12 Techniques of Grafting

learning objectives

- Explain the requirements for successful graftage.
- Describe the techniques of detached scion graftage, approach graftage, and repair graftage.
- Discuss the preparation for grafting—tools, accessories, machines, automation, and processing scionwood.
- Explain the craftsmanship of grafting—manual techniques, record keeping, and mechanization.
- Describe the aftercare of grafted plants—in bench grafting systems, and field and nursery grafting systems.
- Identify field, bench, and miscellaneous grafting systems.

INTRODUCTION

Since people first learned to graft plants, a myriad of grafting techniques have been developed. In *The Grafter's Handbook,* Garner (19) enumerates and describes some forty different grafts.

Here we describe the most important grafting methods. Among them, a person who can use a sharp knife can find one that meets any specific grafting need. However, success in grafting depends not only on a technically correct graft but in preparation of the scion and rootstock for graftage. Equally critical are the optimum time for grafting, and proper aftercare.

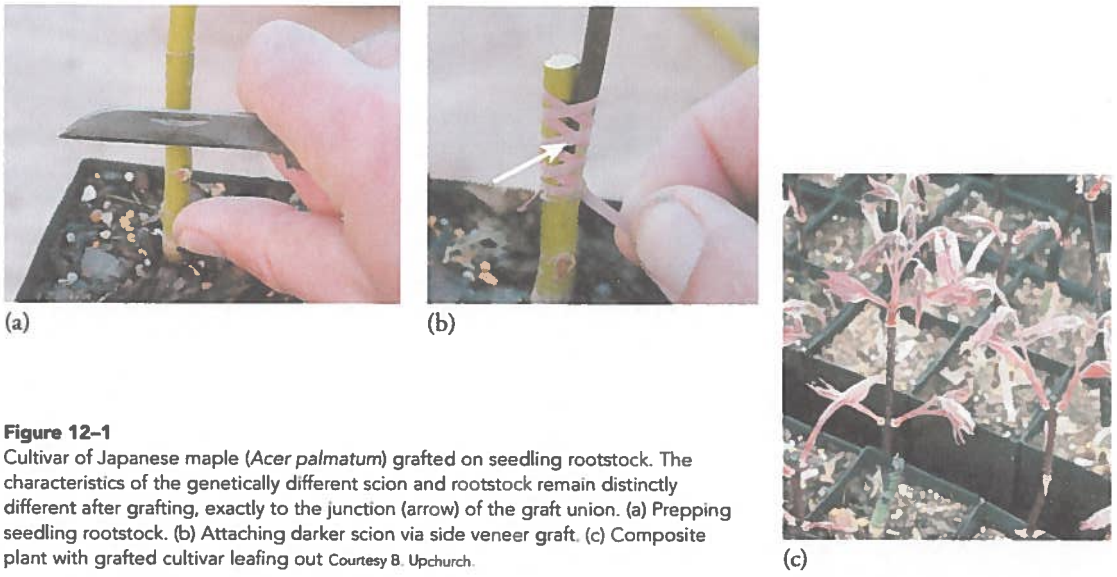
With high labor costs, only a few of the more efficient grafts are utilized in United States woody ornamental nurseries, including the side veneer, splice (whip graft), and whip-and-tongue graft; use of approach and repair graftage is limited. With fruit crops, depending on the species, a number of different apical, side, and root grafts are utilized around the world. Chip budding and T-budding, which are described in detail in Chapter 13, are two of the most common budding methods for woody ornamentals and fruit crops. Vegetable grafting has increased dramatically worldwide—and is commonly done in Asia and Europe where land is intensively used and crops are not rotated. Grafting onto rootstock resistant to soil pathogens and environmental stress helps increase yield and reduce chemical usage (12, 21, 34). For example, some of the most important grafts with cucurbit vegetables (melon, squash) include hole insertion grafting, tongued approach, and one cotyledon graft (also known as the splice, slant, or the Japanese tube graft), which are described in the chapter. Some robotic vegetable grafting machines can produce 800 grafts per hour.

This chapter is divided into three sections: (a) the **types of grafts,** (b) **production processes of graftage**—including the preparation, craftsmanship, and aftercare of grafted plants, and (c) **grafting systems,** including field grafting, bench grafting, and miscellaneous grafting systems—such as herbaceous graftage, cutting grafts, and micrografting.

REQUIREMENTS FOR SUCCESSFUL GRAFTING

For any successful grafting operation, producing a plant, as shown in Figure 12–1, requires five important elements:

1. *The rootstock and scion must be compatible.* They must be capable of uniting. Usually, but not always, closely related plants, such as two apple cultivars, can be grafted together. Distantly related plants, such as oak and apple, cannot make a successful graft combination (see Chapter 11 for a discussion of these factors).



(a) (b) (c)

Figure 12–1
Cultivar of Japanese maple (*Acer palmatum*) grafted on seedling rootstock. The characteristics of the genetically different scion and rootstock remain distinctly different after grafting, exactly to the junction (arrow) of the graft union. (a) Prepping seedling rootstock. (b) Attaching darker scion via side veneer graft. (c) Composite plant with grafted cultivar leafing out Courtesy B. Upchurch.

2. *The* **vascular cambium** *of the scion must be placed in direct contact with that of the rootstock.* The cut surfaces should be held together tightly by wrapping, nailing, wedging, or some similar method. Rapid development of the graft union is necessary so that the scion may be supplied with water and nutrients from the rootstock by the time the buds start to open.

vascular cambium
The tissue responsible for the formation of new xylem and phloem in the development of a successful graft union.

