



Linking Edible Arizona Forests

Growing Edible Arizona Forests, An Illustrated Guide

Excerpt from *leafnetworkaz.org*

Edible Tree Guide

PLANT Your Trees

- Acquire Your Trees

Acquire Your Trees

Purchase young trees

Trees can be purchased in dirt-filled pots or as *bare root trees*—without dirt around the roots. Young trees are available through nurseries, catalogs and local growers. Buy high-quality trees that come with a guarantee. While it might seem expensive, the cost of a good tree will be the smallest expense of your tree's life. Trees that are one to two years old adapt best to new locations. Choose trees with no signs of disease, damage or lack of vitality. Young trees should be 4 to 5 feet tall with trunk diameters from $\frac{1}{2}$ inch to $\frac{3}{4}$ inch in size. Bare root trees require special care to prevent the roots from drying out, so read and follow the instructions provided with the trees.

Plant tree seeds

You can plant the seeds of native edible trees and many fruit and nut trees directly in the ground. Collect seeds from native trees that have good tasting seeds and pods and that are growing far away from nonnative varieties that might cross-pollinate them. Some seeds need to be chilled (*cold-stratification*) to mimic winter conditions before germinating. Other seeds need physical or chemical abrasion (*scarification*) to break down hard seed coats and allow germination. Seeds can be soaked prior to planting to prepare them for sprouting. Seeds that need light to germinate should be placed near the surface or on top of the soil. Others need to be planted deeper. Soils should be well drained and contain well-composted organic material. Keep planted seeds moist and generally between 65-70°F until germination. For more information on tree-specific seed planting techniques, see the **Edible Tree Directory** at *leafnetworkaz.org*.

While some trees and varieties can be successfully reproduced by seed, other varieties planted from seed might produce fruits that are smaller in size and lower in quality than the parent tree produces. In these cases, desirable fruit tree varieties are reproduced using different techniques of *clonal propagation* to ensure reliable quality fruits.



Fruit trees available for purchase at a commercial nursery.



Blue palo verde seeds include dried pods with seeds inside, dried seeds separated from pods and seeds that have been scarified and soaked and are ready to plant.

Clonal Propagation of Trees

Desirable fruit tree varieties are often grafted onto strong rootstock—a method of *clonal propagation*—to ensure that reliable quality fruits are produced. Many trees can be also be propagated by taking cuttings from healthy trees and rooting these to create clones of their well-adapted parents. In fact, many domesticated and cultivated fruit tree “varieties” are clones of a single individual tree. To preserve desirable tree and fruit characteristics, clonal propagation techniques are often the best choice. These methods include *grafting*, *rooting* hardwood and softwood cuttings taken from the tree, and *layering*—a technique that encourages root growth on a branch that is in contact with soil.

Grafting. Grafting is the most common propagation method for cultivating fruit trees because it preserves the desired tree variety characteristics and is effective for most fruit and nut trees. Grafting involves taking a branch or cutting from a desired fruit variety (the *scion*) and splicing it onto a rooted tree (the *rootstock*). To successfully graft, the inner bark layer (the living *cambium* layer) of the rootstock and scion must touch and be held together tightly until they heal and join. After they are joined, these two genetically distinct plants grow as a single plant. Grafting takes multiple steps, as described in the box.

Scions are selected to yield delicious fruit. Rootstocks are selected based on characteristics such as dwarfing, disease and insect resistance, soil type, cold hardiness and drought tolerance. Dwarfing rootstocks are used in many species including apple, pear, cherry, citrus and others. Some rootstocks are tolerant of poorly drained, heavy clay or saline soil conditions.

Many nurseries provide grafted trees. If you decide to graft trees yourself, make sure the scions and rootstocks you plan to use are compatible. Grafting is usually successful between different varieties within the same species (apple rootstock for an apple scion) or sometimes with different species of the same genera (plum rootstock for an apricot scion). See grafting resources at the end of this section.



