



Core Skills Educational Factsheet 3: Grafting and Budding

Agriculture Education Program

People in Need Czech Republic

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Core Skills Educational Factsheet 3: Grafting and Budding

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1) Welcome to the Factsheet

Grafting is a technique of uniting two, sometimes three plants so that they grow as one. The scion is a newly installed shoot or top of the plant. The rootstock (or stock) is the seedling or plant used as the bottom half of the new plant. The rootstock becomes the root system of the newly grafted plant. The union between scion and rootstock is a physical union (growing together of the tissue) that allows free movement of plant sap across the graft and from the rootstock to the new top and back again.

In this third Core Skills Educational Factsheet we will discuss the topics of grafting and budding. These activities are important skills of a manager of an orchard. They allow you to improve the yield and quality of your harvest. Enjoy the factsheet and get back to us with your ideas and feedback.

2) Grafting – basic vocabulary



Grafting: A technique of uniting two, sometimes three plants so that they grow as one. Symbiosis between two varieties where both of them can significantly influence growth, reaching the bearing stage, productivity, maximum age of the tree, the minimum distance between trees, etc.

Rootstock: The bottom part of a graft that is in contact with the soil and is not allowed producing side shoots.

Scion: The plant part that is the top part of a graft and grows to become the desired shoot.

Graft union: The point on a plant where the graft is joined to the rootstock.

Compatibility: An ability of scion and rootstock to accept each other and be joined as one. The stock and scion must be sufficiently closely related genetically to form a functional graft union.



Cambium: A layer of tissue under the bark of a tree. This layer has the ability to connect and grow together and transfer water and nutrients to the new part of the plant. It is important that the stock and scion join their layers of cambium.

3) Grafting - Why to graft?

Saving time

To grow a new tree from a seed takes a long time. What if we have one tree with very nice apples and we would like to have more of these trees? We have to wait for the tree to bear ripe apples, take the seeds and let them germinate, grow them into a seedling and then plant it. It takes a long time. Or we can take scions from this tree and graft them to already growing rootstocks. We can have a lot of new trees with the same quality apples in a much shorter period of time!

Improving old trees

Maybe we already have a tree in our garden or orchard, but it is not producing good quality fruit or even maybe it doesn't produce fruit at all. Do we have to get rid of such a tree? No, we can obtain a scion that is compatible and graft it on to the old tree. In this case grafting made your tree younger and it is now able to bear more and better fruit.

Combining adaptability and high yields

Grafting is also useful when establishing an orchard. Some varieties of trees are very well locally adapted. They are resistant to draught, local pests and diseases and grow well in local soil. But their fruit is not that good as fruit of other varieties. Therefore, we use the first variety as rootstock and another hi-yielding variety as a scion. In this way we will reach best outcomes.

Grafting increases the productivity of trees because it makes it possible to do the following things:

- Combine different varieties
- Optimize cross-pollination and pollination
- Take advantage of particular locally adapted rootstocks
- Control the size of a plant
- Produce certain plant forms
- Produce certain kinds of flowers, fruit and leaf colors
- Duplicate disease and insect resistant/tolerant clones
- Repair damaged plants
- Increase the growth rate of seedlings

4) Preconditions to Successful Grafting

In grafting, it is important that both the rootstock and scion be **disease free**. The two must also be **compatible** so that they can grow together to form a strong union. The rootstock may control ultimate plant height, fruiting and flowering when properly selected. The top will grow much the



same as it grew on the parent plant before the graft and will duplicate all the characteristics of the parent plant.

