

# Propagating Deciduous Fruit Plants

Common to Georgia



UNIVERSITY OF GEORGIA  
EXTENSION





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# Propagating Deciduous Fruit Plants Common to Georgia

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Deciduous fruit plants common to Georgia must be propagated asexually because they do not come true to seed. This makes it necessary to reproduce the desired fruit plants by methods such as cuttings, runners, layering, budding or grafting. Due to differences in characteristics of deciduous fruit plants, certain methods of propagation will work for some fruits while other asexual methods are needed to reproduce other fruits.

Generally, if plants can be reproduced by cuttings and the root system of the cuttings will develop satisfactorily,

then the more complicated methods of propagation are not used. Methods such as budding and grafting are used on most tree fruits where a specific rootstock is desired, or when cuttings do not root satisfactorily or do not develop a root system sufficiently large to support a tree of the desired size.

This publication discusses the common techniques used to asexually propagate fruit plants adapted to Georgia. Those discussed are by no means the only methods of asexual propagation. However, the methods omitted are not required to succeed in reproducing adapted fruits.

## T-BUDDING AND WHIP GRAFTING

Several fruit plants are commercially propagated by either T-budding or whip grafting. T-budding is a summer-time method of propagation; the whip graft is done in the winter. The orchardist uses other grafting techniques when a variety change of existing trees is desired or an injury is to be repaired. These methods of grafting will be discussed later.

Fruit plants commonly propagated by T-budding and/or whip grafting are apples, peaches, nectarines, pears, persimmons and plums. Propagation by T-budding and whip grafting differs from other methods of asexual propagation because a rootstock and a scion piece of the desired variety are required. Therefore, rootstock requirements of the common fruits propagated by these methods should be understood before one attempts them.

### Rootstocks Used in the Nursery

Most fruit trees are propagated on seedling rootstocks. Apples and pears, however, are sometimes propagated on clonal rootstocks produced in stool beds. A number of nurseries in the Northwest specialize in production of clonal rootstocks. Fruit tree nurseries that produce apple and pear varieties on clonal rootstocks buy these rootstocks from specialized nurseries. Many of the rootstock nurseries also sell seedling rootstocks to nurserymen.

### Seed Germination for Rootstocks to Be Grafted or Budded

Mature seed of deciduous fruits grown in Georgia will not germinate immediately, but first require conditioning by a period of cool, moist storage at temperatures slightly above freezing. This "after-ripening" process is necessary to satisfy the rest requirement of the seed embryos, and to soften the stony layer surrounding some seed. Two meth-

ods are used to after-ripen deciduous fruit tree seeds—*stratification and fall seeding*. Stratification is the desired method for small-scale germination; direct fall seeding is used extensively by commercial nurseries.

### Stratification

To stratify seed, first soak the seed in water for 24 hours. While the seed are soaking, prepare a stratification mix of one-third peat moss and two-thirds sand (by volume). Following soaking, mix the seed with the stratification mix, or layer the seed in the mix by placing an inch of mix, a layer of seed, an inch of mix, a layer of seed and so on in the container. To prevent seed decay, the mix should be moist, *not wet*. Squeeze excess moisture out by hand.

As soon as sprouting begins, the seed should be planted or stored at a lower temperature (32° to 33°F) until planting is possible. Germinating seed must be planted carefully because the young sprouts are brittle and easily broken. It is not necessary to separate the mix from the seed when planting. The seeding rate of the sprouting seed should be about eight to 14 seed per foot of row in rows 4 feet apart. Apple, pear and persimmon seed should be planted about ¾ inch deep; peach should be seeded about 1½ inches deep. If germination is good, thin the seedlings so there are four or five seedlings per foot of row.

Polyethylene bags are convenient containers for stratifying small lots of seed. The plastic prevents loss of moisture, and the beginning of germination can be observed without opening the bag. Two or three small holes should be cut into the top of the bag to allow for air exchange. The mix should be checked periodically to insure that drying out does not occur.

After-ripening seed should be maintained at temperatures between 35° and 50°F for periods of 12 to 20 weeks, depending on the species (Table 1). Persimmon rootstocks are generally too small for June budding but normally grow large enough for dormant budding.

**Table 1. After-ripening Period Required for Seed of Deciduous Fruit Trees Adapted to Georgia**

Seed should be placed in moist medium at temperatures of 35°F to 50°F for the number of days indicated.

Species	Time Required (days)
Apple (commercial varieties)	60-80
Pear ( <i>Pyrus calleryana</i> )	45-90
Peach, Plum and Nectarines (Lovell, Halford, Nemaguard* – peach varieties)	90-130
Persimmon ( <i>Diospyros khaki</i> , <i>D. Virginian</i> or <i>D. lotus</i> )	90-120

\*Nemaguard should be used only in orchards on sandy soil.