3. *The grafting operation must be done at a time when the rootstock and scion are in the proper physiological stage.* Usually, this means that the scion buds are dormant while at the same time, the cut tissues at the graft union are capable of producing the callus tissue necessary for healing of the graft. For deciduous plants, dormant scionwood is collected during the winter and kept inactive by storing at low temperatures. The rootstock plant may be dormant or in active growth, depending upon the grafting method used.
4. *Immediately after the grafting operation is completed, all cut surfaces must be protected from desiccation.* The graft union is covered with tape, grafting wax, Parafilm tape, Buddy Tape, or the grafts are placed in moist material or a covered grafting frame.
5. *Proper care must be given to the grafts for a period of time after grafting.* Shoots (suckers) coming from the rootstock below the graft will often choke out the desired growth from the scion. In some cases, shoots from the scion will grow so vigorously that they break off unless staked and tied or cut back.

TYPES OF GRAFTS

Grafting may be classified according to the part of the rootstock on which the scion is placed—a root, or various places in the top of the plant. Types of grafts can be categorized as (1) **detached scion graftage,** which includes apical, side, bark, and root graftage; (2) **approach graftage,** where the root system of the scion and the shoot system of the rootstock are not removed until after successful graft union formation occurs; and (3) **repair graftage of established trees.** The grafts that are categorized in Tables 12–1 and 12–2 are described in greater detail later in the chapter.

detached scion graftage
A type of graft used when a section of the shoot of the scion is removed and grafted to the apex or side of the rootstock. It is also used in grafting roots (**root graftage**).

approach graftage The root system of the scion and shoot system of the rootstock are not removed until after successful graft union formation occurs.

repair graftage Graft used in repairing or reinforcing injured or weak trees.

Table 12–1
TYPES OF GRAFTS

I. **Detached Scion Graftage**
  A. **Apical Graftage**
    Whip-and-tongue graft
    Splice graft (whip graft; with vegetables—One cotyledon graft [OCG] or Japanese tube graft)
    Cleft graft (split graft)
    Wedge graft (saw-kerf graft)
    Saddle graft
    Four-flap graft (banana graft)
    Hole Insertion Graft (HIG) or Terminal/Tip Insertion graft with vegetables
  B. **Side Graftage**
    Side-stub graft
    Side-tongue graft
    Side-veneer graft
    Side insertion graft (SIG) with vegetables
  C. **Bark Graftage**
    Bark graft (rind graft)
    Inlay bark graft
  D. **Root Graftage**
    Whole-root and piece-root grafting
    Nurse-root grafting
II. **Approach Graftage**
    Spliced approach graft
    Tongued approach graft (TAG)
    Inlay approach graft
III. **Repair Graft**
    Inarching
    Bridge graft
    Bracing

Table 12–2
UTILIZATION AND ROOTSTOCK CRITERIA OF SELECTED GRAFTS

Graft type	Diameter of rootstock	Rootstock condition	Uses
Whip-and-tongue graft	Small: 6 to 13 mm (1/4 to 1/2 in); same diameter as scions	Dormant; however, active with bench grafting of container rootstock	Bench grafting; container grafting; some topworking in field; root grafting; a popular graft
Whip graft (splice graft) —also called **One cotyledon graft (OCG) or Japanese tube graft** with vegetables.	Small: 6 to 13 mm (1/4 to 1/2 in); same diameter as scions; See Figure 12–46 for schedule.	Dormant; however, active with bench grafting of container rootstock, greenwood grafting, and vegetable crops	Bench grafting; container grafting; some topworking in field; grafting of vegetable liner plants; root grafting; a popular graft
Cleft graft (split graft)	Moderate: 2.5 to 10 cm (1 to 4 in)	Dormant—before active growth starts in spring	Topworking in field
Wedge graft (saw-kerf graft)	Moderate: 2.5 to 10 cm (1 to 4 in)	Dormant—before active growth starts in spring	Topworking in field
Saddle graft	Small: 6 to 19 mm (1/4 to 3/4 in); same diameter as scion	Dormant	Bench grafting via hand or machine; container grafting; root grafting
Four-flap graft (banana graft)	Small: up to 2.5 cm (1 in); same diameter as scions	Active; bark must be slipping	Topworking small caliper trees
Hole insertion graft (HIG) or Terminal/Top insertion graft			Bench grafting; container grafting of liner vegetable plants

Graft type	Diameter of rootstock	Rootstock condition	Uses
Side-stub graft	Small to moderate rootstock larger than scion: grafted on rootstock branches up to 2.5 cm (1 in) in diameter	Dormant	Topworking in field
Side-tongue graft	Small: 6 to 19 mm (1/4 to 3/4 in); diameter of scion slightly smaller than rootstock	Dormant	Bench grafting; container grafting of broad- and narrow-leaved evergreen species
Side-veneer graft	Small: 6 to 19 mm (1/4 to 3/4 in); same diameter as scion	Dormant	Bench grafting; container grafting of smaller liner potted plants; a popular graft for conifers, deciduous trees and shrubs, and fruit crops
Side insertion graft (SIG)	Works well using vegetable rootstock with wide hypocotyls.	Active	Bench grafting; container grafting of liner vegetable plants
Bark graft (rind graft)	Large: 2.5 to 30 cm (1 to 12 in).	Active; bark must be slipping	Topworking in field
Inlay bark graft	Large: 2.5 to 30 cm (1 to 12 in).	Active; bark must be slipping	Topworking in field (e.g., pecans)
Spliced approach graft	Small: 6 to 19 mm (1/4 to 3/4 in); same size as scion; exception is mango grafting in India on larger, established trees	Active	Container grafting with difficult-to-graft species; scion and stock grafted as two independent, self-sustaining plants; only limited topworking in field
Tongued approach graft (TAG)	Small: 6 to 19 mm (1/4 to 3/4 in); same size as scion	Active	Container grafting with difficult-to-graft species; scion and stock grafted as two independent, self-sustaining plants; also used with vegetables
Inlay approach graft	Small: 6 to 19 mm (1/4 to 3/4 in); bark of rootstock is thicker than scion	Active	Container grafting with difficult-to-graft species; scion and stock grafted as two independent, self-sustaining plants
Inarching	Large: 15 cm (6 in) and larger	Dormant	Used to replace a weak or damaged root system of an established tree
Bridge graft	Large: 15 cm (6 in) and larger	Active; bark must be slipping	Repair injury to trunk of tree
Bracing	Limbs of tree bound by pulling together two strong young lateral shoots from limbs to be braced	Active or dormant	Natural grafting used to strengthen scaffolding limbs of a tree

Detached Scion Graftage—Apical Graftage

There are many variations of apical graftage. As the name suggests, the scion is inserted into the top of the severed rootstock shoot.

