

Propagating Fruit Trees and Bushes A Guide for Homeowners and Small Orchardists

Alexis Zeigler

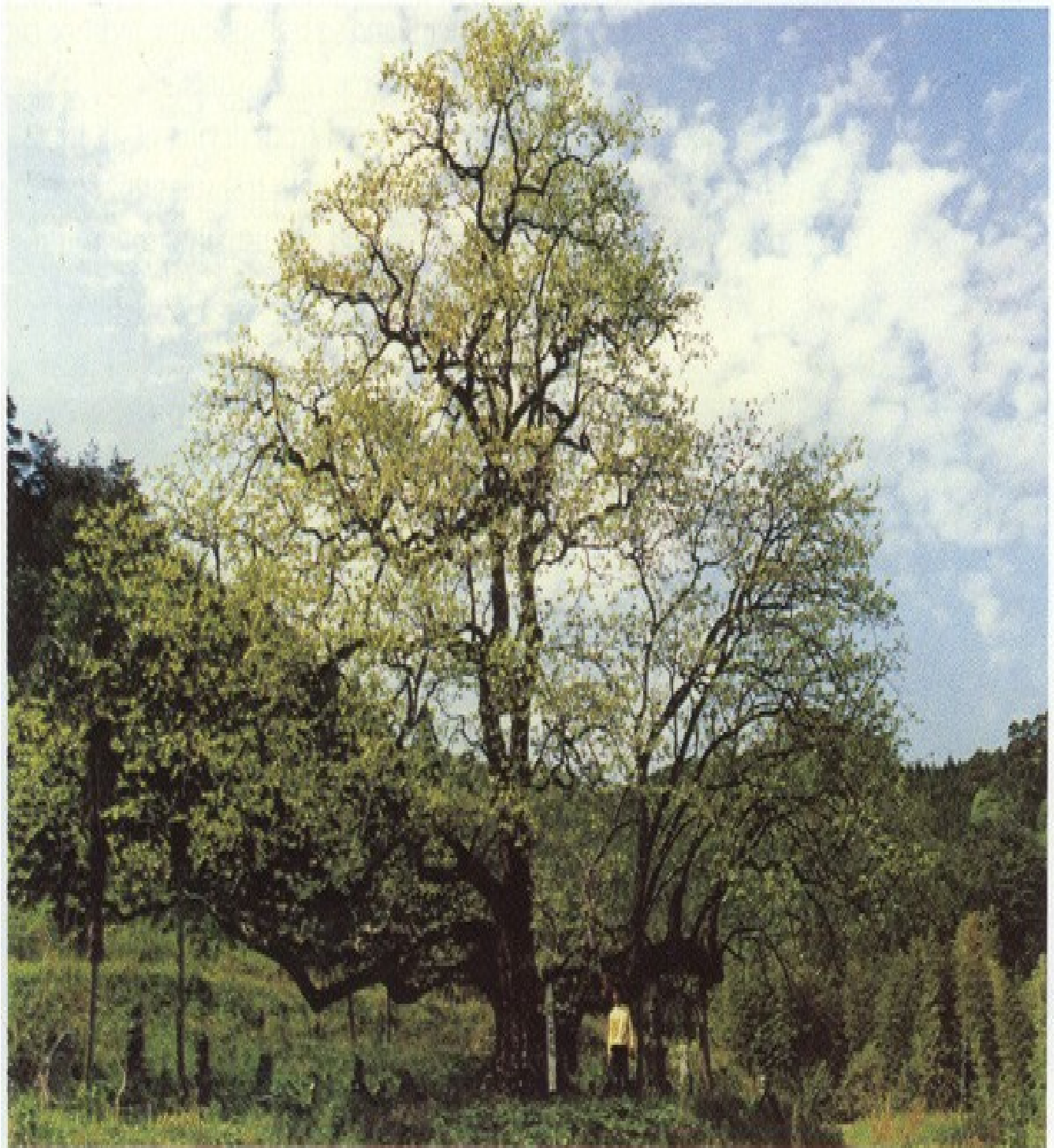


Photo of 600 year old grafted persimmon tree in Japan
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Note to reader:

This is a work in progress. Comments and notice of typos can be sent to alexis@conev.org

What Works, What Doesn't

The purpose pamphlet is the guide the small-scale orchardist in how to propagate a diversity of fruiting plants. I wrote this pamphlet because I have found the information regarding grafting and other propagation techniques to be scattered and confusing. While one can find particular instructions in the propagation of a particular tree, finding a concise compendium of information about how to propagate a diversity of plants is not easy. Grafting techniques are best learned with hands-on work. With the use of this pamphlet, you should be able to avoid many time-consuming mistakes, and hopefully you will know where to look for further information.

One caveat is in order. I am not an old man who has spent a lifetime propagating fruit trees. I have worked with fruiting plants all of my life. For the last 10 years, I have tried to learn how to propagate all of the plants I want to grow. After much effort and failure, I have achieved a high success rate at many different propagation methods. I will notify the reader in those areas where I have little experience.

Rules for Successful Propagation

Any fruiting plant can be propagated with relative ease and a high success rate ***provided you use the method(s) best suited for each plant.*** For each plant, there are one or two methods that work well, and many methods that do not work at all. Knowing which methods of propagation to use with which plant is what makes it all work. The problem is that many people may not know how graft, so they try to apply what they know. The home grower may know how to plant seeds or root cuttings, so they plant seeds or try to root cuttings for plants that are normally grafted. In some cases, this can work. In other cases, it is a complete waste of time. Within the limits of my experience, I will tell you what works, regardless of whether it is the orthodox method.

Propagation Methods

Fruiting plants can be propagated by planting seeds, rooting cuttings, layering, and grafting. (There are some more exotic techniques, like tissue culturing, that are applied at the commercial level, but that is not our concern here.)

Growing From Seed

Some fruiting plants can be grown from seed with reasonable reliability, some cannot. Generally, planting from seed is as simple as putting the seeds in the ground

and waiting. There are few things one must take into consideration.

1) Some seeds are very vulnerable to drying out. Cherries and pawpaws both fit in this category. In this case, do not leave the seeds sitting in your house for months. Plant them soon after they are removed from the fruit, or store them over winter in your refrigerator in a bag of moist peat or soil.

2) Most seeds need to know what season it is in order to sprout at the right time. If you keep your seeds in your warm house all winter and plant them in the spring as if they were vegetables, they may not have experienced sufficient cold to convince them it is really spring. The solution is to either plant outdoors and let the seeds experience a natural winter (the easiest solution), or put them in the refrigerator over the winter.

3) Some seeds can take a couple of years to sprout.

4) Seeds from commercial fruit you buy at the grocery store may have low fertility or may not be viable at all. If you want to plant seeds from that favorite peach variety, plant lots of them, not just one or two.