### Fall Seeding

If after-ripening of the seed is to be done in the field, plant the seed in mid-October. A shallow, narrow furrow should be made so the seed will be planted either ¾ inch deep for apples, pears and persimmons or 1½ inches deep for peaches. In heavy soils with a tendency to crust, line the furrow with a small quantity of peat moss. After seeding, lightly cover the seed with peat moss and fill the furrow with soil. Avoid excessive mounding (more than 1 inch) of the furrow.

### When to Asexually Propagate the Seedlings

Peach seedlings, if properly cultured, should be large enough to bud by late May or June following seeding. Apple and pear seedlings get off to a slower start, and should be dug and whip grafted the winter following seeding, or budded in the original row during July of the second year.

### Specific Rootstocks

#### Apple Rootstocks

Apple varieties are budded or grafted onto either seedling or clonal rootstocks. Varieties grafted on seedling roots produce the largest trees; those grafted on clonal roots vary in size, depending on the clone selected. Clonal rootstocks were developed so that tree size could be manipulated depending on the clone selected (Table 2). Also, clones vary in resistance to insects and diseases. Rootstock selection is often based on resistance to soilborne diseases or insects common to a particular area. The two most common clonal rootstock series used in Georgia are the Malling (M) series and the Malling Merton (MM) series. M7 is the best rootstock at this time for middle and northern Georgia. Seedling rootstock is recommended for South Georgia. Dwarf rootstocks such as M9, M26, and Mark require extra care but can be grown successfully in North Georgia.

**Table 2. Apple Rootstocks Available for Georgia**

Vigor	Rootstocks
Standard (very vigorous)	Seedling
Semi-standard (vigorous)	M2, MM 111, MM 106
Semi-dwarf	M7, M4, M26
Dwarf	M9, Mark

Clonal rootstocks are available from rootstock nurseries specializing in apples.

### Peach and Nectarine Rootstocks

The primary rootstock for peach and nectarine trees in Georgia are Lovell peach seedlings, but others used on occasion are Nemaguard and Halford. These rootstocks are produced as described in the “Seed Germination” section of this publication. Peaches and nectarines can also be propagated by softwood cuttings and grown on their own roots.

### Plum Rootstocks

Most plums are propagated on Lovell peach seedlings, with a few being propagated on Nemaguard peach seedlings. Plums can also be propagated by softwood cuttings and grown on their own roots.

### Persimmon Rootstocks

The preferred rootstock for persimmon is the Oriental persimmon, *Diospyros khaki*. Trees propagated on *D. khaki* seedlings live longer and produce fewer root suckers than trees on the American persimmon, *D. virginiana*. Seedlings of *D. lotus* are also used as rootstocks for Oriental persimmons.

### Pear Rootstocks

The most commonly used rootstock for pears in the Southeast is the Oriental pear, *Pyrus calleryana*. Several rootstock nurseries produce *P. calleryana* seedlings for sale to fruit tree nurseries.

Dwarf pear trees require the use of special quince rootstocks—either Angers Quince or Provence Quince—to produce dwarfing of the scion variety. Both of these clonal quince rootstocks are incompatible with most pear varieties. Therefore, a 3- to 4-inch interstem piece of pear wood compatible with both the clonal quince rootstock and the desired scion variety must be used to bridge the incompatibility. The pear variety ‘Old Home’ is the universally accepted interstem used for this purpose.

### Care of Rootstocks

If seedlings are grown at the nursery and are to be budded, they should be left in place in the nursery row. Some thinning may be required if the seedlings are too close.

When the whip graft method of propagation is to be used, the rootstocks received from rootstock nurseries—or grown and dug by the grafter—must be stored properly to ensure they are in good condition when they are grafted. *Rootstocks should be held at 34° to 38°F and kept moist, not wet.* Upon arrival from the rootstock nursery or after

digging, the rootstocks should be placed in containers and roots completely covered with sawdust. These containers should be placed in a cold storage room and removed as needed for whip grafting.

**CAUTION:** Do not store rootstocks, fruit trees or scionwood in a room containing fruits and/or vegetables. Gasses given off by the produce will injure or kill the trees or propagation material.