Graft union on a young lemon tree. When the tree is planted, the graft union should be placed at least 2 to 4 inches above land surface

STEPS IN GRAFTING

1. Assemble grafting equipment and materials.
2. Use sharp tools and keep them clean.
3. Collect scion material.
4. Review the grafting and budding technique and conduct one that is right for your needs, including *Whip and Tongue Grafting*, *Chip Budding*, *Cleft Grafting* and *T Budding*.
5. Secure the Graft Union.
6. Label the grafted tree.

For more details on grafting techniques, see pages 5 to 7

Planting Trees from Cuttings. Some fruit trees and shrubs will grow from cuttings of young wood that are planted directly in soil. Fruit trees and plants such as olives, figs, pomegranates, currants and grapes can be easily propagated this way. Cuttings may be taken and rooted at two different times of year. *Dormant hardwood cuttings* are those taken when the plant is pruned during the dormant season in winter or early spring. *Softwood cuttings* are taken from the plant in summer from actively growing, leafy branches. Tree cuttings, when successfully rooted, will be a clonal copy of the parent tree.

Take cuttings that are pencil-sized in diameter and 6-12 inches long. Clip the “bottom” of the cutting at a diagonal and be sure this is the end planted in the soil. Dip the bottom end of each cutting in rooting hormone—available as a powder from most nurseries. These cuttings can be planted in pots or in the ground. In pots, use a soil medium that is well drained and includes a mixture of peat moss or well-composted organic matter, plus an inorganic material such as perlite, pumice or vermiculite. Leave one or two buds showing above the soil. In cold times of year, cuttings planted in pots can be placed over a heating pad on low heat to encourage root development. Keep cuttings warm and moist for several weeks. After a year’s growth, cuttings can be transplanted into larger pots or into the ground.



Cuttings from pomegranates being prepared to root in pots.

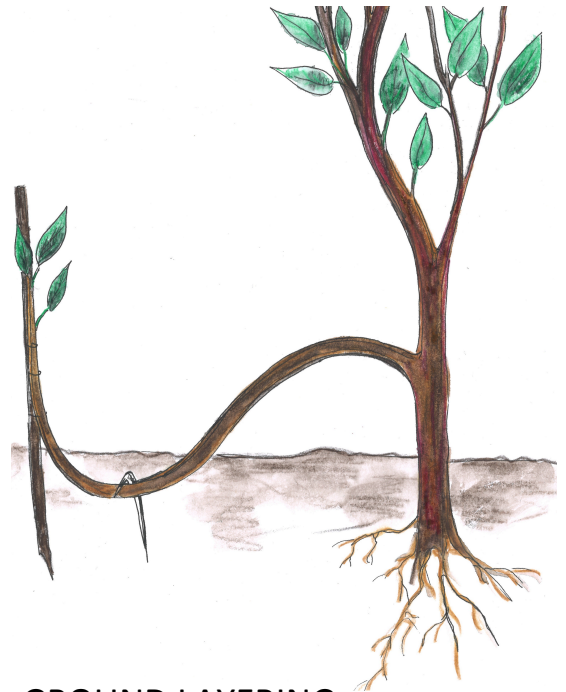


Young pomegranates obtained from rooted cuttings, growing out in pots before being transplanted into the ground.

Layering. Layering is a clonal propagation technique that encourages root growth from a tree branch by covering part of the branch with soil while it remains attached to the parent plant. Some fruiting vines naturally sprout roots when the tips of their vines touch the ground (called *tip layering*). Other fruit types can be encouraged to produce roots by layering dirt over a branch that has been bent down to the ground or over suckers that have been pruned back to the ground.

To conduct *ground layering*, select a long branch from the parent tree that can be bent to the ground. Dig a hole several inches deep and bend the branch into the hole leaving the branch tip exposed above ground. Cut or lightly scored the portion of the branch that will be buried to expose the inner bark, then brush it with rooting hormone to promote rooting. Fill the hole with soil to cover this portion of the branch. After one season's growth, cut the rooted branch from the parent plant and transplant it into a pot or the ground. Early spring is the best time to use this method. Keep the soil moist throughout the year to stimulate root development.

