

Grafting

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Agenda

- What is grafting
- Reasons to graft
- Tools for grafting
- Grafting failure
- Grafting aftercare
- Compatibility
- Scion collecting
- Cleft graft (also called Wedge graft) demonstration
- Whip graft (also called whip and tongue graft) demonstration
- Budding - Chip budding demonstration
 - T-budding discussion

What is grafting

Grafting is a method to attached a section of one tree to another tree so that they form a union and grow as one plant.

In this presentation, grafting is used to take a section from a desired fruit tree and attached it to a different tree. The same technique are used for other plants.

The section that is taken from the desired tree is called a scion. For “bud-ding” a single bud is taken from the scion. The scion or bud is a genetic copy of the parent plant.

The tree to which you graft the scion or bud onto is called the stock or root stock. This could be an existing tree or new root stock.

There are two aims of a graft:

1. Get the cambium layers of the stock and scion to be in direct contact.
2. Mechanical support to keep #1 true by holding them tightly together while the graft union forms.

There are many techniques to do this “attachment” or graft with varied amount of cambium contact.

Reason to graft

- Grow varieties of fruit not found in stores
- Grow a cultivar from a relative or neighbor/friend tree where the actual variety is unknown.
- Change variety or cultivar of an established tree
- Fruit from trees grown from seeds in general do not match the parent tree's fruit. Seedlings take a long time to bear fruit. Grafts will bear fruit in 2 to 3 years.
- Obtain the benefits of selective rootstock
 - Dwarfing
 - Soil tolerance
 - Disease resistance
- Harvest timing.
- Cross pollination. Most apple and pear varieties require cross pollination.
- Bloom timing.
- Space saving - one tree multiple varieties.
- Fruit trees are difficult to propagate from cuttings.
- Virus free root stock and scions.
- Repair damage to tree.

Grafting is not new. The Romans did grafting. It is also believed that Magon of Carthage wrote about it in 540 BC.

Tools

Like any activity, you can get specialized tools and equipment for grafting. However, unless you are going to do a lot of grafting you do not need them.

Tools:

- Very sharp knife. An actual grafting knife is not that expensive, but a utility knife with a new blade will work.
- Safety: Finger and hand protection.
- For cleft grafting, a small hammer and a chisel or shaped wood.
- Tying material

Tape (Parafilm and/or Budding).

Grafting bands.

Wax.

- Labels

Graft failure

- The cambium layers are not touching.
- Root stock and scion are not compatible.
- Scion or bud is upside down.
- Scion or bud was not dormant.
- The scion consists of only flower buds.
- The rootstock or scion is dead or has dried out.
- See graft aftercare.

Graft Aftercare

- Inspect the binding of the graft or bud to make sure that it providing a good seal to stop the graft from drying out. Be careful not to knock or move the scion or bud. When doing this inspection do not remove the binding. Let nature run its course.
- If you used any wax, make sure the wax has not cracked or falling off. Repair it if needed.
- If the graft was done with tape that does not stretch, the tape will need to be removed once the graft has taking. Otherwise there is a possibility that the tape will girdle the graft and kill it.
- For Chip and T-budding, once the bud has started growing, remove the part of the stock above the bud.
- Once the graft or bud has started growing, remove all unwanted growth below the graft or bud.

Scion and root stock compatibility

In general you want to graft a scion onto the same type of root stock or tree. It should be in the same genus.

Table 1 is a very short list of the root stocks that are easily available.

Table 1:

Root stock	Comments
M111 (Apple)	Semi-dwarf. Tolerates many soil types and conditions.
M7 (Apple)	Semi-dwarf.
Old Home x Farmingdale (OHxF) 333 (Pear)	Semi-dwarf. Resistant to fire blight.
Bartlett (Pear)	For European pears. Not for Asian pears
Marianna 2624 (Prunus)	Tolerant of wet soils.
Myrobalan 29C (Prunus)	Tolerant of wet soils.
Lovell (Prunus)	Compatible with most Prunus species. Tolerant of wet soils. Peach seeding
Citation (Prunus)	Induces early bearing. Tolerant of wet soils.
Mazzard (Cherry)	For Cherries.

Table 2 lists the compatibilities between scions and root stocks.

Table 2:

SCION	Root stock
Apple	Apple tree, M111, M7
Pear	Pear tree, OHxF 333, Calleryana, Bartlett
Cherry	Cherry tree, Colt, Mazzard
Apricot	Apricot tree, Lovell, Marianna 2624, Myrobalan 29C.
Peach/Nectarines	Lovell.
Plum (European)	European plum tree. Marianna 2624, Citation, Myrobalan 29C, Lovell.
Plum (Asian)	Asian Plum tree, Marianna 2624, Citation, Myrobalan 29C, Lovell. European plum tree.

Scion collecting

1: Get from grandparents, parents, friends and neighbors.

If you collect the scions yourself:

- Respect the rights of patent holders.
- Scion wood should be dormant.
- Should be from previous season's growth with 3 or 4 good buds.
- Should be $\frac{1}{4}$ to $\frac{3}{8}$ inch in diameter.
- Cut each scion 4 to 8 inches long, with at least four buds.
- Label the scions
- Store in a slightly damp plastic bag to prevent drying.
- Store in the refrigerator (not the freezer) or in a cool location. Do not store with fruit as this may simulate the scions to break dormancy.
- If kept alive and dormant, the scions should be usable for 2 to 3 months.

2: Scion Exchanges.

- What you will find there: Scions of apples, plums (Japanese and European), peach, apricots and pears. Also scions from some nut trees.
- Some sell root stock. Normally a very limited supply.
- Grafting supplies for sale.
- Books for sale.

If you are going to attend a scion exchange, take the following with you.

A large plastic bag (should be slightly damp inside).