5) Some fruit trees do NOT come true to seed. You may plant a cherry pit from a big, sweet cherry, and ten years later you may get small bitter cherries from the tree you have nursed and cared for all these years. This pamphlet tells you, within the limits of the author's knowledge, which fruiting plants can be grown from seed.

Given these various considerations, and if you have determined that a desired fruit can be grown from seeds, the simple method is to simply put them in the yard in the ground and keep an eye on them. They will experience the seasons and stay damp without intervention on your part, and hopefully, will sprout the following spring or summer.

Rooting Cuttings -- A Simple Home Method

With some slight variation, the practice of rooting cuttings is the same for whatever plants you should choose to root. Some plants cannot be rooted in any reasonable manner and are best propagated by other methods.

Understanding commercial rooting procedures is useful as it informs the methods used by the home grower, even if one has no desire to invest in the equipment necessary for commercial scale rooting. Rooting cuttings on a larger scale is done in misting beds. The temperature must be warm enough for the plants to be active. A well-drained rooting medium is used, often perlite. A device is used to measure the humidity in the air. Humidity levels are kept very high with misting nozzles that come on periodically and spray mist over the rooting beds. The perlite allows water to drain away easily. The cuttings cannot dehydrate in this situation because of the near constant supply of fresh water. The stems in the perlite have access to water, but are not in a water-logged medium that would promote rot. The misting beds are kept in mild shade or under translucent -- not transparent -- shelter so they do not receive harsh, direct sunlight. Many plants that are hard to root can be rooted in a

misting bed. Sometimes other rooting mediums are used. Blueberries may be rooted in peat moss instead of perlite.

If you don't want to go to the trouble to set up a misting bed, you must mimic the same conditions. A very low-budget rooting procedure is as follows:

- 1) Determine if the desired plant will root from cuttings. If it will, take a cutting in the late spring or summer. The ambient air temperature must be warm enough for the plants to be active and growing before and after you take the cuttings. Cut a branch from a few inches to a foot long, and remove all of the leaves except for one or two small ones at the end.
- 2) Put some well-drained rooting medium in a flower pot. I use a mix of perlite and sand most often, but other options may work. Make sure your pot has holes at the bottom that will drain. Leaving cuttings in a puddle of water is the surest way to make them rot. Place your cuttings in the pot(s). Label them as necessary.
- 3) Water the pot thoroughly.
- 4) Put a clear or translucent bag over the pot(s) so that the bag covers your cuttings. Tuck the bag under the edges of the pot. Soon after the bag is placed over the pot, the air inside the bag will become super-humidified. This will prevent the cuttings from drying out.
- 5) Put the pot with the bag over it in FULL shade. A tree in the yard will work, or up under the eaves on the north side of the house. Ideally, rooting conditions are both warm and shaded, do don't put them in a cool spot, and don't start too early in the spring.
- 6) If you use a rooting mix with a lot of perlite, you may need to add water after a few weeks. Often cuttings can be rooted without any additional water until they ready to plant in real soil.
- 7) Depending on what you are rooting, it may take 4 to 8 weeks. After a few weeks, gently remove the bag. If the cuttings are dead, go back to step one and try again. If the cuttings have green leaves or new growth, leave the bag off for a few hours. If the leaves do not wilt, then you probably have roots and can transplant. If the leaves do wilt, then add a little water and put the bag over the pot for another week or two. Once the cutting has established roots, the bag can be removed and the leaves will not wilt.
- 8) Once your cutting has roots, transplant it to a pot with good potting soil. Leave it in the shade. If it remains unwilted, begin to move it slowly into stronger sun. I usually start my cuttings at the base of a tree. Once the cuttings are potted in good soil, I move them out from the base of the tree a little further each day. Over the course of a couple of weeks, the plants can be transitioned to full sun. Once they have strong roots in their new pot, they can be transplanted to any suitable long term home.

Layering

Layering is simply another form of rooting, except in this case one leaves the

branch or vine to be rooted attached to the mother plant while rooting takes place. Layering can be effective on numerous plants that will not root using the plastic bag method described above. There are at least two different ways to layer plants, ground layering and air layering.

Ground Layering

To ground layer a plant, simply find a branch near the ground, and pin it to the ground using a rock or whatever is convenient. Cover a portion of the branch with damp soil or mulch. Keep the soil or mulch watered. In some cases, the success rate of layering can be improved by scraping the bark lightly in the area where you want roots to grow. If one scratches the bark of a plant, under the brown bark one finds a layer of green, then white or light colored wood. In between the bark and the wood is a single-cell- thick layer called cambium. This cambium is the part of the plant that grows, creating bark on the outside and wood on the inside. The cambium is like the "stem cells" of the plant and is capable of growing new bark, wood, or roots. By exposing the cambium to soil, the cambium may be encouraged to grow roots.

If there are no branches near the ground, a branch or vine can be fed through a hole in the bottom of a pot, or the top of an upside-down soda bottle with the bottom cut out and filled with soil to hold moist soil around the branch. One can tie up or prop up the pot. If you take this approach, you will need to water your pot often as it will dry out quickly.

Layering must be done in the warm seasons when the plant is active. It may take from several weeks to a couple of months depending on the plant. Once roots have formed, the branch or vine may be cut from the mother plant and moved to a desired location. Beware the new root may be too small to support many leaves. Removing some of the leaves or shortening the branch prior to transplanting may be beneficial.

Air Layering

from

<http://www.learn2grow.com/gardeningguides/propagation/techniques/LearnHowToAirLayer.aspx>

Air layering is a tedious method of rooting that is used for certain difficult to root plants.

- 1) After selecting the branch you want to propagate from, come down 12 inches from the tip of the branch and make two parallel cuts 1½ inches apart with a sharp knife. Don't cut through the branch! Just cut deeply enough so the outside bark peels off. (What you're going for is an exposed wound.)

- 2) (optional): If you'd like, add a little rooting hormone to the wound to speed up the rooting process.

- 3) Wrap the wound with moist sphagnum moss (or potting soil), then cover it with

plastic wrap to form an airtight pouch. (Note: This is the hardest step – and it can be amusing just trying to keep the moss from falling off the limb while getting the plastic wrap securely around it. To make the task a bit easier, place the moss or potting soil in the plastic wrap first, then wrap both around the wound at the same time.)

4) Tie the rubber bands around the ends of the plastic wrap. (So now you should have a ball of moss wrapped in plastic wrap around the wound.)

5) Cover the plastic wrap with aluminum foil. The foil protects the wound from sunlight in two ways: First, it prevents sunlight from destroying the hormone that causes rooting. Second, it reflects sunlight and keeps the rooting area from getting too hot.

And then you wait (and wait). To determine if a cutting is fully rooted, periodically check it by removing the aluminum foil to see if roots have grown to the edge of the plastic.