Air layering involves wrapping a moisture-holding medium such as burlap, cloth or mesh to hold a soil medium like peat moss around a section of branch on a parent tree. Before wrapping, lightly score the branch section to expose the inner bark and brush this with rooting hormone to promote rooting. Keep the wrapping and soil medium moist to stimulate root development on the branch. When sufficient roots have grown from the wrapped area, cut the branch section from the parent and plant it in the ground. This process may take anywhere from a few weeks to a few growing seasons.



GROUND LAYERING



AIR LAYERING

ADDITIONAL RESOURCES

Grafting, rooting and layering techniques

- *The Grafter's Handbook*, 6th Edition, By R.J. Garner, Revised by Steve Bradley, 2013 Chelsea Green Publishing
- Texas A&M AgriLife Extension, Plant propagation: <http://aggie-horticulture.tamu.edu/earthkind/landscape/plant-propagation/>
- Missouri Botanical Garden, Propagation of plants by cuttings: <http://www.missouribotanicalgarden.org/gardens-gardening/your-garden/help-for-the-home-gardener/advice-tips-resources/visual-guides/propagating-plants-by-cuttings.aspx>
- NC Cooperative Extension Services, Plant propagation by layering: <https://content.ces.ncsu.edu/plant-propagation-by-layering-instructions-for-the-home-gardener>

SUPPLEMENT ON GRAFTING TECHNIQUES

Why Graft?

- To propagate genetic clones of individual varieties, especially for species that do not propagate well from cuttings.
- To control the size of the fruit tree via grafting scions onto dwarfing or semi-dwarfing rootstocks. Dwarfing rootstocks are used in many species: apple, pear, cherry, plum, peach, citrus and others.
- To combine desirable traits of disease and drought resistance in a rootstock with the desirable characteristics for fruit. Some rootstocks may be tolerant of poorly drained, heavy clay or saline soil conditions.
- To obtain resistance to low winter temperatures. Some species, especially apple and citrus, survive cold winters better on some rootstocks than others.

Tools and Materials:

- Hand pruning shears
- Grafting knife (important to have a thin, sheep's foot blade, where one side of the blade is flat and only one side angled. In this case, right- and left-handed knives are opposite).
- Sharpening stone or 600 grit sand paper (it is helpful to staple or glue sandpaper to a flat piece of wood).
- Aluminum tags (can be cut from empty soda cans)
- Elastic grafting strips
- Parafilm, buddy tape, or plastic sandwich bags and twist-ties
- Grafting wax or sealant
- Ethyl alcohol (sterilizer)
- Grafters' Handbook (optional)

CAUTION: When performing any form of grafting, work slowly and carefully with the sharp grafting knife. Do not cut yourself!

How to Graft

Before you graft, make sure the scions and rootstocks you intend to use are compatible. Grafting is usually successful between different varieties within the same species (apple rootstock for apple scion) or sometimes with different species of the same genera (plum rootstock for apricot scion). A notable exception to this rule is the compatibility of quince and pear. Quince (*Cydonia*) is often used as a dwarfing rootstock for pear (*Pyrus*). Be sure to check the compatibility of your rootstock and scion material. For example, sour cherries should never be grafted onto sweet cherry rootstock. *The Grafters' Handbook*, or the *Fruit, Nut and Berry Inventory* from Seed Saver's Exchange are useful references for determining the suitability of a rootstock for grafting.

1. Assemble grafting equipment and materials

Materials include hand pruning shears; grafting knife with thin sheep's-foot blade, with one side of the blade flat and one side angled; sharpening stone or 600 grit sand paper; metal tags; elastic grafting strips; parafilm, "buddy" tape, or plastic sandwich bags and twist-ties; grafting wax or sealant, ethyl alcohol to sterilize, and you might want a Grafters' Handbook

2. Use sharp tools and keep them clean

Work with clean, sharp tools to ensure the tissue is cleanly cut and contaminants such as oil, dirt, and diseases are not transferred into the graft by the tools or grafter. Isopropyl alcohol is sufficient to kill pathogens; sharpen and sterilize the grafting tool blade when switching between cultivars or every 10 or so grafts. Keep the cut surfaces clean, and do not let them dry out.