## Collecting Scionwood for Grafting

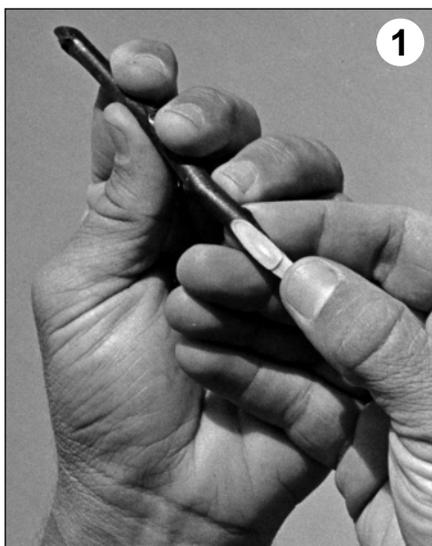
Whip, cleft, bark and saw-kerf grafting require dormant scionwood of the desired variety. Select shoots that grew during the last growing season. Moderately vigorous to vigorous shoots are best. Water spouts are satisfactory. Make sure the shoots are insect and disease free and are true to type. Tie the bundles of each variety and identify them with a permanent label. Remember, a wooden label marked with a regular ballpoint pen is trouble. If it gets wet, the ink will smear or wash off completely. Use a pencil or a horticultural pen for marking wooden tags. Regardless of what type tag you use, make sure the name will stay on it under adverse conditions.

To store the scionwood, place each variety in a moist (not saturated) medium, such as sphagnum moss, sawdust, paper towels or old cloth, and wrap it in plastic. A garbage can liner will do. Do not let the wood dry out. The wrapped packages of propagating wood should then be stored in a refrigerated room at a temperature range of 34° to 38°F. Properly stored scionwood should remain in good condition until it is ready for use in late winter or spring.

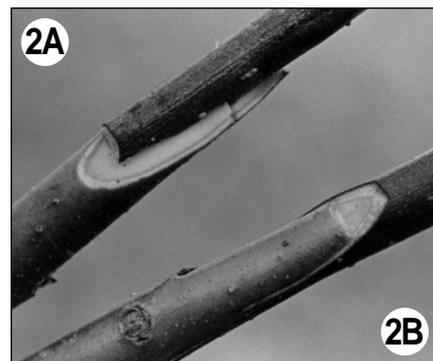
## Whip Grafting

Seedlings or clonal rootstocks are grafted in February or early March while still dormant. Following grafting, they are placed in moist, green pine sawdust, peat or sphagnum moss and stored where the temperature is approximately 45° to 50°F. Be sure to check them for drying while in storage; they should be moist but not wet. They should be transplanted in early April in the nursery row or directly in the planting hole where the tree(s) is to be located.

To make the graft, use a sharp knife and make cuts approximately 1 inch long at the base of the scion and at the selected place on the rootstock. Clonal rootstock should be grafted 10



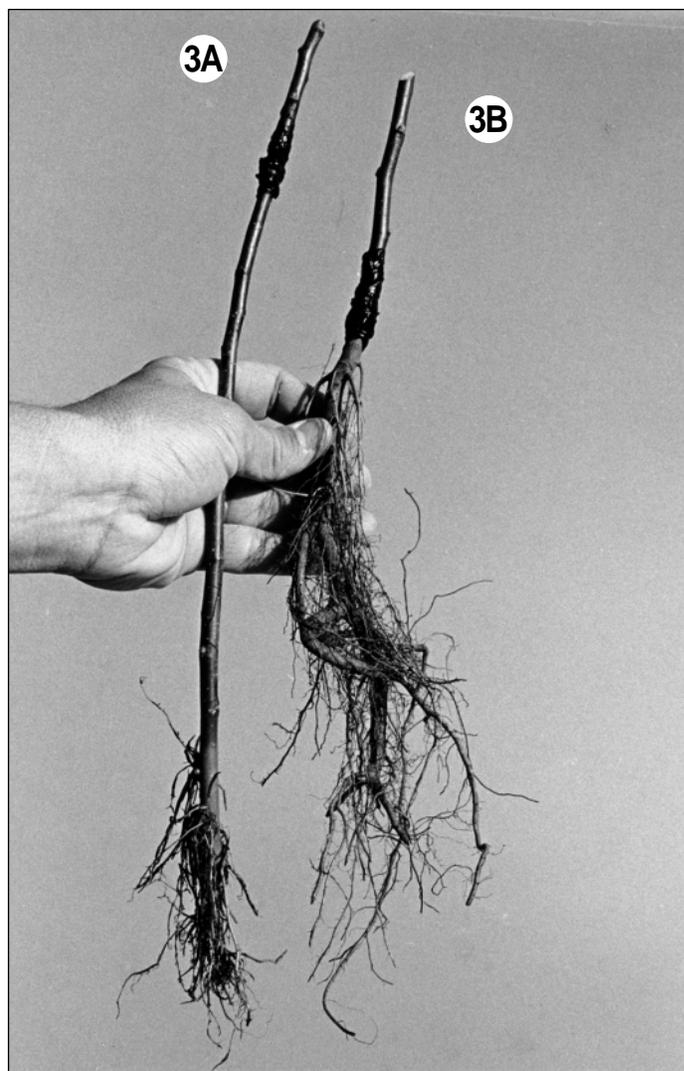
to 12 inches above the roots, while seedlings are grafted 1 to 2 inches above the roots. Make a 1/2-inch long reverse cut that is nearly parallel to the first cut on each of these surfaces (Figure 1).