6) Once you've determined that the cutting is fully rooted, it's time to plant your baby plant. First you need to cut the baby off of the mother plant below where your pouch was located. Then plant your new plant in a pot using the appropriate potting mix, or plant it outside in a desired spot. It may be desirable to trim a few leaves off of the new plant when transplanting. Keep the new plant well watered until it can establish strong roots.

Specialty Rooting Methods, The Toothpick Method and Tubering (For Blueberries)

Some plants are difficult to root. Blueberries are popular, but will not root using the aforementioned plastic bag approach. Commercially, they are rooted with misting systems in peat moss. If you want to root them at home, there are two methods that have been established for rooting blueberries and other difficult to root plants.

The Toothpick Method

(From gardenweb.com)

1) In August, select the stem from which you wish to take a cutting. Look along it until you locate a bud on last year's growth.

2) Place the block of wood behind that point and make a single vertical cut all the way through the stem, just below the bud.

3) Insert a toothpick through the cut.

4) Mark each cutting with colored yarn/tape so that you can locate it at a later date.

5) Walk away from your toothpick cuttings until the end of October or November. Leave them alone!

6) You will note that a callus has formed where you wounded the cutting and inserted a toothpick. With sharp pruning shears remove the cutting just below the toothpick. Trim off the toothpick on either side of the cutting.

7) Dip your cuttings in rooting hormone and set them in a cold frame. (Author's

note, there is a diversity of opinions about the efficacy or desirability of rooting hormone.) Water well and close up the frame for the winter. Water as needed. If you do not have a cold frame, set the cuttings right next to your house foundation on the east or north side. Lean an old window or glass pane up against the foundation to protect them.

8) Rooting should take place by mid-spring. Those with greenhouses can leave the cuttings on the mother plant into December/January before setting them to root. Commercial propagators will find this useful.

A Variation of the Toothpick Technique

This method requires a bit of practice but works well. In August/September select the stem to be used as a cutting. Locate last year's growth on the stem and grasp it between thumb and forefinger. Snap the stem lightly until it breaks in half. Leave it hanging on the plant where it will callus. Then follow instructions above for setting cuttings. Snip the cutting off, when callused, at the wounded part. This is a useful technique for azaleas and many woody shrubs and Japanese maples

Tubering (for Blueberries)

from http://www.gardenology.org/wiki/Blueberry_culture

Cuttings are made in late winter or early spring, and the whole plant may be used, including old stems an inch or more in diameter. With a saw and knife cut the wood in pieces about 4 inches long. Lay these horizontally in a shallow, well-drained box containing a bed of clean sand and cover them with half an inch of the same material. Water the sand well, cover the box with glass, and keep it at a temperature of 60° to 65°, or less if the equipment does not permit the maintenance of such a temperature. The sand-bed must be kept moist, although if there are only slight apertures beneath the glass, a second watering may not be required for several weeks.

At the temperature already specified, shoots should begin to appear above the sand within six weeks. The boxes should then be placed in good light but protected from direct sunlight, and, when warm weather approaches, they should be given the coolest situation available so as to keep the temperature below 65° as long as practicable. When the first shoots have stopped growing and their foliage has turned to a mature green color, they are ready to produce roots.

A half-inch layer of finely sifted rotted peat should then be added to the surface of the sand-bed and thoroughly wet down with a fine spray. The box should remain in this condition, with a glass or plastic covering to maintain little ventilation but a saturated or nearly saturated atmosphere, until new shoots cease to appear. Meanwhile, during the spring and early summer the older shoots will have formed roots between the surface of the ground and the point at which they sprang from the cutting.

After a shoot is well rooted it will make secondary twig-growth, and if the development of roots has not already been ascertained by direct examination, the making of such secondary growth is good evidence that rooting has actually taken place. If the rooted shoots have not already disconnected themselves from the dead cuttings they should be carefully severed with a sharp knife. They are then potted in 2-inch pots in the standard blueberry soil mixture of about of clean sand and sifted peat. During a period of three or four weeks they should be gradually changed from their saturated atmosphere and full shade to open air and half sunlight. If preferred, the shoots may remain in the original cutting-bed until the following spring, before potting, the cutting-bed being exposed to freezing temperatures during the winter.

Grafting

Grafting encompasses many different techniques for attaching a branch (referred to as a scion) of a desired fruiting plant onto the roots and trunk (referred to as rootstock) of another plant. There are many different kinds of grafts, each with a different name. All of these techniques are essentially variations on the same procedure, with each shape of cut given a different name as if it were a different procedure entirely. That makes for unnecessary confusion.

Cambium is the active, growing layer of a plant in between the bark and the wood. If the cambium of a scion and rootstock of two plants of the same family are brought into contact when the plants are active and conditions are right, then the cambium will form a bridge between the two pieces of wood and grow together. From there, the cambium can heal all around the cut area, and eventually grown the scion into a whole new tree. There are a number of variables, and some luck, that can cause grafts to succeed or fail. But there are a few factors that **MUST** be correct in order for a graft to succeed.

Rules of Grafting

For a graft to succeed, the following things must be true: rootstock and scion must be of the same family of plants, rootstock must be vigorous, scion wood must be gathered and stored in winter when it is dormant, grafting must occur when the rootstock is active and growing, and post-graft care must protect the graft from dehydration and allow the tree to recover.

1) The rootstock and scion must be of the same family. Any pear scion can be grafted to any pear rootsock, but a pear scion cannot be grafted onto an apple root. (Some disparate root/ scion combinations may grow together in the short term, but will not make a viable tree.) Even within the same family, some rootstocks work better than others. Some pear rootsocks may support Asian as well as European pears with full vigor, some may not. If you are buying rootstock, ask about compatibility. If you are collecting or using rootstock from the wild or from friends,

you can either do some research or take your chances. Mostly, within the same family, grafts will work. Sometimes productivity may not be optimal if the root-scion combination is not fully compatible.

2) For all grafting methods, scions must always be collected in the winter when the wood and buds are dormant. Scions should be kept in a plastic bag in the dark in a cool place. At the back of your refrigerator is a good spot. The scions must not be allowed to dry out. Some people wrap the scions in a damp paper towel before putting them in the bag. Others believe this extra moisture supports fungal growth and is not desirable. The cut end of the scions can also be sealed with wax and the whole scion treated with an appropriate fungicide, especially if very long term storage is intended. Scions are usually taken from healthy, first year growth. Try to get stems with only leaf buds and not flower buds if that is possible. (Sometimes it can be hard to tell the difference.) The one exception to this rule of winter gathered scions concerns sweet cherries, to be discussed below.

