Then a notch is placed on the seedling above the union and another one on the scion below the union. This is to encourage the graft to grow together. A coat of melted household paraffin is placed over the graft to complete the operation.



During the next several weeks, or until a good union is formed, the stock should be watered regularly so that it will not dry out. When the stock and scion are well united (it will take from 2 to 3 months) the scion is cut loose from the parent tree just below the graft at the notch, and the top of the stock is removed.

The young graft should be kept in a shady and sheltered area for several days and then gradually exposed to more sunlight. Any new shoots forming below the graft should be promptly removed. The new graft should be ready for field planting in about 6 months.

Inarching takes considerable time to perform, but a high percentage of success may be expected by beginners if the above rules are carefully followed.

Modified Chip Bud

The modified chip bud is a grafting technique by which a bud is removed from the scion and placed on the stock. This method of propagation of mangoes is popular in Florida. It is popular because a greater number of grafted plants are secured from a limited amount of scion wood and the stocks can be grafted much earlier than when other grafting methods are used.



It is necessary to prepare the bud wood by cutting off 1 or 2 inches of the terminal stem and removing all the leaves except two or three at the terminal. This stem is left on the tree until the lateral buds swell and become plump; usually 2 weeks are required. The stems selected for bud wood should be $\frac{1}{4}$ to $\frac{3}{8}$ inch in diameter. Larger stems give too large a shield.

The mango seeds for stock are prepared by removing the husk and planting them with the convex edge upward about $\frac{1}{2}$ inch below the surface of the planting medium.

The young stock is budded when 2 to 3 weeks old. At this age, the stock is still in the succulent red stage.

The modified chip bud is made by removing a bud with 1-1/2 to 2 inch long shield as illustrated by the dotted line in Figure 7 A. The front of the shield below the eye is cut off through the bark, leaving the cambial area exposed. The scion is then inserted, like a side graft, into the deep, slanting cut into the stock extending horizontally about one third through the stem and about 2 inches deep. A piece of 20-gauge vinyl film 2 inches wide is wrapped around the stem one and a half times, and a rubber band used to hold the bud and the vinyl film in place. One week to 10 days after budding, the stock is cut back completely. In 2 weeks the rubber band and vinyl film may be removed.

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