If we fail to form a successful graft or bud union, it is possible that the selected varieties are not compatible. We can identify incompatibility through these symptoms:

1. Yellowing of leaves in the latter part of the growing season followed by early defoliation accompanied by decline in vegetative growth.
2. Premature death of the trees which may live only a year or two in the nursery.
3. Marked difference in the growth rate or vigor of scion and stock.
4. Overgrowth at, above or below the graft union

Grafting is generally done when the stock and scion are **dormant** and have no leaves. The rootstock may be actively growing, but the scion should not be. Unlike budding, which can be performed before or during the growing season, **most grafting is done during winter and early spring**, while the scion and rootstock are still dormant. It shouldn't be too cold though – when it's freezing outside, it's impossible for the scion and rootstock to grow together; the plants are too brittle and can easily break; plus it's difficult for people to work. In winter we mostly perform grafting inside. It is best to graft in mid-winter through to spring from the time the buds of rootstock are beginning to open, until blossom time.

5) Methods of Grafting

Grafting may be accomplished by one of several methods, depending on the species, the age and size of the plant, the problem to be corrected, and the purpose. These methods also differ in difficulty and the skill required for success. Although some methods are for general purpose use, others are used to solve specific and specialized problems.

The basic methods are **Whip or Tongue grafting, Cleft grafting, Bark grafting and Side grafting**. Some methods of grafting work any time during the year when it's not freezing - chip budding and cleft grafting, for example. However, there are grafting methods that rely on the bark of the rootstock ability to "slip" meaning that it peels cleanly away from the wood (T-budding and bark grafting especially). This needs to be done in spring (even during blossoming) because during that time trees produce sap and it is easy to separate the bark from the wood.



Whip or Tongue grafting



Cleft grafting



Bark grafting or Side Venere grafting



Side grafting

6) Budding

Budding is a form of grafting in which a single bud is used as the scion rather than a section of stem. It is the most commonly used method for fruit trees production in the nursery; it can be used for plum, cherry, apricots, and peach as well as young apple and pear trees. (Cherry, plum, apricot, and peach are not easily cleft grafted or whip grafted.)

Budding is described as pseudo-grafting and sometimes it is called bud grafting. A major difference between budding and grafting is that budding uses a single bud as the scion, whereas grafting uses a piece of plant material consisting of several buds. Budding is much easier to accomplish than grafting. Since a bud is inserted into an opening in the bark of a stem or branch, it is important that budding be done when the rootstock is actively growing. Usually, we can do budding in two occasions: in late spring (which is called Jawzayee - May and June) and in late summer (Tera Mahi - August); T-budding needs active sap which is not available in late fall.

Methods of budding:

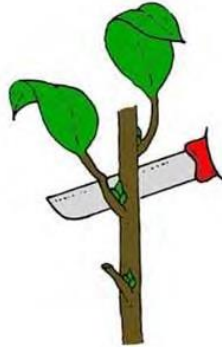
Methods of budding include T-budding, Patch budding, Flute budding, Ring budding, I-budding and Chip budding. Most commonly used method in Afghanistan is T-budding which is described in detail below.

T-budding

T-budding is a most common budding method for fruits and ornamental plants. Single bud is inserted into T-shaped opening in bark of actively growing rootstock.

T-budding gets its name from the shape of the cut made in the bark of the stock in which the bud (scion) is inserted. It's the most commonly used budding method in plant propagation. The stock

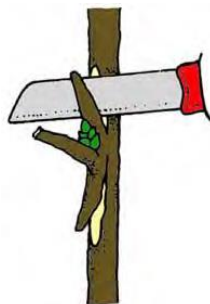
should be actively growing and need to be young (one to two years old) so that the bark can be easily separated from the stem. T-budding is widely used for propagating of fruit trees (apple, pear, peach, citrus apricot and almond).



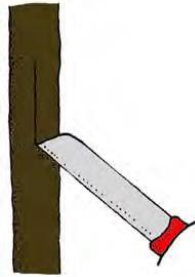
1. As you see bud sticks have healthy buds. Leaf blades come out from the bud stick.



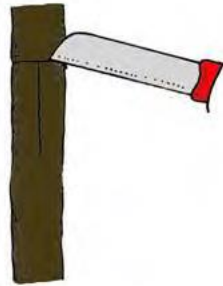
2. The bud and small sliver of wood is cut from the stick using an upward slicing motion. The cut should be 1 cm below the bud, and should go deep enough into the wood so that when the cut is finished about 1 cm above the bud, the bud and small sliver of wood are cut off.