Whip-and-Tongue Graft The whip-and-tongue graft, shown in Figures 12–2 and 12–3, is particularly useful for grafting relatively small material about 6 to 13 mm (1/4 to 1/2 in) in diameter. It is highly successful if done properly because there is considerable vascular cambium contact,

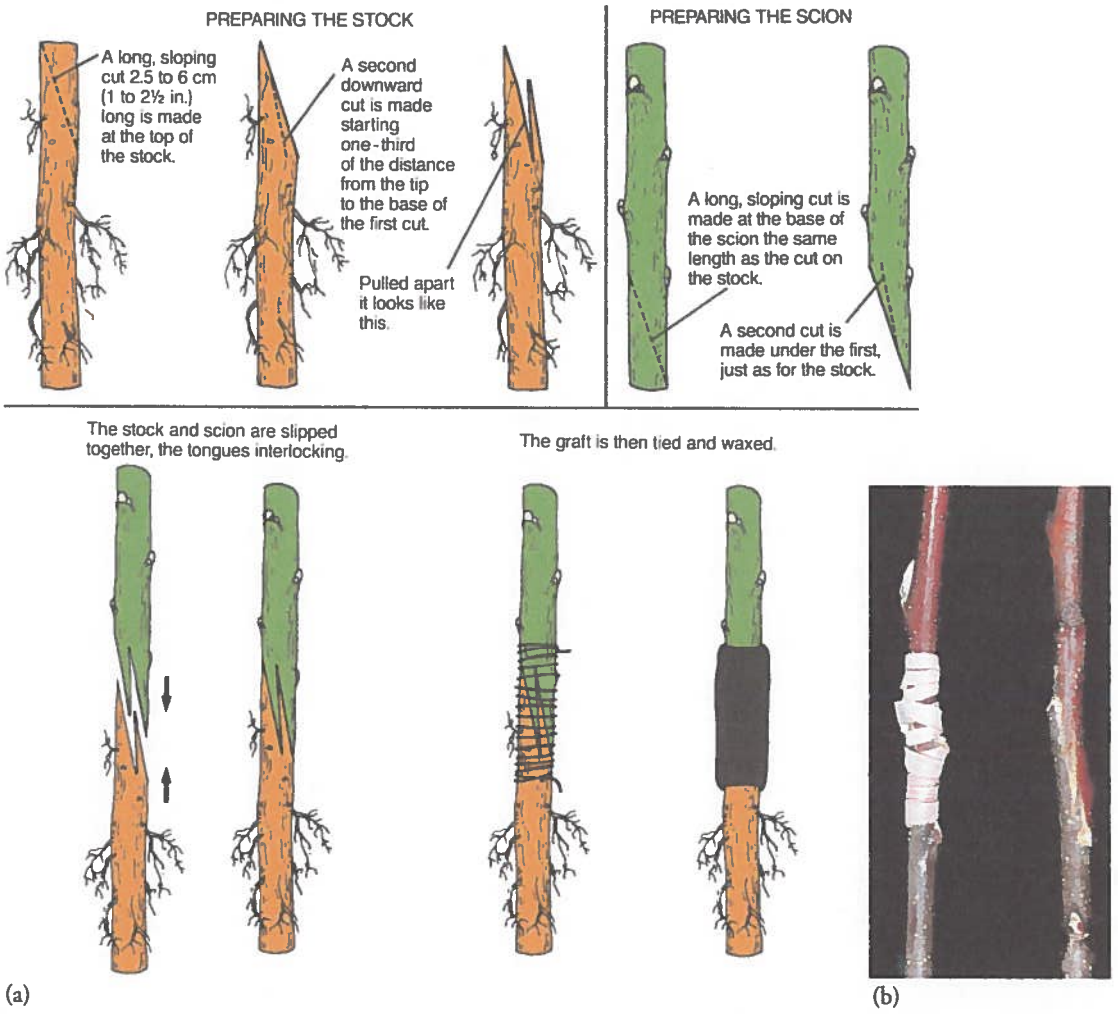


Figure 12–2
Whip-and-tongue graft. (a) This method is widely used in grafting small plant material and is especially valuable in making root grafts as illustrated here. (b) Whip-and-tongue of bench grafted pear.

plus it heals quickly and makes a strong union. Preferably, the scion and rootstock should be of equal diameter. The scion should contain two or three buds, and the graft made in the smooth internodes area below the lower bud.

The cuts made at the top of the rootstock should be the same as those made at the bottom of the scion. First, a smooth, sloping cut is made, 2.5 to 6 cm (1 to 2 1/2 in) long; longer cuts are made when working with large material. This first cut should preferably be made with one single stroke of the knife, in order to leave a smooth, flat surface. To do this, the knife must be razor sharp. Wavy, uneven cuts made with a dull knife will not result in a satisfactory union.

On each of these cut surfaces, a reverse cut is made. It is started downward at a point about one-third of the distance from the tip and should be about one-half the length of the first cut. To obtain a smooth-fitting graft, this second cut should not just split the grain of the wood but should follow along under the first cut, tending to parallel it.