3. Collect scion material

Collect dormant scions (cuttings) of year-old growth in winter, before the buds begin to swell. In Arizona, cuttings can be taken in January and grafted until April. Scions should be roughly the size of a pencil, or as close to the diameter of the rootstock as possible with healthy buds. Cut healthy scions 6-12 inches long from branches growing at a 45° angle. Diseased/damaged wood is unsuitable for grafting. After harvesting, label the scions with masking tape and a permanent marker or pencil; bundle scions from one source together. Store scions in damp cloth or paper towels in a sealed plastic bag in the refrigerator until rootstock begins to break bud. 35-40°F is the ideal temperature for storing cuttings. Some people recommend dipping the cut ends of the scions in a latex paint or tree seal to keep in the moisture. After the sealant has dried, you can dip the end in a 10% bleach solution to sanitize the scions. Observe the scions in storage, and if the paper towel has dried, moisten it again. The bag should have dew drops inside. When you take the bag out of storage, the scions should not appear shriveled; the cambium layer should be green when cut. The leaf buds should still be closed.

4. Review the grafting and budding technique and conduct one that is right for your needs

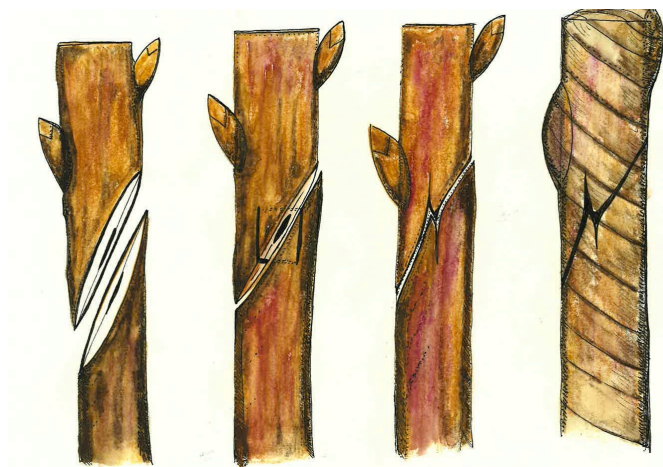
Whip and Tongue Grafting

Select scion material and a rootstock of similar diameter. Use a sharp grafting knife to make a complete diagonal cut across the scion wood, and a matching diagonal cut across the rootstock. Keep the flat side of the knife against the wood. Try to use one smooth, clean stroke for each cut. The faces of the two cuts should match as closely as possible so that the green inner cambium touches around the perimeter when the two ends are pressed together. Remember that the inner cambium is the living material that will heal together—it is very thin and forms a ring just inside the outer bark. The inner cambium must have a long contact surface between the scion and rootstock to make a successful graft.

Make a straight perpendicular tongue cut in the upper third of the exposed face of the diagonal scion and another cut in the lower third of the diagonal rootstock face. These two flaps will lock the joint together and make a more secure and structurally stable graft union. This method is most successful for grafting material that ranges from pencil-sized (1/4 to 3/8 inch) to about 1 inch in diameter. The cambial contact makes it heal quickly and develop a strong union. This type of graft is made in early spring when both the rootstock and scion are dormant (late March to early April). Important Note: Make sure the scion is grafted onto the rootstock right side up (the buds should be pointing up).