3) Only healthy, vigorous rootstock will take a graft. If you have sickly or slow growing rootstock, attempting to graft is a waste of time. Also, larger rootstock is generally stronger and will have a higher success rate. Some hard to graft plants (such as pecans) will not work well on rootstock smaller than the diameter of a dime.

4) Control of dehydration is critical before, during, and after a graft is made. Shade is your friend. Post graft care is critical. Even after the graft has "taken," the plant is still vulnerable to dehydration. With potted plants or bare rootstock, they must be shaded and over time moved into full sun, not placed in full sun immediately. With outdoor plants grafting is best done in the spring before the weather gets too hot. Fully wrapping the scion with parafilm can also improve the success rate of outdoor grafts.

5) The timing of grafting must be adjusted to each plant, and it must occur when the plant is active. Grafting cannot succeed on dormant rootstock. For instance, apples become active early in the spring, and are best grafted in early spring. (April or even March in VA.) Whereas persimmons should be grafted in late April or early May, and pawpaws should be grafted in mid May. Grafting can commence once the rootstock has visible growth.

Other Considerations of Grafting

1) Some grafters are more careful than others about keeping their tools and materials clean and sanitary. It is certainly a good idea to keep some rubbing alcohol in your grafting kit. Keep your knife or razor reasonably clean. Some grafters will even wipe the bark of the scion and rootstock with alcohol, most do not. Avoid touching the cut part of plants with your fingers.

2) A sharp knife cuts more cleanly and does less damage to the cells of the plant than a dull knife, thus making it easier for the plant to heal. Surgeons use very sharp scalpels for similar reasons.

3) Grafting can be accomplished with many different kinds of tape. Historically,

grafters used waxed thread. One can use any moisture impermeable tape such as freezer tape (which looks like masking tape but is more moisture impermeable), electrical tape, strips cut from plastic bags, flagging tape, commercial grafting tape, or parafilm. Some tapes, such as electrical tape, have to be cut (not removed) parallel to the stem of the plant after the grafted plant has begun growing in order to prevent constriction. Other tapes, such as freezer tape, will simply weather off. Other tapes are sufficiently stretchy that they pose to construction risk. Parafilm is stretchy, highly versatile tape that is well worth the extra trouble if you are doing any serious amount of grafting. Parafilm can also displace the need for grafting wax or latex sealants, and thus simplify your tool collection. In some cases, it is not necessary to wrap the whole scion in parafilm. But rather than assess when conditions are right, the easy rule of thumb is to simply wrap every scion fully in parafilm. The parafilm stretches as you use it, so the final wrap is thin and buds easily push through it.

4) It is often helpful when grafting, particularly if grafts are made to larger rootstocks, to maintain a small branch or some leaves below the level of the graft. This "nurse branch" will serve to help keep the rootstock alive. It will be cut off later when the new scion grows.

Grafting Techniques

Different shapes of cut are useful depending on the relative size of rootstock and scion, the volume of grafts being made, and personal preference. Some grafts work well if the rootstock and scion are of similar diameter, other methods are designed for putting small scions on large rootstock. Nonetheless, the timing, importance of cambium contact, and the need for protection from dehydration are the same regardless of grafting procedure.

Whip and Tongue Graft

The whip and tongue graft, sometimes referred to as bench grafting, is a very common graft used to connect a rootstock and scion of similar size. The popularity of this graft relates to the fact that the cut is easily made and of simple shape. It is the standard graft used in mass production of fruit trees historically, though grafting tools are now more common. The disadvantage of the whip and tongue graft is that it is structurally weak. For this reason, I prefer the saddle graft. But saddle grafting is a slower, more complex cut, and is not suited to high-volume production.

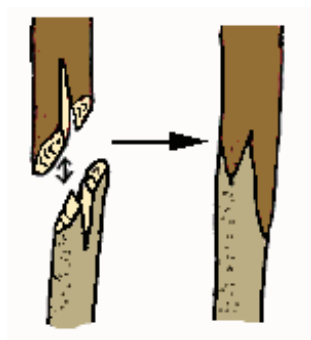
Both the rootstock and scion should be of equal size and preferably no more than 1/2 inch in diameter. One can make whip and tongue grafts on standing plants in the ground, or on purchased rootstock. If using purchase rootstock, handling the roots is easier before they are planted.

Take a scion of similar size to the rootstock. Cut it down to 2-3 buds. Starting at the

upper end, stretch and wrap parafilm over the cut end and then down around the whole scion, covering buds and all. Leave an inch or so at the bottom of the scion uncovered. Alternately, instead of wrapping the whole scion in parafilm, the top end of the scion can be covered with latex grafting sealant or vasaline. Full coverage with parafilm is better for grafting in outdoor, unprotected conditions.

Make similar, angled cuts on both the rootstock and scion. The length and angle of the cut should be of similar length on both rootstock and scion. Although it is ideal to make the cut with a single draw of the knife, often one has to "whittle" the cut. Try to keep the cut as flat as possible, not lumpy or ragged. A very sharp knife helps.

Next, hold the scion in your hand with the angled cut facing up at the end of your first finger. Place the knife edge 2/3rds of the way up the cut. (Intuitively, one wants to put the notch in the middle. That doesn't work.) Gently, without deeply cracking the wood or cutting yourself, open a cracked notch. Put the same notch in the rootstock. Then slide the rootstock and scion together, as with the image below. Make sure the cambium of the scion is touching the cambium of the rootstock on at least one side of the cut. Do NOT place the scion in the middle of a larger rootstock cut as the cambium will not touch on neither side. The cambium has to grow together for the graft to succeed.



Starting below the cut on the now-attached rootstock and scion, wrap the cut tightly with tape. If you used parafilm on the scion, wrap all the way up to the parafilm on the scion. Cut a thin rubber band and wrap that over the graft. The rubber band pulls the graft together and allows better cambium contact. Label your plant with the variety name.

If you have bare rootstock purchased from a nursery, put it in a plastic bag and in moderately warm spot, but not in direct sun. After 10 days or so, you should see buds starting to swell on the scions. The grafting procedure may be repeated on failed grafts.

If you are grafting potted plants, put them in a warm spot out of direct sun until they start to grow. If you are grafting outdoor plants, one simply has to wait until they

become active, and then graft. Grafting should be commenced as soon as the rootstock shows signs of growth. Waiting even a week or two may push you out into warmer temperatures and cause graft failures from dehydration.