The rootstock and scion are then inserted into each other, with the tongues interlocking. It is extremely important that the vascular cambium layers match along at least one side, preferably along both sides. The lower tip of the scion should not overhang the stock, because it increases the likelihood of the formation of

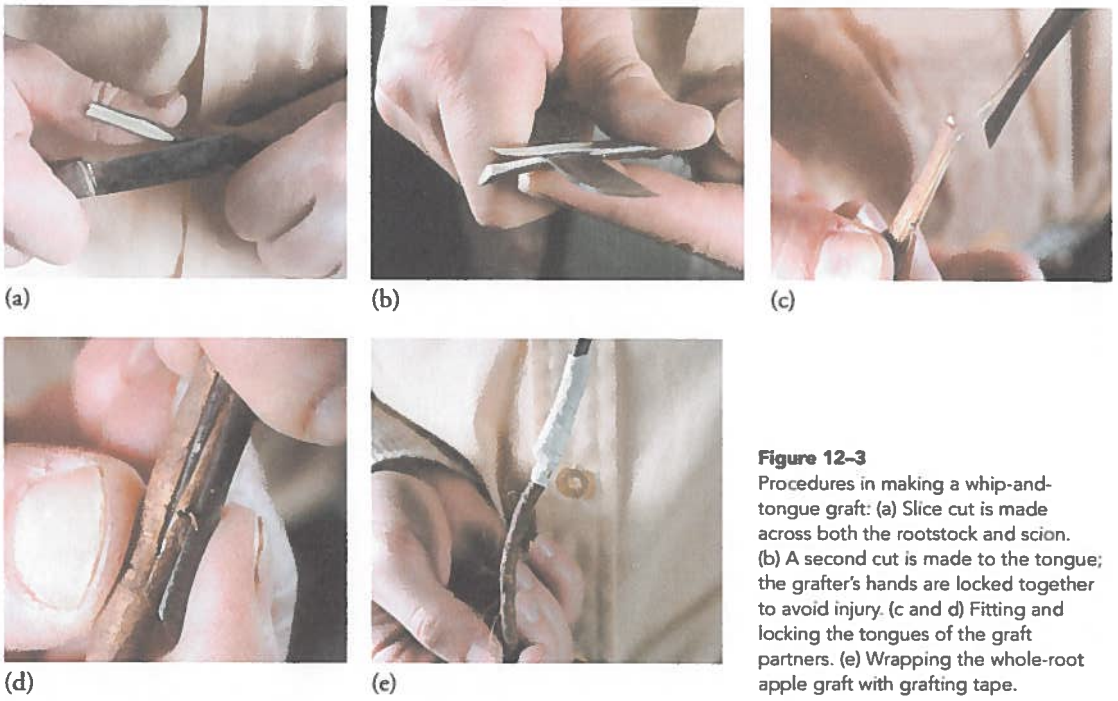


Figure 12–3
Procedures in making a whip-and-tongue graft: (a) Slice cut is made across both the rootstock and scion. (b) A second cut is made to the tongue; the grafter's hands are locked together to avoid injury. (c and d) Fitting and locking the tongues of the graft partners. (e) Wrapping the whole-root apple graft with grafting tape.

large callus knots. The use of scions larger than the rootstock should be avoided for the same reason.

After the scion and rootstock are fitted together, they are securely tied with budding rubber strips, plastic (poly) budding/grafting tape, or raffia. It is important that the tissues in the graft union area not dry out, so either sealing the graft union with grafter's wax, Parafilm, or Buddy Tape, or placing the plants under high relative humidity, is essential until the graft union has formed.

In **bench graftage** (page 502) the bare-root grafted plants can be stored in a grafting box (without sealing the graft union with grafter's wax) and packed with slightly moist peat or bark. Grafted plants in liner pots can be placed in a polytent in a temperature-controlled greenhouse (Fig. 12–4). If bare-root, bench-grafted plants are to be directly planted in a field nursery, the graft union is temporarily placed below the soil level. Any poly budding tape will need to be removed after graft union formation to prevent girdling the stem. Grafts wrapped with budding rubbers and temporarily covered with soil or media should be inspected later; the rubber decomposes very slowly below ground and may cause a constriction at the graft union.

If the whip-and-tongue graft is used in **field grafting,** the graft union of the **topworked** (page 422) plant must be tied and sealed with grafter's wax, Parafilm, or Buddy Tape. Aftercare of grafted plants is further described in the section "Production Processes of Graftage" (page 491).

Splice Graft (Whip Graft) The splice graft is simple and easy to make (Fig. 12–5). It is the same as the whip-and-tongue graft except that the second, or "tongue," cut is not made in either the rootstock or scion. A simple slanting cut of the same length and angle is made in both the rootstock and the scion. These are placed together and wrapped or tied as described for the whip graft. If the scion is smaller than the rootstock it should be set at one side of the rootstock so that the vascular cambium layers will match along that side (Fig. 12–5).

The splice graft is particularly useful in grafting plants that have a very pithy stem or that have wood that is not flexible enough to permit a tight fit when a tongue is made as in the whip-and-tongue graft. The splice graft is used in greenhouse production of vegetable crops for grafting disease-resistant rootstocks. For vegetable crops such as cucurbits or *Solanaceae,* this graft is sometimes referred to as One Cotyledon Grafting (OCG), the slant graft, or Japanese tube graft