The scion piece and the rootstock are then fitted together so the cut surfaces match on one side (Figure 2A). It is best to get a match on both sides (Figure 2B). The whip grafting operation is completed when the graft is tied with a rubber band or tape and painted with a tree wound dressing.

Figure 3A illustrates a finished whip graft on a clonal rootstock; 3B illustrates a finished whip graft on a seedling rootstock.

**CAUTION:** When grafts are set out in the nursery, always handle them by the rootstock. Do not bump the scion because this may disturb the callus tissue, causing the graft to die.



Clonal stocks should be set with the graft union 6 to 8 inches above the soil line in the nursery or 1 to 2 inches above the soil line in the permanent planting hole. Grafts on seedling rootstocks should be planted with the graft union 1 to 2 inches above the soil line in the nursery and 1 inch below the soil line in the permanent planting hole.

## Collecting Budwood for T-budding

Budwood should be of the current season's shoots that are growing vigorously. Make sure the budwood is insect and disease free and is true to type. Clip off the leaves with a sharp knife, leaving about ¼ inch of the petiole. When cutting off the leaves, do not cut into the bud stick with the knife. At all times, the budwood should be kept moist—both before and after clipping off the leaves. Where a two- or three-day supply of buds is cut at one time, wrap the bud sticks in damp paper and store in a plastic bag in a cool place. Properly prepared bud sticks should remain in good condition for three days and possibly longer.



## T-budding

This method of propagation is used in the summer (called June budding) or late summer (called dormant budding). Apple and pear trees 3 years old or less may be top-worked by T-budding if a variety change is desired. June budding is done as soon as mature current season's buds can be cut (mid-June) and continues through July. Two to three weeks after budding, cut the rootstocks off about ½ inch above the bud and remove all suckers from the stock. This will force the bud of the desired variety to grow.

Dormant budding is done in late August or early September, but the buds are not forced until the following spring. In March following dormant budding, cut the rootstocks off about ½ inch above the bud.

To bud, select the proper point on the stock—8 to 10 inches for clonal rootstock, 2 to 3 inches for seedling rootstock in the nursery and 1 inch above the ground line for both types of roots in the tree's permanent location. Wipe the stock clean of soil and leaves that may interfere with budding.

Make a T-shaped cut—first the vertical cut (Figure 4), then crossing the “T.” (Figure 5). Do not cut into the wood.

Next, select a good bud with the petiole stub intact (Figure 6). To cut the bud, begin the cut about ¾ inch below the bud, cutting under the bud and up the bud stick (Figure 7).



Cut across the top of the bud about 1/2 inch above the bud (Figure 8), then peel the bud off (Figure 9). Notice that the wood stayed with the bud; the bud peeled cleanly at the cambium.

Gently insert the bud into the T, using the petiole stub to help protect the bud (Figure 10).

Figure 11 shows a bud properly seated before tying. Figure 12 shows a tied bud. In tying, do not mash the bud or the petiole stub with the rubber band. As previously mentioned, June buds should be forced in two to three weeks, while dormant buds are not forced until the following March.



# GRAFTING TECHNIQUES TO TOPWORK EXISTING TREES

T-budding is often used to topwork apple and pear trees 3 years of age or less. Older apple, pear and persimmon trees are topworked using cleft or bark grafts. The saw-kerf graft is primarily used to topwork peach, nectarine and plum trees.

## Cleft Grafting

When cleft grafting is done, it is best to leave a nurse limb to keep the tree alive until the grafted scions are growing well. The nurse limb can be removed in midsummer or topworked the following winter if the scions are growing well.

Scionwood should be gathered and stored as discussed previously. Late February and March—just before new growth begins—is the time to cleft graft. After growth begins, the bark graft is used.

To cleft graft, cut the desired limbs off and smooth around the edges (Figure 13). These limbs should be 1 inch or larger in diameter. Split the stock with a cleft

grafting tool or hatchet, being sure not to split any knots (Figure 14).

Open the split by inserting the end of the cleft grafting tool or a screwdriver in the center of the split (Figure 15). Scions having three or four buds are cut on the lower end on each side, forming a wedge-shaped cut that is narrower on the opposite side (Figure 16).