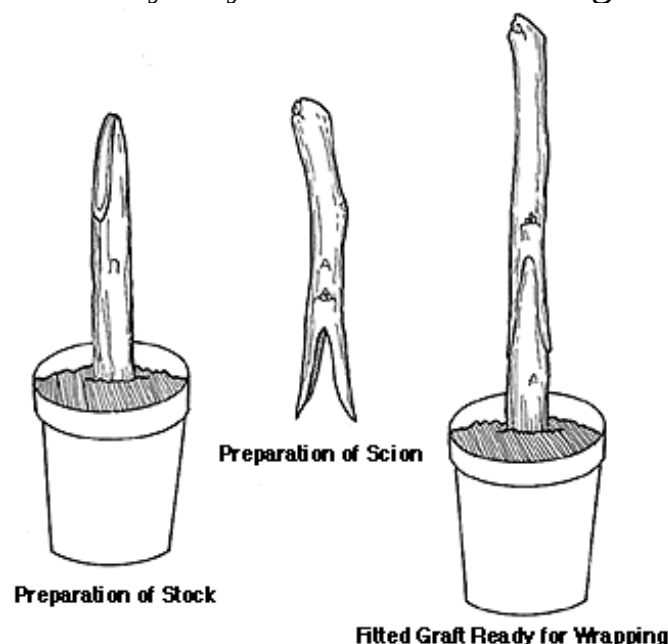
Post graft care is critical. Protect your plants from too much sun exposure too quickly. With bare rootstock, they can be potted or planted out once they start growing, but shade them or otherwise protect them from harsh drying conditions.

Saddle Graft

Saddle grafting is my preferred technique for grafting rootstock and scion of similar size. The cut is a bit more difficult to make, but the improved structural connection makes for a higher long-term success rate, and is much better for use with a diversity of plants. There is no greater heartbreak than seeing a healthy grafted tree snapped off when accidentally bumped. The saddle graft is much stronger, and can tolerate a lot more bad luck. Cambium contact is also excellent if the cut is well made.

Cut your scion to 2-3 buds. Wrap the cut tip and all but 1 inch in parafilm. Make a V shaped cut in the scion, and a mirror image V cut in the rootstock. The textbook saddle graft puts an upside down V in the scion. I usually do the opposite and put an upright V in the rootstock. I find the stiffness of the rootstock is helpful and thus the "inverse saddle" easier to cut.

Place the scion and rootstock together, matching cambium on at least one side. Tape up tightly, and wrap with a rubber band. Protect from dehydration and stage the plant into full sun incrementally as you would with cleft grafted plants.



Commercial grafting tools make a saddle graft, though the cut is somewhat more rounded. Good quality commercial grafting tools cost hundreds of dollars. You may

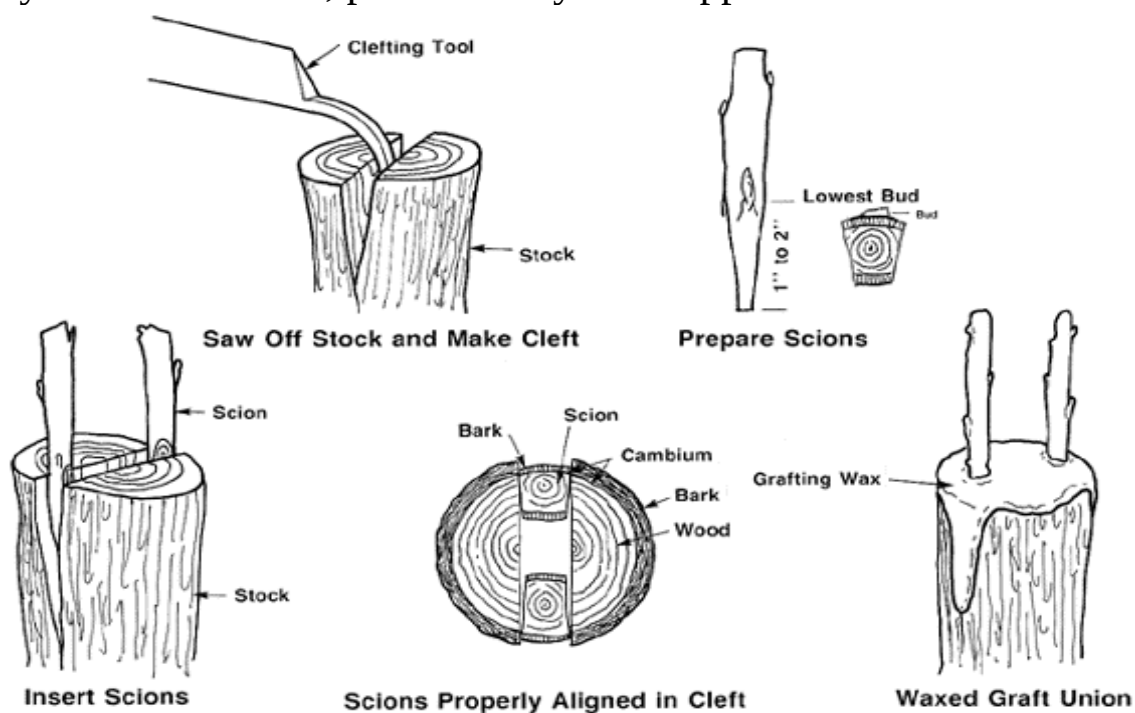
need one if you are planning very large scale production, or if you are doing numerous grafts on fruit trees with very hard wood, such as jujubes. The primary disadvantage of a grafting tool is that the cut is much rougher and the bruising of plant tissue is much worse than can be achieved with a sharp knife.

Cleft Graft

Cleft grafts are perhaps the easiest of grafts to make. Structurally, they are somewhat stronger than whip and tongue, though not as strong as a saddle graft. The cleft graft can be used with rootstock and scion of similar size, but is most often used when the scion is much smaller than the rootstock. Cleft grafts can be used for rootstocks several inches in diameter. The disadvantages of cleft grafts are that cambium contact is reduced. This in theory might lead to a lower success rate, though my experience has been that clefts work just as well as other grafts. The cleft graft also presents something more of a challenge for the plant to heal as compared with whip and tongue or saddle grafts as the bark must bridge a wider expanse of exposed wood.

For a cleft graft, wrap the scion or cover the cut top end with sealant just as you would with other grafts. Cut a wedge shape point at the bottom of the scion. Cut off the rootstock at the desired height. Using a large knife or similar tool, crack open the rootstock. Hold the crack open with the knife, a (clean) screwdriver, or whatever is convenient. Push the scion into the crack at one side aligning the cambium of root to scion. Note, if the root is much larger than the scion, the bark will be thicker. The cambium lies just under the bark, it is not the bark itself. Cambium contact must be maintained.

Commonly, cleft grafts are covered in grafting wax or latex grafting sealant. For moderately sized rootstocks, parafilm may be wrapped around the cut to seal it.