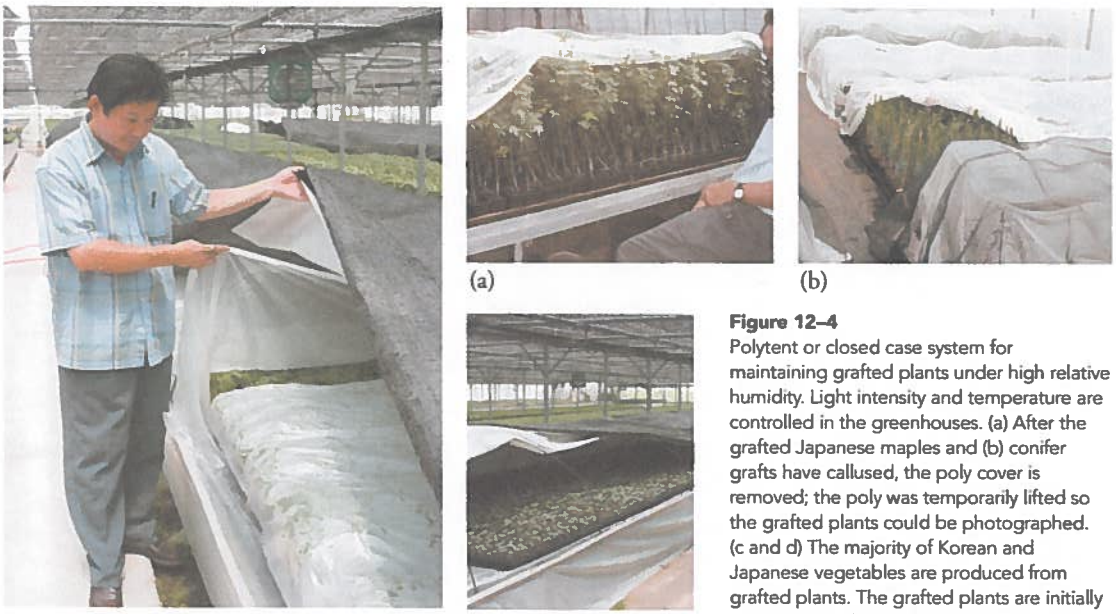


Figure 12–4
Polytent or closed case system for maintaining grafted plants under high relative humidity. Light intensity and temperature are controlled in the greenhouses. (a) After the grafted Japanese maples and (b) conifer grafts have callused, the poly cover is removed; the poly was temporarily lifted so the grafted plants could be photographed. (c and d) The majority of Korean and Japanese vegetables are produced from grafted plants. The grafted plants are initially placed in the dark or under very low light intensity and high relative humidity until the graft has healed. Photos c and d courtesy M. Peet.

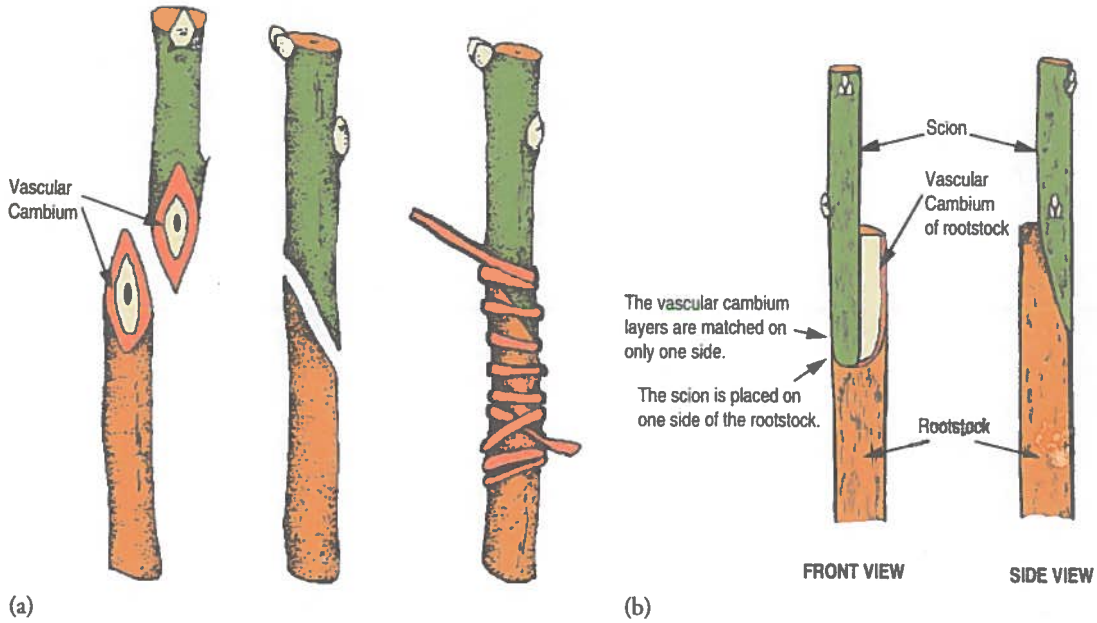


Figure 12–5
Splice graft (whip graft). (a) Procedures in making the splice graft with a slice cut that slants across the grafting partners. Ideally, the rootstock and scion are of the same caliber. (b) Method of making a splice graft when the scion is considerably smaller than the rootstock. It is important that the cambium layers be matched on one side.

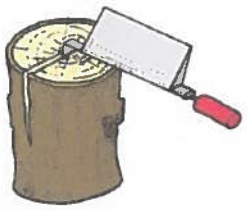
Plant Propagaton

Cleft Grafting

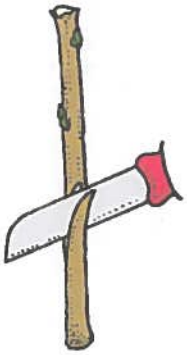
Cleft grafting is a grafting technique which allows the union of a rootstock limb that is much larger in size than the scion piece. Cleft grafting is conducted in late winter when both the rootstock and the scion are in a dormant condition.

Common applications for cleft grafting include changing the variety of an existing orchard (**topworking**), adding a branch of an untested scion cultivar to an existing tree for observation, or repairing a tree that may have had a branch broken off by storm damage or fruit overloading.