Insert the scions into the cleft, with the narrow side of the scions toward the center of the stock (Figure 17). Gently remove the cleft grafting tool or screwdriver so the stock will close tightly on the scions. Extreme care must be taken to match the cambiums of the scions and stock.

Tightly wrap the outside of the stock (Figure 18) then paint the graft area with a tree wound dressing compound (Figure 19).



Six to eight weeks after the grafts begin to grow, cut on two sides of the stock away from the grafts in the area where the tape is. This will allow the tape to eventually peel off, preventing the possibility of girdling. *Do not* remove the tape. It should peel off naturally.

**CAUTION:** If the grafts grow vigorously, tack to the stock by each graft a ½-inch by 2-inch slat. Tie the vigorous shoots to this slat for support. Otherwise, wind may blow the unsupported grafts off.

## Bark Grafting

This is another method used to change varieties of trees too large to T-bud. As with cleft grafted trees, the variety change should be done over a two-year period to reduce tree shock from the heavy cutting. Scionwood should be gathered and stored as discussed previously. Mid-April through mid-May is the best time to bark graft—after the bark will separate readily from the wood.



To bark graft, cut the desired limb off and smooth around the edges (Figure 20). Next, two scions should be cut, each having three or four buds. To cut each scion, one side should be cut about 1 to 1¼ inches long and the opposite side about ½- to ¾-inch long (Figure 21).

Place a scion against the stock and outline each edge of the scion with a knife (Figure 22).

Pull the top of the bark strip away from the stock (Figure 23), insert the end of the scion (short cut side outward) and push downward until the scion is seated (Figure 24).



Once the scions are in place, tape firmly with grafting, adhesive or masking tape (Figure 25), and thoroughly cover the graft with tree wound dressing (Figure 26).

Ten to 12 weeks after the grafts begin to grow, cut on two sides of the stock away from the grafts in the area where the tape is. This will allow the tape to eventually peel off.

**CAUTION:** If the grafts grow vigorously, tack to the stock by each graft a ½-inch by 2-inch slat. Tie the vigorous shoots to this slat for support. Otherwise, wind may blow the unsupported grafts off.



## Saw-kerf or Notch Grafting

Saw-kerf has the same advantage as the cleft graft in that the work can be done over a long period of time—usually February and March.

Even though this grafting method requires more skill than the cleft graft, it has an advantage over the cleft in that knotty stock that cannot be split properly can still be grafted. In addition, there is less danger of wood-decay organisms.

Scions should be cut wedge shape, with the outer edge slightly thicker than the inner (Figure 27). After cutting the wedge on the bottom of the scion, cut the scion off, leaving two or three buds. The lower bud of the scion should be on the outside near the top of the wedge cut.

Cut the stock with a fine-tooth saw, using approximately a 45° angle with the flat surface of the stock

(Figure 28). The saw cut should go into the stock so that it extends 4 to 5 inches from the surface along the outside.

Notch the stock to fit the scion previously cut. The notch is easiest to make using a knife with a half-circle blade—the type used by leather workers (Figure 29).

Insert the scion into the notch, lining up the cambium of the stock and scion (Figure 30). Because of the difficulty in getting a perfect match of the two cambiums, slant the scion a little to make sure the cambiums touch in at least one place. Firmly but carefully drive the scion into the stock. Cover all exposed surfaces with tree wound dressing, including the top of the scion (Figure 31).

**CAUTION:** If the grafts grow vigorously, tack to the stock by each graft a ½-inch by 2-inch slat. Tie the vigorous shoots to this slat for support. Otherwise, wind may blow the unsupported grafts off.



# GRAFTING TECHNIQUES TO REPAIR TREES

Bridge and inarch grafting are used to prevent the loss of a tree girdled by sunburn, rodents, winter injury, disease or mechanical injury.

## Bridge Grafting

This technique of tree repair is utilized when the girdled area is above the ground line. Scions should be dormant wood about ½ inch in diameter and 4 to 5 inches longer than the gap they are to bridge.

Prepare the tree by cutting away all dead tissue, then trim the bark to make the edges even. The scions are cut wedge shape at both ends, with the part to go against the wood of the tree about twice as long as the opposite side (Figure 32). Two slits are made in the bark the same size as the scion to receive the scion.

Insert the scion under the bark (Figure 33) and nail in place. The scion should bow out slightly in the middle when done properly. With tree wound dressing, cover the area around where the graft unions are made. Remove all buds that

start to grow on the scion. Scions should be located every 2 to 4 inches over the girdled portion of the tree (Figure 34).