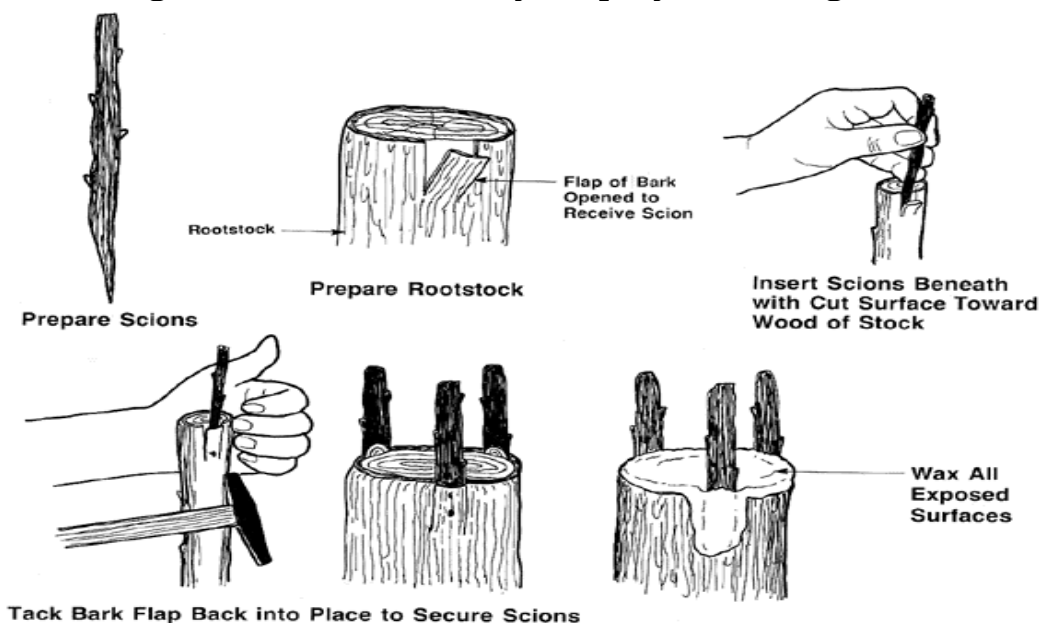
You can put 1 or 2 scions into the clefted rootstock. If you put 2 and both grow, you will need to cut one off. Letting them both grow will lead to weak growth, and one or both will likely be broken of by wind and a later date.

Bark Graft

The bark graft, also called an approach graft, is useful for attaching scions to large rootstock. If you have a moderately mature but unproductive fruit tree in your yard, you can use a cleft or bark graft to convert the tree to a more productive species. Bark grafting can be done with large scions, up to an inch or so.

For a bark graft, if your scion is small, you will need to cut it down to 2-3 buds and wrap it with parafilm as with other grafts. If your scion is very large, you will need to cut it to moderate length (less than a foot) and cover the upper cut end with sealant or parafilm. On the lower end, cut an offset wedge shape with one side of the wedge much longer than the other.

Cut off the rootstock at the desired height. Some grafters make the cut at a slight angle to drain water away from the graft. Hold the scion up to the root to mark the width of the scion in the bark of the rootstock. Make two vertical cuts down the rootstock at the width marks of the scion, approximately the length of the longer side of your chisel cut on the scion. Peel the bark from this cut down slightly. If the bark is not peeling, you are attempting to graft at the wrong time of the year, possibly too early in spring. Push the scion up under the bark. Trim the bark outside of the scion. Tape the scion firmly to the tree, and cover the cut top of the root with sealant or parafilm. If you are using a very large scion, you may need to nail it in place. Wrap a rubber band around at the base of the scion to hold it firmly to the rootstock. Once the scion starts to grow, you may need to brace it. Some fruit woods, such as persimmon, are brittle. Saddle grafted persimmons may break off if not braced. Other structurally stronger grafts, such as the saddle graft, have some benefit in the regard, but are not easily employed on large roots.



Chip Budding

Chip budding is a grafting technique that can be employed to a wide diversity of fruit trees. The advantage of chip budding is that you can make efficient use of scions if you have a limited supply. You can make a new tree from each bud on your scion wood. The disadvantage of chip budding is that the tree gets off to a slower start. Chip budding is not done with very large, thick-barked rootstocks.

Wrap some tape/ parafilm around your rootstock just below where you intend to make the graft and let it hang there. Cut a shallow, V-shaped notch into the bark of the rootstock where one side of the V is much longer than the other. Take your scion, and cut under a single bud, then cut below the bud to make a chip the same size as the notch you made in the rootstock. Put the chip from the scion into the cut on the rootstock maintaining cambium contact on at least one side. Using the tape that you started to wrap below the chip bud, wrap up and over the chip. Parafilm is strongly preferred for this procedure as you can wrap right over the bud and bud will push through the parafilm. Wrap a rubber band around the bud to hold it firmly to the rootstock, but do not cover the bud itself. The bud will need to grow.

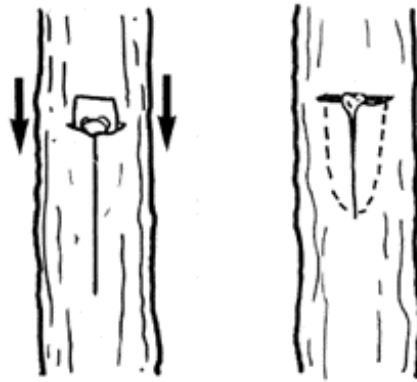
If the plant is movable, put it in a shady spot until the new bud starts to grow. When the new bud starts to grow, cut off the rootstock above the level of the bud and transition the plant incrementally to full sun. If you wish to chip bud on established outdoor plants in full sun, then do so before the summer heat. The bud may also be temporarily shaded by a tin foil "hat" wrapped around the stem of the plant but open at the bottom to prevent heat build up. The illustration below shows how the chip fits into the rootstock.



T Budding

T-budding can be applied to a variety of fruit trees. Citrus is propagated largely by t-budding. T-bud grafting must be done when the plants are active and bark readily

slips or separates from the wood. To make a t-bud graft, first make a vertical cut in the bark of the rootstock. At the top of the vertical cut, make a horizontal cut to form a T. Cut a chip from your scion wood in a similar fashion as you would to make a chip bud, but start below the bud with your first cut, and remove it from the scion with a second cut above the bud. Gently peel back the bark a bit on your rootstock at the top of the T, and slide the bud under the bark. Tape over the bud with parafilm or some other tape. Do not cover the bud itself if you are using any tape other than parafilm. When the bud starts to grow, then the top of the rootstock may be cut off and the plant transitioned to full sun.



Four-Flap Graft for Pecans

The four-flap graft, also known as banana graft, was developed especially for pecans. It can be used for other nut and hardwood trees. The four-flap graft is more complex, involving more steps, than other grafts. But the novice can achieve high success rates if you follow the steps carefully.