The limb to be grafted or topworked is cut square with a sharp pruning saw. The branch is then split in the middle longitudinally using a chisel, large knife, or a special tool that is a combination blade/wedge designed specifically for cleft grafting. The limb is split for a distance of 2 to 4 inches, with care taken to make the split in the middle of the limb. For species which do not split evenly, the initial cut may need to be made with a saw to prevent uneven splitting (termed **saw kerf grafting**).



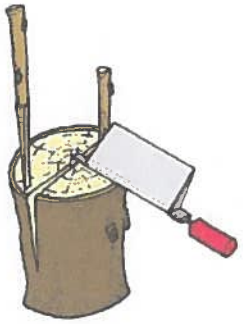
After the split is made, the "cleft" is pryed open and held open with the wedge end of the grafting tool or another suitable instriment to hold the cleft open.



A 3 to 4 bud scion stick between 4 and 6 inches in length is then prepared for grafting into the cleft. The budstick should be obtained from small limbs or water sprouts that grew vigorously during the past season of growth (1/4 to 3/8 inch in diameter) as indicated by well spaced, large plump buds. Very large diameter sprouts and ones which are small and thin with closely spaced buds should be avoided.

The lower end of the budstick is trimmed with gradually sloping cuts made on exactly opposite sides of the stick. The slope of the cuts on the budstick should match the angle of the cleft as closely as possible.

The sloping cuts on the budstick should exactly match the shape of the cleft in the rootstock. Furthermore, the cuts should be even in slope (not wavy) to allow for maximum contact between the budstick and the rootstock for the entire length of the budstick. If the budstick is too blunt, the amount of contact will be too small to promote good healing of the union.



When the budstick is inserted into the cleft, the cambia of the two pieces must be matched exactly to promote good healing. The cambium is recognized as the faint line that separates the bark from the wood. The bark on the rootstock will likely be much thicker than the bark on the budstick, so the outer edges of the budstick and rootstock will not be flush.

The ability to **align the cambia of the two partners** to be grafted and **maximizing the contact between the two pieces** to promote rapid healing are the two principal determinants of success in cleft grafting.

The natural spring in the wood should be sufficient to hold the budsticks in place. After both budsticks have been inserted and aligned, the wedge holding the cleft open is carefully removed. The cut ends of the budsticks, the cut end of the rootstock, and the splits of the cleft are painted with grafting wax to prevent desiccation of the wood.

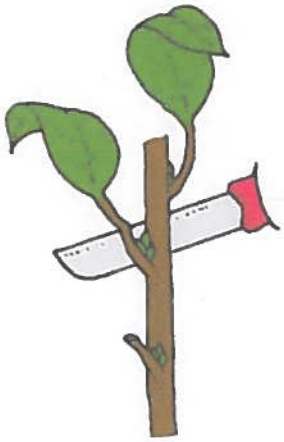
The budsticks should break buds readily during the subsequent spring growth flush. If both budsticks survive and resume growth, the less vigorous one should be cut away being careful not to dislodge the other one. A decision on which one to remove can wait a month or so to see which grows out most vigorously. However, under no circumstances should both budsticks be allowed to remain for the entire growing season since complete healing of the wound will not occur with both in place.

Plant Propagation

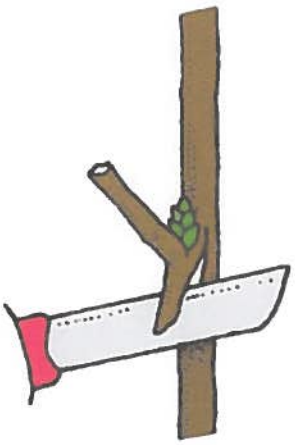
T or Shield Budding

T budding or **shield budding** is a special grafting technique in which the scion piece is reduced to a single bud. As with other techniques of asexual propagation, the resulting plants are clones (*genetically identical plants reproduced from one individual entirely by vegetative means*). The plant being propagated (represented by the bud) is referred to as the **scion**, while the plant being grafted onto is referred to as the **rootstock**, or simply **stock**. A small branch with several buds suitable for T budding on it is often called a **bud stick**.

Successful T budding requires that the scion material have fully-formed, mature, dormant buds, and that the rootstock be in a condition of active growth such that the "*bark is slipping*". This means that the vascular cambium is actively growing, and the bark can be peeled easily from the stock piece with little damage. T budding can be performed on certain fruit trees (peaches, for example) in June using cold stored budsticks and field grown seedling rootstocks. Many deciduous trees are budded in late July or early August after the current seasons buds have developed fully and are dormant using field grown seedlings that have slipping bark.



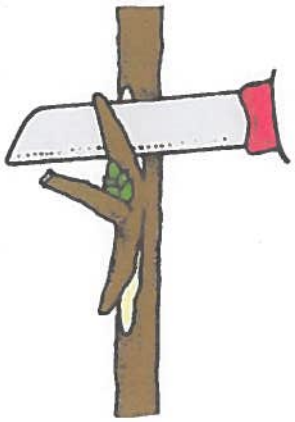
Bud sticks having plump, healthy buds are suitable scions. These budsticks should be on branches that exhibited good growth during the current season, rather than ones from the interior of trees that have slender stems and closely spaced, small buds. Thick water sprouts that grew very vigorously are often poor scions. Leaf blades are clipped from the budsticks, leaving the petiole intact. This leaves a convenient "handle" for holding the bud while it is cut from the budstick.



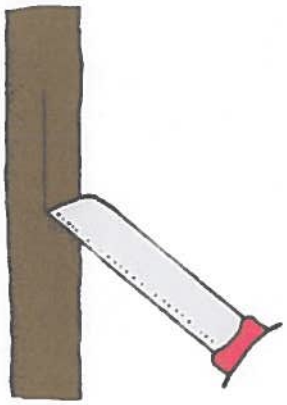
The bud and a small sliver of the wood underneath it are cut from the budstick using an upward slicing motion. The cut should begin about 1/2 to 3/4 inch below the bud, and should go deep enough into the wood so that when the cut is finished about 1/2 to 3/4 above the bud, the bark and a small sliver of wood are cut off. A perpendicular cut across the top of the upward cut will separate it from the bud stick.