## Inarch Grafting (or Inarching)

This technique of tree repair is used to save trees that have been girdled at or below the ground line. Inarching is also used if a root disease threatens an orchard where susceptible rootstocks have been used. Orchardists will plant rootstocks resistant to the disease around the tree and inarch graft.

Inarching is done by planting rootstocks—generally seedling—around the base of a tree and grafting the top of the rootstocks to the trunk of the tree above the damaged area. In the case of trees with a suspected root disease problem, the grafts onto the trunk should be 5 or more inches above the graft union. Plant 3- to 6-foot-tall rootstocks so they can be joined with the trunk of the injured tree every 2 to 4 inches around the damaged area. The graft used is the same as the upper graft of the bridge grafting technique (Figure 33). Figure 35 illustrates inarching.



# SUMMARY OF T-BUDDING AND GRAFTING

## Technique

Technique	Date	Use
Bark grafting	Mid-April through mid-May	Establish a pollinating variety on a limb of a tree or to completely topwork a tree.
Bridge grafting	Mid-April through mid-May	Repair trees girdled above the ground line.
Cleft grafting	Late February and March	Establish a pollinating variety on a limb of a tree or to completely topwork a tree. Limbs should be 1 inch or more in diameter.
Inarch grafting	Mid-April through mid-May	Repair trees girdled at or below the ground line. Also used if a root disease is suspected or feared.
Saw-kerf grafting	February and March	On peaches, nectarines and plums to completely topwork a tree.
T-budding	June through mid-September	Propagate actively growing rootstocks in the nursery. May also be used to topwork apple and pear trees up to 3 years old and 1-year-old peach, nectarine and plum trees.
Whip grafting	February and early March	Propagate 1-year-old rootstocks. May also be used to establish a pollinating limb on a young, established tree.

## Best Methods for Each Fruit

Fruit	<i>Propagation in Nursery</i>	<u>Method</u> <i>Topworking</i>	<i>Tree Repair</i>
Apple	Whip grafting, June budding or dormant budding	T-budding on trees three years old or less, cleft or bark grafting on older trees	Bridge or inarch graft
Peach, plum and nectarine	June budding or dormant	Saw-kerf grafting	Not normally done
Pear	For propagating seedlings, whip graft, June budding or dormant budding  For propagating on quince rootstocks, the interstem piece should be whip grafted and the scion variety June or dormant budded onto the interstem.	T-budding on trees 3 years old or less, cleft or bark grafting on older trees	Bridge or inarch graft
Persimmon	June budding, dormant budding or whip grafting	Cleft graft or bark graft	Bridge or inarch graft

# FRUITS PROPAGATED BY CUTTINGS, RUNNERS, LAYERING AND STOOLING

## Cuttings

Three types of cuttings are used to propagate specific fruit plants common to Georgia. Root cutting is the simplest method of propagation, and only erect blackberries are satisfactorily reproduced by this method. Hardwood cuttings—stem cuttings taken in the dormant season—are also an easy method of reproducing fruit plants. Figs and bunch grapes are most often propagated by hardwood cuttings. The softwood cutting method of fruit plant propagation is most commonly used to propagate rabbiteye blueberries and muscadine grapes, and is occasionally used to propagate figs. A mist system to keep the foliage of the cuttings from drying out is necessary, making this method of propagation more complicated than the root or the hardwood cutting methods.

### Root Cuttings

**Erect blackberries** are most often propagated by root cuttings planted directly in the field where the berries are to be permanently situated. Root cuttings should be the diameter of a pencil and 4 to 6 inches long (Figure 36). These cuttings are placed horizontally about 2 inches deep in the soil in March. Shoots should appear in four to eight weeks. If stor-

age of the roots is necessary before planting, moisten them and store in a plastic bag at 34° to 38°F until time to plant.