Your rootstock and scion should be nearly the same diameter, and both should be between the size of a dime and a quarter in diameter. Scion wood is collected in winter and stored in the refrigerator in a plastic bag. Grafting occurs in the spring, when the leaves on the rootstock are small. The bark should slip at this time, peeling easily away from the wood when a cut is made. If you try to graft too early, the bark may not slip and the tree may not be active enough. If you graft too late when hotter temperatures occur, your graft success rate will decline as some of your scions will dehydrate before the graft can heal and grow.

Cut off your rootstock at the desired height. It is desirable to leave a branch below the graft that can leaf out and serve as a "nurse branch" to keep the tree alive and healthy until the scion can grow. You can adjust the height to achieve a more accurate match between scion and rootstock diameter. Put a rubber band around your rootstock, doubled over and rolled down 2-3 inches.



Figure 1

Make four cuts down the side of the rootstock, evenly dividing the bark into four strips that can be peeled like a banana. Cut your scion wood so that you have several good buds. Hold your scion wood up to the rootstock, and using tape or some other means, mark the length of the cut made on the rootstock on the scion wood.

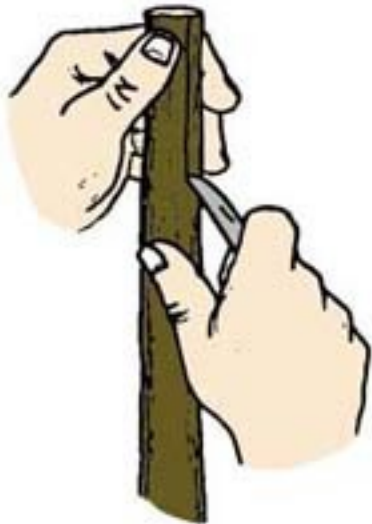


Figure 2

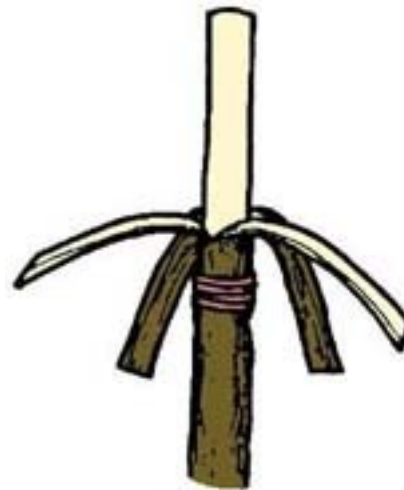


Figure 5

Peel the bark down and cut out the wood in the center.



Figure 6

Wrap the scion from the top with parafilm, covering the top and the buds, but leaving the area below the mark you made exposed. Take your scion wood and, starting at the mark you made earlier, cut away four strips of bark, leaving bark in between each cut. Place the scion on top of the rootstock so that the bark flaps from the rootstock can be folded up to land on the exposed wood on the scion.



Figure 7

Fold up the bark flaps and roll up the rubber band to hold them in place.



Figure 8

Starting below the cut area, wrap upward over the graft tightly with grafting tape. Flagging tape is a stretchy, cheap tape available in any hardware store that works well for this graft.

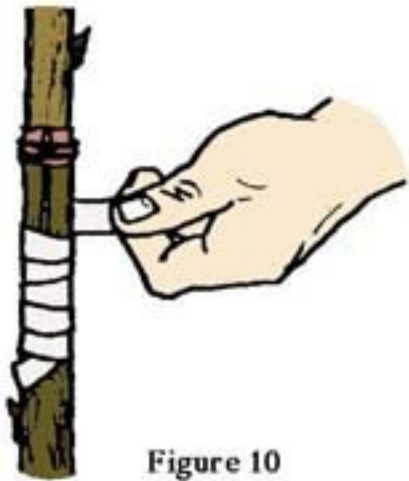


Figure 10

At this point, your entire scion should be covered. Some grafters only cover the top end of the scion with a grafting sealant and do not wrap the whole scion in parafilm. Wrap tin foil snugly over the graft union (NOT over the entire scion.) Assuming this is an outdoor graft, the purpose of the tin foil is to reflect heat and prevent the graft union from becoming overheated. Wrap plastic wrap (a sandwich bag works) over the tin foil, but keep it snug so it does not form an air pocket that can collect heat. This plastic is to keep rainwater out of the graft.



Figure 13



Figure 14

The scion should start to grow in a couple of weeks. If there are multiple buds, trim them to one central leader. Never let multiple leaders compete as they will simply weaken each other.

Making and Finding Your Own Rootstock

There are some advantages and some cautions concerning homemade rootstock. The advantages of homemade rootstock are: it's cheap, it makes you more self-sufficient, you can take advantage of wild plants as rootstock which in some cases have better disease resistance than commercial cultivars. The disadvantages of homemade rootstock are: cultivated rootstock is grown in disease free conditions, there is a proven record of compatibility and productivity, they are easily acquired in high volume.

Your circumstance determines the wisdom of either course. If you are grafting apples or pears and you have time to order rootstock, they are cheap and easily acquired. If you do not have access to purchased rootstock, you can dig a root or a sprout from under an existing tree. If you are grafting plums, plumcots, pawpaws, or persimmons, then wild plum, wild pawpaw, or wild persimmon trees will make good rootstock. In the case of persimmons, almost all commercial nurseries use lotus rootstock. In the southeast, American (Virginiana) rootstock is arguably better, and certainly more disease resistant. In this case, your home-grafted tree would be better than a purchased tree.

I grow my own rootstock for peaches (from seed), pecans (from seed), jujubes (from suckers), apples (from rooted cuttings from M-111 commercial rootstock), pears (from rooted cuttings from commercial rootstock), citrus (from trifoliolate seedlings), plums and plumcots (from American wild plum seedlings), persimmons (from homegrown and wild-collected seedlings), cherries (from seeds from wild cherries that are more durable than commercial rootstock), and pawpaws (from seedlings and sprouts grown and collected).

Appropriate Propagation Methods for Different Fruits

As much as the home grower may want to use the skills they already possess to propagate fruit, using the wrong method on the wrong kind of fruit is a waste of time. ***Every kind of fruit can be propagated at home reliably and easily if you know how to use the right method.*** The following list indicates which methods will work with which fruits. Some methods are ideal and others are simply suitable, as will be noted with each kind of fruit.

Regarding grafting, in the commercial arena, a specific kind of graft is usually preferred for each kind of plant. For example, stone fruits are normally bud grafted, while apples or pears are normally grafted with a "whip and tongue" graft. These techniques are used because the cuts are fast and easy to make. For commercial producers, labor costs are a significant consideration. For this reason, grafts that are more difficult or slower to make are not favored even if they are more reliable. For

the home grower who is grafting a very small number of plants, more reliable, if more time-consuming, grafting techniques might be desirable. Usually, but not always, any grafting technique can be applied to any plant. Some techniques will work better than others on particular plants, and the technique that works the best may or may not be the technique that is the industry standard. In general, bud grafting is the weakest form of grafting because the scion is reduced to a single bud. Other forms of grafting are preferred for the home grafter, even if they are not the industry standard.