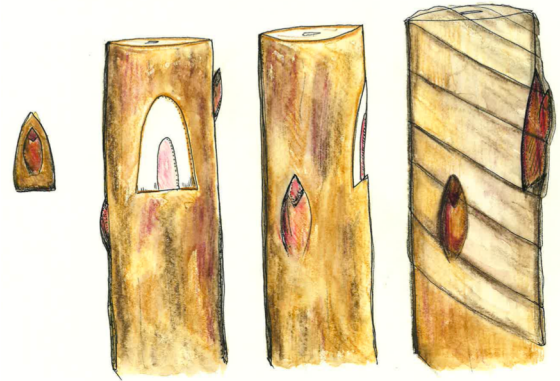
Parts of a scion selected for grafting



Whip and Tongue Grafting

Chip Budding

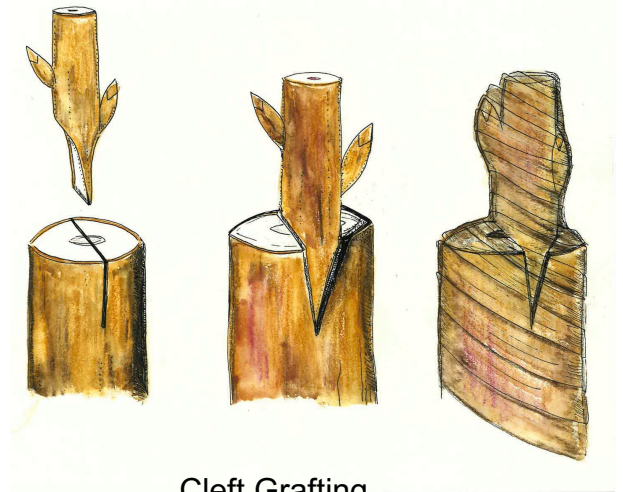
In chip budding, a detached bud of the desired variety is placed under the bark of a rootstock. Buds must be dormant when chip budding takes place. Select healthy buds from year-old wood and slice them cleanly off the branch, including some extra bark around the bud in the shape of a shield. Make a matching shield-shaped cut into the rootstock. Remember to place the shield-shaped vegetative buds point up. Buds are secured in place with grafting tape until the bark heals. This is a very standard method for propagating plants, and it is used more widely than grafting by nurseries.



Chip Budding

Cleft Grafting

This method is usually practiced on older trees to “top-work” new varieties onto the tree. This method is very damaging to the tree, and should generally be avoided. Cleft grafting uses dormant scion wood, and is best suited for branches 1 to 2 inches in diameter. The grafts are made within 2 feet of the trunk or main branches and not more than 4 to 6 feet from ground, or new top of tree will be too high. Make sure to line up the cambium layers to promote successful joining.



Cleft Grafting

T Budding

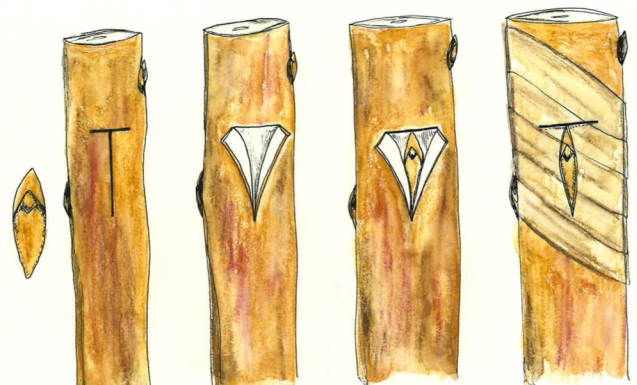
T budding is usually practiced in the fall when the rootstock material is growing and the bark slips easily. Select healthy leaf buds near the tips of growing branches from the variety you wish to propagate. Using a sharp grafting knife, cut a “T” into the bark of the rootstock and peel the bark back. Carefully insert the detached bud into the T.

5. Secure the Graft Union:

Once the scion and rootstock are closely fit together so the inner cambiums line up, secure the graft union with buddy tape or a rubber grafting strip and a piece of parafilm. Seal any exposed cut-surfaces using grafting wax or other tree sealant. In the dry Southwest climate, reduce moisture loss by placing a small plastic bag over the graft union and scion, securing the bag with a twist-tie. Once the scion leafs out and begins to grow, remove this mini-greenhouse over several days, starting by puncturing a hole in the bag to allow the scion to slowly adjust to the drier outside air.

6. Label the grafted tree

Initially label your newly grafted tree using a black marker to write on masking tape placed on the grafts. For grafts that start to grow, replace the masking tape with nursery tags or tags cut from aluminum cans or other thin metal. A sharpened nail can be used to ‘write’ on metal tags.



T Budding