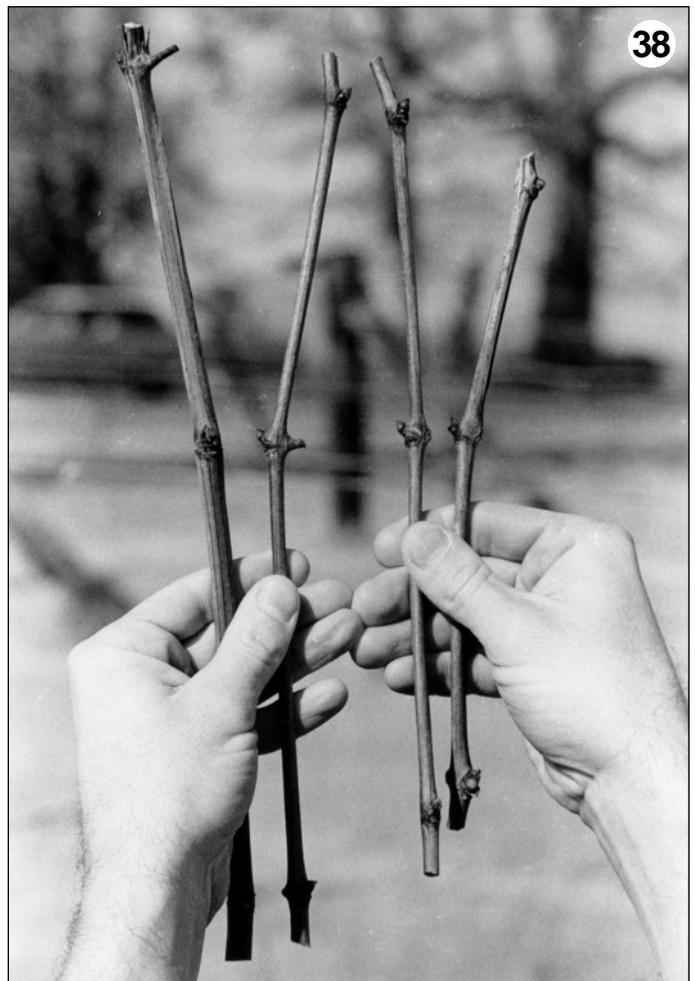
### Hardwood Cuttings

**Figs** are generally propagated by 8- to 10-inch long hardwood cuttings of the previous year's growth (Figure 37) and placed in a nursery row about 4 inches apart in late February or March. Place the cuttings at a depth so only the top bud is exposed. The base cut on the fig cutting should be ½ inch below a node; the top cut on each cutting should be ½ inch above a node. Rooted plants are dug the following winter.

**Bunch and French hybrid grapes** are propagated by hardwood cuttings taken any time during the dormant season. For varieties such as Fredonia, select canes with buds 3 to 5 inches apart and make cuttings at least three buds long (Figure 38). For less vigorous varieties, such as Delaware, select canes with shorter internodes and leave more buds per cutting.

Place these cuttings in a rooting box so only the top bud is exposed. The rooting medium should be sand, sand and peat, or sand and vermiculite, and should be kept moist at all times. Roots should appear in three to six weeks.

After rooting begins, the cuttings can be planted in the nursery row or in their permanent location in the vineyard.



## Softwood Cuttings

**Rabbiteye blueberry** plants are grown from softwood cuttings. Cuttings should be taken immediately after the first flush of growth in the spring. Using wood that is about 1/8 inch in diameter, make cuttings 4 inches long. Leave three or four upper leaves and place approximately 2½ inches deep in the rooting bed. The rooting medium should consist of half peat and half clean sand by volume. A rooting hormone is not needed. These cuttings should be placed under intermittent mist.

When cuttings have rooted well (generally five to seven weeks), gradually reduce misting and allow the plants to harden. Water only when the surface of the medium becomes dry. Plants may be left in the bed covered with glass or polyethylene for protection during the winter. Grow rooted plants at least one year in a nursery row before moving them to their permanent location.

**Muscadine grapes** are propagated by two methods: softwood cuttings or layering. Propagation of large quantities of plants is easier and quicker using softwood cuttings taken in late June. Use the current season's shoots. Cut off and discard the tender tip and make cuttings from the rest of the shoot. Leave four nodes on each 4- to 6-inch cutting. Keep the cuttings moist to avoid wilting. Remove the two basal leaves on each cutting, treat the base of the cutting with a rooting hormone (optional), and line them out on a 3-by-4 inch spacing. The medium in the propagation bed should be a mixture of one part coarse sand and one part peat. Provide shade by blocking out about 50 percent of the direct sunlight with shade cloth or lath.

Maintain the humidity near 100 percent by intermittent mist. When the cuttings root and the shoots begin to grow, remove the shade. Gradually reduce misting and fertilize with a solution of one tablespoon of 20-20-20 soluble fertilizer per gallon of water once a week until mid-September. Use one gallon per 25 square feet of plant bed. Allow the plants to harden. Water only when needed. When dormant, these plants can be dug and planted in the vineyard, or planted in the nursery to grow for a year.

**Figs**, although generally propagated by hardwood cuttings, are sometimes propagated by softwood cuttings. Softwood cuttings of actively growing fig shoots can be propagated under intermittent mist. Treatment of the base of the cutting with a rooting hormone is not necessary. However, two nodes should be placed in the medium. The base cut should be ½ inch below a node. Rooting should begin in three to four weeks, at which time the misting interval is widened to encourage further root growth. If these rooted cuttings are to be dug and potted, they should be placed under mist or in a shade house after potting until the roots recover from the transplanting operation.