Budding knives should be kept very sharp, so that as little damage as possible is done to the bud. Dull knives strip and tear the wood, leaving cuts that do not heal properly. Buds must be cut from the bud stick just prior to grafting, otherwise they will dry out. Some grafters put the bud in their

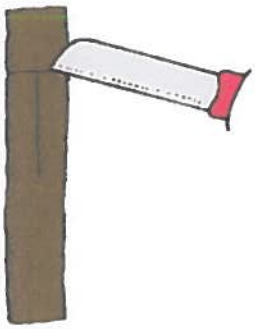
mouth for the time between when it is removed from the stick and when it is grafted in place, but this practice is not recommended. Speed in grafting is a more suitable solution.



Some grafters make a downward cut as the second cut to remove the bud from the budstick. This works well as long as it does not result in too much of the underlying wood being removed with the bud.



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



The "T is then crossed." That is, a perpendicular cut is made at the upper end of the vertical cut. In areas with heavy rainfall during the grafting season, or in species in which the rootstock is likely to "bleed" heavily, an upside down, or **inverted T bud** can be used to prevent water or sap from pooling in the graft.

The bark is carefully slipped from the stem of the rootstock exposing a "pocket" into which the bud shield can be placed.

Care should be taken not to tear the flaps of bark in the process of spreading them.

If the bark does not slip easily, this indicates that the stock is not in active growth and the process should be conducted later when active growth has resumed.

An alternative method for budding which does not require the bark to slip is the technique of chip budding in which the bud is cut out with a "chip" of the underlying wood. This requires that a chip of corresponding size be cut out of the stock piece in order to align the cambia for proper graft healing.

The bud shield is carefully slipped in between the bark flaps. The top of the bark strip on the bud shield is trimmed to fit tightly against the horizontal cut (the cross of the T) so that the bud fits within the "pocket" snuggly.

The bark flaps are held tightly against the bud as they are wrapped with a budding rubber, grafting tape or other suitable closure. This closure must either breakdown by weathering (as budding rubbers do), or must be removed in 2 to 3 weeks after the union has healed. If the material does not break down, it will girdle the rootstock.

After the union has healed, the upper part of the rootstock plant can be cut away to force the bud to grow (as would be the case for June budding). If the grafting is done in the late summer, the bud likely will need to overwinter prior to resuming growth. In this case, the upper portion of the rootstock is usually removed during the dormant season, either in late winter or early spring.

After the upper portion of the rootstock is removed, the scion bud grows vigorously.

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$302.49

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Search Results for "grafting"

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GKWO
Grafting Kit

$55.99 DETAILS

GT3
Grafting Tool

$84.49 DETAILS

VP-34
Poly Budding Tape

as low as $2.13 DETAILS

VP-XXXRS
Rubber Strips for Budding and Grafting

as low as $24.49 DETAILS

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Grafting Wax

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Search Results for "grafting"

Sort by: Best Sellers

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10GT
Cleft Grafting Tool
$42.99 DETAILS

2475E
Victorinox Folding Florist and Grafting Knife
$22.99 DETAILS

475V
Victorinox Folding Grafting Knife Brass Lined
$24.99 DETAILS

600AT
Tina Folding Extra Heavy Grafting Knife
$120.99 DETAILS

605LH
Tina Folding Grafting Knife Left Hand Model
$103.99 DETAILS

605T
Tina Folding Grafting Knife
$93.99 DETAILS

6434
Nursery Grafting Tape
$14.99 DETAILS

685T
Tina Fixed Blade Grafting Knife
$47.99 DETAILS

7475E
Victorinox Folding Budding Grafting Knife
DETAILS

891R
Victorinox Fixed Grafting Knife
DETAILS

8AML
Leonard Jumbo Grafting Knife
DETAILS

9457
Leonard Folding Grafting Knife ABS Handle
DETAILS

自制土农药	配制方法	使用方法	防治对象	特别提示
辣椒水	辣椒粉50克（或干辣椒50克，弄碎），加500毫升水，煮沸30分钟，用布过滤，冷却后待用	取一份该溶液，加入4份水，混合均匀后喷洒叶片的正反面	蚜虫、菜青虫、红蜘蛛、粉虱	晴天上午10点至下午2点间喷施效果最佳
烟草水	烟草末或烟丝20克，加500毫升冷水浸泡24小时后过滤	直接喷叶面，或喷洒土壤及盆底周围	蚜虫、红蜘蛛、蚂蚁、线虫、蝼蛄	
过磷酸钙浸出液	10克过磷酸钙，加冷水500毫升溶解，静置沉淀，取上层清液	直接喷洒植株	棉铃虫、烟青虫	
蒜液	蒜头50克捣碎，加500毫升冷水，浸泡12小时后过滤	直接喷洒植株	黑斑病、白粉病、疫病	将大蒜捣碎洒于盆土可灭蚯蚓、蚂蚁、线虫
洗衣粉水	取适量的洗衣粉稀释500~800倍，可加放几滴清油	直接喷洒植株，每周1次，连续3~5次	蚜虫、红蜘蛛、粉虱、翅目幼虫、蝶类幼虫	需喷到虫体才有效果，杀死害虫后最好用清水喷洗植株
蚊香		用塑料袋将植株连盆套住，放入点燃的蚊香，约1小时见效	红蜘蛛、粉虱	
风油精	取适量风油精加水稀释400~500倍	直接喷洒植株	蚜虫	
高锰酸钾溶液	每1升水中加入0.1~0.2克高锰酸钾	直接喷洒植株	白粉病、病毒病	
米醋水	取适量米醋加水稀释150~200倍	直接喷洒植株	白粉病、黑斑病、霜霉病	使用时加0.5%的洗衣粉，防治效果更好
醋和烧酒混合液	醋3毫升、35度的烧酒3毫升，加1升水配制	直接喷洒植株	白粉病、黑斑病、霜霉病	使用时加0.5%的洗衣粉，防治效果更好
小苏打水	10克小苏打，加冷水500毫升溶解	直接喷洒植株	白粉病	
尿洗合剂	尿素10克，洗衣粉2.5克，食盐4克，加水1~1.2升，混合溶解	直接喷洒植株	蚜虫、红蜘蛛、白粉虱	
牛奶		直接喷洒植株	蚜虫	使用时加0.5%的洗衣粉，杀虫效果更好