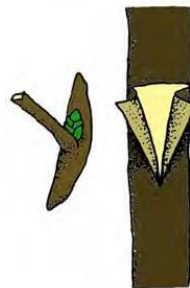
3. A perpendicular cut across the top of the upward cut will separate it from the bud stick.



4. A vertical cut is made on the stem of the root stock. The cut should be deep enough to insure the bark will separate at the cambium.



5. The “T” is crossed. A perpendicular cut is made at the upper end of the vertical cut to make a T.



6. The bark is carefully slipped from the stem exposing a “pocket“, into which the bud shield can be placed. Take care not to tear the flaps of the bark in the process of spreading them.



7. The bud shield is carefully slipped between the bark flaps. The top of the bark strip on the bud shield is trimmed to fit tightly against the horizontal cut so that the bud fits within the “pocket” snugly.



8. The bark flaps are held tightly against the bud as they are wrapped with budding rubber or grafting tape. The wrap must be removed within 2-3 weeks or when signs of a successful union/s are apparent, whichever comes first. Removal of wrap at the appropriate time will prevent girdling. Often a “grafting wax” is applied over the budding rubber or grafting tape to minimize drying of the grafted area and improve upon potential success. Be sure not to apply grafting wax onto the bud as this may restrict potential growth.



In August of first year we have a successful T-bud graft



7) Selection of rootstock - How to find a good rootstock?

The key to making the best rootstock decision today is to focus on the specific site and the known performance of trees on a particular rootstock under those conditions. A fruit tree rootstock is the stump of a related species which already has an established, healthy root system, and to which a separate fruit tree is joined by grafting or budding. The resulting fruit tree will be stronger, quicker to establish and will take on the desirable features of the rootstock itself.

There are many ways to find your rootstock. If you already have a rootstock you can cut the suckers from and replant it in a piece of land, when it is time of grafting you can graft it with a good scion from another fruit tree to have a quality fruit tree.



These plants are cultivated solely to function as rootstocks. The branches from these rootstocks are cut, let to root and planted in a nursery. Later a scion is grafted onto them. We need to use only one-year shoots, not old branches.

The steps in choosing a rootstock may not always be obvious, but there are several factors that have been traditionally important. One of the more important factors is your personal experience along with that of friends, neighbors, and nursery managers. The information you gather may be conflicting and sometimes confusing, but the sum total available can lead to better rootstock decisions. Some of the other steps and factors involved are described below in a generalized approach to selecting the best rootstocks for your conditions.

1. Resistant to present and potential soil pests.
2. Resistant to freeze
3. Easy to graft and bud
4. Free of diseases and resistance against the diseases
5. Suitable for the soil's texture, depth, and fertility.
6. Compatible with soil chemistry (pH, salinity, lime content).
7. Favored for the anticipated soil water availability, drainage, and irrigation practice.
8. Good growth, flowering, foliage, habit and fruiting characteristics.

8) Selection of scion - How to find a good Scion?

Select scion from healthy, virus-free plants. Try to avoid trees older than 8 to 10 years of age as they have likely bloomed for at least 5 to 7 years or more and possibly contracted pollen-borne virus diseases.



Limit wood to one-year-old wood. Avoid any wood or portion of wood that is older. Wood should be straight and have a lot of vegetative buds (narrow buds). This varies among species. Selecting the best scion for your conditions:

1. Current year growth.
2. Free of diseases.
3. Compatibility with the rootstock.
4. The scion should be chosen from vegetative growths.
5. It's good to choose the scion from the middle of the scion stick.
6. Do not choose the scion from the upper part of the scion stick - they are very weak.
7. Do not choose the scion from the bottom part of the scion stick - they are not producing high yield.