**Peaches, nectarines and plums** are generally grown from softwood cuttings.

Preliminary tests with trees produced from rooted cuttings compared with conventionally propagated trees on

Lovell rootstock have shown own-rooted trees to be as good in respect to tree survival, fruit production and quality as well as tree size. As such, own-rooted trees have been recommended, in most cases on a trial basis, in many peach production areas. Recent research by USDA scientists indicate that own-rooted trees come into production earlier than conventionally propagated (two-piece) trees.

Generally speaking, there has been success by taking softwood cuttings following the period of flower bud initiation. As a result, specific timing will vary from area to area. In Georgia, the ideal time to take cuttings is in late July to mid-August.

Take terminal portion of shoots. The cuttings should be in the range of 6 to 12 inches in length. Leaves should be removed with exception of the most terminal 3-5, leaving a tuft of leaves on the end of the shoot. Cuttings should be protected from drying out after they are cut and prepared. If cuttings are to be held for even a short period, they should be placed in plastic bags and held in a cooler or refrigerator. However, cuttings should be used as soon as possible after they are taken.

To prepare the cuttings for rooting, wound by removing a shallow slice of bark 1 inch in length on two sides of the base of the cutting. Following this wounding, dip the wounded area of the cutting into an alcoholic solution of 2500 pm indolebutyric acid (IBA).

Treated cuttings should be stuck down into a media of vermiculite or other suitable rooting media. The rooting bed should be surrounded by plastic on the sides and set up with a mist system in order to maintain a 100 percent relative humidity.

Cuttings should remain under the mist system until well rooted. At that time, rooted cuttings can be moved into larger containers and placed in a greenhouse or other protective structure for overwintering.

## Runners

Only the strawberry, which produces numerous daughter plants during the growing season, is propagated by runners.

Strawberry plants (runners or daughter plants) are produced by the mother plants. Runner formation occurs throughout the growing season. These runners form roots, and subsequently produce more runners, which in turn form roots. These rooted runners are dug in the fall for fall planting or in the winter for spring planting (Figure 39).



Since all of the strawberries grown in Georgia are for pick-your-own operations or home use, the matted row system of strawberry culture is most desirable. Matted row strawberry plantings are best established by spring planting. Thus winter digging of runners for plants is preferred. These plants should be bundled, kept moist and held at 33° to 34°F until they are planted.

## Layering

The trailing brambles (blackberry and raspberry) and muscadine grapes are the fruit plants most commonly propagated by layering in Georgia.

### Tip Layering

Trailing bramble plants often tip layer naturally late in the season. The terminal of the vigorously growing bramble canes will grow into the soil (Figure 40) and form a mass of roots. These rooted tip layers can be dug in the winter (Figure 41) and planted in the desired location.

To ensure tip layering, nurserymen often place a half shovel of soil over the terminals of the canes in late August. By placing the soil over the tip, the resulting layers generally develop a larger root system.

### Simple Layering

Muscadine grapes are often propagated by simple lay-

ering—placing soil over the mid-portion of new shoots in late June or early July, leaving the shoot terminal exposed. Roots will form where the vine is covered with soil. These rooted layers can be removed from the mother plant during the dormant season and transplanted.

If a number of plants are desired, take an entire fruiting arm of the muscadine vine and lay it in a shallow trench in late June or July. Cover it with 4 to 5 inches of soil and leave the tips of all the growing shoots uncovered. Most of these shoots will root and form new plants. In the winter, remove the soil and cut the rooted shoots from the mother plant.

## Stooling

Natural stooling of plants, such as the erect blackberry, fig and rabbiteye blueberry, will produce a limited number of plants. Where only a few plants are wanted, digging the natural stools of established plants of desired varieties is a good method. Stools of these three fruits should be dug in the dormant season and planted in the desired location. Because most stool plants have a limited root system, the top of the plant have a limited root system, the top of the plant should be pruned back by at least half. Figure 42 is an erect blackberry stool with an exceptionally large root system.



## SUMMARY OF METHODS TO PROPAGATE FRUIT PLANTS NOT BUDDED OR GRAFTED

<b>Fruit</b>	<b>Method</b>
Erect blackberries	Root cuttings, stools
Figs	Hardwood cuttings, softwood cuttings, stools
Bunch and French hybrid grapes	Hardwood cuttings
Rabbiteye blueberries	Softwood cuttings or stools
Muscadine grapes	Softwood cuttings or simple layering
Strawberries	Runners
Trailing brambles	Tip layering

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