自制土农药	配制方法	使用方法	防治对象	特别提示
烟草石灰水	烟丝 10 克，生石灰 10 克；水 300 毫升。先用 200 毫升水烧开浸泡烟丝 24 小时后过滤。另取 100 毫升水与石灰配成石灰乳，过滤。使用前将两种溶液混合搅拌均匀	直接喷洒植株	蚜虫、红蜘蛛、白粉虱	使用时加 0.3% 的洗衣粉，杀虫效果更好。采收前一周不要使用

家庭可用农药

家庭种菜不仅能给居室环境带来一片的绿意，更重要的是能让家人吃上健康安全的蔬菜。实在需要使用农药的时候，也要采用低毒低残留的农药，最好采用生物农药进行防治。

杀虫杀菌剂	其他常用名称	防治对象	使用方法
乙蒜素	菌无菌、鼎苗	细菌性角斑病、青枯病、霜霉病、疫病、枯萎病、黑斑病、炭疽病	喷雾或灌根。对铁质容器有腐蚀作用，不能与碱性药剂混用
春雷霉素	爱诺春雷、雷爽	叶霉病、疮痂病、细菌性叶斑病、枯萎病、炭疽病	主要喷雾，也可以灌根
多抗霉素	金抗、宝抗	白粉病、灰霉病、炭疽病、叶霉病、霜霉病、晚疫病、立枯病	喷雾。不能与酸性或碱性药剂混用
井冈霉素	井冈霉素、春雷米尔、纹枯净	立枯病	灌根
鱼藤酮	施绿宝	蚜虫、菜青虫、小菜蛾、跳甲	喷雾。不能与碱性药剂混用
多杀霉素	菜喜、猎蝇	小菜蛾、甜菜夜蛾、棉铃虫、蓟马、瓜实蝇	喷雾。对瓜实蝇多采用诱杀。对蜜蜂高毒
吡虫啉	艾美乐、爱美尔、一遍净	蚜虫、白粉虱、跳甲	喷雾
灭幼脲		菜青虫、小菜蛾、斜纹夜蛾	喷雾
浏阳霉素	绿生	红蜘蛛	喷雾。对鱼类有毒

杀虫杀菌剂	其他常用名称	防治对象	使用方法
中生菌素	克菌康、佳爽	疮痂病、炭疽病、细菌性角斑病、青枯病、软腐病、姜瘟病	喷雾或灌根
武夷菌素	格润	白粉病、灰霉病、叶霉病	喷雾。不能与碱性药剂混用
宁南霉素	菌克毒克	病毒病、白粉病、根腐病、立枯病	喷雾或喷淋
嘧啶核苷类抗生素	农抗 120、富高	白粉病、锈病、炭疽病、枯萎病、黄萎病、早疫病	喷雾或灌根。不能与碱性药剂混用
硫酸链霉素	农用硫酸链霉素、细菌特克	软腐病、疮痂病、青枯病、细菌性角斑病、细菌性叶斑病	喷雾或灌根。不能与碱性药剂混用
菇类蛋白多糖	抗毒剂 1 号	病毒病	喷雾。不能与酸碱性药剂混用
新植霉素		软腐病、细菌性角斑病	喷雾。土霉素和链霉素复配药剂，不能与碱性药剂混用
苏云金杆菌	Bt 乳剂、菜虫特杀	棉铃虫、菜青虫、玉米螟、小菜蛾、甜菜夜蛾等鳞翅目害虫的幼虫	气温 15℃以上使用，最好是 20℃
阿维菌素	爱诺虫清、爱福丁	小菜蛾、菜青虫、烟青虫、斜纹夜蛾、棉铃虫、斑潜蝇、蚜虫、红蜘蛛、根结线虫、跳甲	喷雾或灌根。对鱼类有毒，对蜜蜂高毒
甲氨基阿维菌素苯甲酸盐	好打、京博保尔	小菜蛾、菜青虫、烟青虫、斜纹夜蛾、棉铃虫、斑潜蝇、蚜虫、红蜘蛛	喷雾。不能与碱性药剂混用
甜菜夜蛾核型多角体病毒		甜菜夜蛾	喷雾。不能与酸碱性药剂混用
棉铃虫核型多角体病毒	毙虫净	棉铃虫	喷雾。不能与酸碱性药剂混用
菜青虫颗粒体病毒	武洲	菜青虫	喷雾。不能与酸碱性药剂混用
苦参碱	绿诺、绿土地一号	菜青虫、小菜蛾、甜菜夜蛾、烟青虫、蚜虫、红蜘蛛、地老虎、韭蛆	喷雾或灌根。不能与碱性药剂混用
烟碱	绿色剑	蚜虫、菜青虫、烟青虫	喷雾。不能与碱性药剂混用
藜芦碱	虫蛾毙治	蚜虫、菜青虫、小菜蛾、棉铃虫、烟青虫	喷雾。不能与酸碱性药剂混用