Some labels or masking tape.

A pen to write on label or tape.

Scion Exchanges

Please check this web site for dates and times and if they are open to the public.

Note: There is usually a small donation requested to help pay for the cost of renting the facilities, however the scions are free, with a limit of two scions of each variety, per person.

<https://crfg.org/2022-scion-exchanges>

Your Guide to Making the Best of a Scion Exchange:

http://www.crfg.org/chapters/golden_gate/Making%20the%20Best%20of%20the%20CRFG%20Scion%20Exchange.pdf

Web sites:

1: University of California: <https://www.ucdavis.edu>

Do a search for budding and a search for grafting.

Propagation of Temperate-Zone Fruit Plants - leaflet 21103

Budding & Grafting Citrus & Avocados in the Home Garden

Home Orchard: Growing Your Own Deciduous Fruit and Nut Trees - Publication 3485.
Very good book. Has a section on grafting.

2: <http://www.grandpasorchard.com/>

Under the “Growing tips” tab, has charts on cross pollination of a number of fruits.

Note that this site is in Michigan and therefore the dates on the charts for fruit maturity will be later than when the fruit mature here in California.

2: <http://www.davewilson.com/>

Has a fruit and harvest chart for California. My experience in Dublin shows that fruit in our area ripens about 3 weeks later than shown on this chart.

Cleft graft

Done in February to March (possible April) when the rootstock and scion are still dormant.

Size of rootstock is 1/4 to 2 inch in diameter. It is possible to do larger diameter stock but that would require specialize tools.

Cut or saw the trunk or branch at the point that you want to graft. Make sure there are no knots at this point.

Make a vertical cut about 2 to 3 inches deep through the center of the rootstock's trunk. Make sure that the bark and cambium layer are cut smoothly and are not torn.

At the base of the scion, make a 1 to 2 inches long tapering wedge cut so that the outside edge is wider then the inside edge. The scion should have two or three buds on it and be about 4 inches long. Make sure that the scion is the correct way up and the top bud on the scion is facing the direction that you want.

Place the scion into the vertical cut of the root stock so that the cambium layer of the scion touches the cambium layer of the rootstock. You will need to wedge open the vertical cut. Note that the bark on the root stock may be thicker than the bark on the scion.

Wrap the cut surfaces with tape (parafilm or budding bands). You can also use wax to seal the surface at the join.

Do not allow the vertical cut in the rootstock or the cuts on the scion to dry out while you are doing this procedure.

If there is room, you can put a second scion at the other top end of the vertical cut. If you do, make sure that the top bud is facing out.

Add a label to the graft to identify the variety.

TIP: Angle the scion slightly.

Whip graft

Done in January through March (possible April) when root stock and scion are dormant.

Size of rootstock less than 1 inch. Best is 1/4 to 1/2 inch. Used when the root stock and scion are of similar size.

Make a smooth diagonal cut 1 to 1¹/₂ inches long through the rootstock trunk or branch.

Make a matching cut at the base of the scion. Make sure that the top bud on the scion is in the direction you want the branch to grow.

Check that the two cuts fit closely together.

For the tongue, starting about a third of the way down from the tip, make a cut downward that is neither parallel to the grain of the stock nor to the slanted cut but is in between the two. Stop the cut just before the base of the first cut (about an inch). This cut should not split the grain of the wood.

Make the same cut on the scion.

Now slide the two parts together. **Make sure** that the cambium layers are touching. If root stock is larger than scion, place the scion on one side.

Wrap the cut surfaces with tape so that no cut area is exposed.

Add a label to the graft to identify the variety.

Chip Budding

Done in March through September. The root stock can be dormant or actively growing. The “bud” must be dormant.

On the bud scion make a cut $\frac{1}{2}$ inch to $\frac{3}{4}$ inch below a bud, inserting the blade about $\frac{1}{8}$ to $\frac{1}{4}$ inch deep at an angle of about 30 to 45 degrees.

Make a second cut about $\frac{1}{2}$ inch above the **bud**. Cut down through the wood to meet the first cut, taking care not to damage the bud.

Make the same two cuts in the rootstock to correspond with those on the bud chip and remove the resulting sliver of wood.

Place the bud chip into the ‘lip’ of the cut rootstock so that the cambium layers match as closely as possible. May need to put the bud to one side to match the cambium layers.

Wrap the graft with budding tape and parafilm so that no cut area is exposed but leave the bud exposed.

Add a label to the graft to identify the variety.

If grafting multiple different buds on to the same tree, be aware of the growth rate of the varieties. **Also be aware that the top (apex or terminal) bud on the branch may prevent other buds from growing.**

Chip budding done in late summer should be “forced” to grow the next spring by cutting the stock above the bud.

T-budding

Done when the root stock is in active growth (April to August) and the bark is slipping. This means that the bark can be easily peeled from the root stock without damage to the cambium layer. The “bud” must be dormant or if done in late summer must be mature and inactive.

On the root stock make a vertical cut about 1.0 inches long and deep enough to ensure that the bark will separate from the cambium layer.

Make a horizontal cut (cross the “T”), about halfway around the stock, at the upper end of the vertical cut.

Raise the bark at the intersection of the vertical and horizontal cuts

On the scion, make a **horizontal** cut 1/2 inch above the bud.

Starting about a 1/2 inch below the bud, cut upward to meet the cut above the bud. Make sure not to damage the bud.

Slip the bud under the raised bark starting at the top of the “T”. Push the bud down until the upper end of the bud is below the horizontal cut of the root stock.

Wrap the cut surfaces with budding tape and parafilm so that no cut area is exposed.

Add a label to the graft to identify the variety.

T-budding done in late summer should be “forced” to grow the next spring by cutting the stock above the bud.