Peaches

All stone fruits, including peaches, are normally chip bud grafted. However, other grafts (saddle, whip and tongue, etc) performed in the spring will likely give more vigorous results. Sometimes peaches are grafted onto plum rootstock. Contrary to conventional wisdom, peaches can be grown from seed. They will not have the uniformity of ripening time that is preferred by commercial standards, but seed grown peaches will most often make a peach that is similar to its parents and quite tasty. Peach pits from commercial peaches that you buy from the grocery store will have a very low fertility rate. You may have to plant many to get one or two trees.

Apples

Apples are one of the easiest trees to graft, and rootstock is cheap. Any grafting method may be employed. You can also dig up roots from under your favorite apple tree and use them as rootstock, though it should be considered an option of last resort. Conventional wisdom is that they do not come true to seed.

Pears

Pears, like apples, are easily grafted using most any grafting method. Conventional wisdom is that they do not come true to seed.

Sour Cherries

Sour cherries are usually propagated by chip budding. However, other grafts (saddle, whip and tongue, etc) performed in the spring will likely give more vigorous results.

Sweet Cherries

Sweet cherries are usually propagated by chip budding, but some varieties can be difficult. For hard to graft varieties, they may respond better with fall budding. In this case, the graft is made in September and the grafted bud remains dormant for the entire winter, starting to grow in the spring. In this circumstance and only in this circumstance, scion wood is gathered in the summer or fall immediately prior to bud grafting. Other grafts (saddle, whip and tongue, etc) performed in the spring will also give vigorous results. Sweet cherries will not root easily, and they do not come true to seed. Perhaps they cross pollinate with popular flowering cherry varieties. In any case, seeds from wonderfully sweet cherries often grow trees that

produce inedible cherries.

Mulberries

Mulberries can be propagated by grafting. They can also be rooted using home methods, but the success rate is not high. Given the ease of setting them up for rooting, such low success is not a hindrance.

Figs

Figs are perhaps the most easily rooted of fruiting plants. There is no reason to consider any other propagation method.

PawPaws

They may be propagated by seeds or grafting. They can be grafted by any method except T-budding. They will come reasonably true to type with seeds, though the seeds may take a very long time to sprout. Also, the seeds can dry out and die, so they should not be stored in your house for any length of time. Pawpaws are late-starting trees in the spring, so grafting is also occurs at a later date than most other trees.

Persimmons

Persimmons are propagated by grafting. American persimmons will come true to seed for the most part. Asian persimmons appear to be less true to type when planted from seed. Also, seed grown Asian persimmons may suffer disease problems in the roots. Persimmons, like pawpaws, are late starting trees, so grafting occurs much later than other trees like apples or pears. Most any grafting technique may be used.

Blueberries

Blueberries cannot be rooted using normal methods no matter how skillful or lucky the gardener. There are two methods of home-rooting blueberries, referred to as "tubering" or "the toothpick method." As mentioned above, these are the methods that will work for the home grower.

Raspberries

Raspberries send up many new plants in the spring. These can be dug up and transplanted. Raspberries do not like heat. Transplant them as early in the spring as you see new growth. They will die if transplanted under hot summer conditions.

Saskatoons/ Serviceberries/ Sarvisberries/ Juneberries

They send up lots of suckers around the base of the parent tree. These can easily be transplanted. Beware that these are slow growing trees. Be patient. It may work best to transplant suckers into a pot that can be kept in the shade until the tree can grow enough roots to sustain itself in full sun.

Nanking Bush Cherries

They can be propagated from seeds, and they also send up new plants from the roots that can be transplanted.

Muscadines And Scuppernongs

Muscadines are propagated most easily by layering. Simply pin some lower vines to the ground and cover them with mulch or soil during the warm months. Muscadines can also be rooted from cuttings, but the success rate is very low.

Grapes

Grapes are almost always propagated from cuttings, though some varieties are far more cooperative than others. Concord grapes root well from cuttings, other varieties do not. If a particular variety will not root from cuttings, then use layering. Grapes can also be grafted relatively easily, though the home grower will find rooting or layering suits most needs.

Blackberries

The thornless varieties are most easily propagated by ground layering. The plants also tend to spread naturally, providing new plants for transplanting.

Gooseberries

Gooseberries are propagated from cuttings.

Currants

Currants are propagated from cuttings.

Che

Che are propagated by grafting, usually onto osage orange rootstock, which is in the same family.

Plums

Plums are usually propagated by chip budding, but some varieties can be rooted as well. However, other grafts (saddle, whip and tongue, etc) performed in the spring will likely give more vigorous results. All of the stone fruits can be grafted onto each other. Plum rootstock is often used for peach trees. Wild American plums come true to type from seed, and may be used as rootstock for other plants. Most of the large plums that you see in the grocery store are Japanese plums. I do not know if they come true to type from seed.

Pomegranates

Pomegranates are easily propagated from cuttings.

Apricots

Apricots are propagated by chip budding or other grafting techniques. I do not know if they come true to type from seed.

Plumcot

Plumcots are propagated by chip budding or other grafting techniques. I do not know if they come true to type from seed.

Fuzzy and Hardy Kiwis

Kiwis of all kinds are easily propagated from cuttings. They can be grafted as well. A sand-perlite mix is recommended as a rooting medium.

Passionfruit

They can easily be propagated from seeds, or from transplanted runner vines that come up in the spring. The runners must be kept shaded after transplanting until they can build some roots.

Jujube

Jujubes are propagated by grafting. They may start late, so grafting may be delayed until the plant is fully active. The wood is very hard and somewhat challenging to cut for grafting purposes. I do not know if they come true to type from seed. They send up lots of suckers from the base of the tree. These suckers can be transplanted and used for rootstock for other jujubes. But beware, do not try to grow out these suckers as fruiting trees as they will produce only very tiny fruit.

Citrus

Citrus is usually T-budded though some varieties can also be rooted. Grapefruit family plants appear to be more often rooted. For potted citrus that is overwintered indoors, grafting onto trifoliolate rootstock gives better performance than rooted plants as the trifoliolate is more active in moderately cool temperatures.

Pecans

Pecans can be difficult to graft. The four-flap method mentioned above was developed especially for use with pecans and achieves a high rate of success. Both scion and rootstock should be between a dime and a quarter in diameter. With large rootstock, bark grafting may also be employed. The four flap graft may also be employed for other nuts and hardwoods. Pecans can be grown from seed, but southern "papershell" varieties will produce trees that grow somewhat smaller, harder nuts when grown from seed.

Filberts

Filberts can be layered, or suckers transplanted from existing stands. New disease resistant cultivars are recommended as many varieties get blight.