

Fruit tree quality can be perpetuated by budding and grafting, whereas the results from seedling trees tend to be variable.

Budding and grafting are the two most common methods used by nurseries and commercial fruit growers to raise young trees and rework or refurbish mature trees. In the home garden these two methods provide an economical way of increasing the range of fruit trees grown or altering and improving varieties already established.

Growing fruit trees from seedlings is not recommended. Cross pollination may occur between varieties, and it is not often that seedlings are identical to the parent tree.

Occasionally a seedling may equal or even surpass the parent tree in quality, but this seldom occurs. If a good seedling is obtained, it is better to bud or graft it on to a suitable rootstock than let it grow on its own roots.

Trees grown on from seedlings are seldom as satisfactory as trees propagated on recognised rootstocks. Seedling trees take longer to come into bearing and are usually prone to erratic cropping. They tend to grow into very big trees.

Principle

Budding and grafting are based on the same principle, i.e. placing the cambium layer of one plant on another so that they will unite and grow.

In budding, a single bud is used, whereas in grafting a scion (a piece of 1-year-old wood, usually with 3-4 buds) is used.

Both systems are forms of grafting, as they involve the joining of a new variety to the rootstock or existing tree.

There are numerous methods of budding and grafting, but only the simplest are described here. In the home orchard, these operations can be used in several ways.

Propagation of young trees: Raising young pip fruit trees is not practicable in the home garden, as a stock bed must be established and rootstocks vegetatively produced. However, it is comparatively simple to propagate stone fruit, particularly peaches and plums, which grow readily and easily from seed (stones).

Budding enables the seedlings to be transformed into worthwhile trees. This is usually done in the first year of growth, but may be delayed to the second year if stock has made poor growth.

Changing varieties: With slower-maturing fruit trees, such as apples, pears, and European plums, many years are wasted if a changeover to a more economic or desirable variety entails eradication of old trees and their replacement with young ones. Such trees can be successfully

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Fruit Trees

Budding and Grafting

In the Home Orchard

Other Index entries: Home orchard; rootstocks; budding; grafting.

reworked or refurbished by grafting, and be in production again within a comparatively short time.

A satisfactory tree will not be obtained by reworking a weak unthrifty tree.

With quick-maturing trees, such as peaches, neclarines and Japanese plums, replanting is better than budding or grafting the old tree to a new variety.

Pollination: Some "shy-cropping" trees require a second variety to serve as a suitable pollinator. Either a second tree can be planted, or a second variety can be grafted on to the tree, particularly if space is limited.

One reworked branch is usually enough to ensure ultimate good pollination of the whole tree.

Utilisation of space: To provide a succession of fruit throughout the harvesting season, several varieties of each type should be grown. However, the restricted space of the average home garden may not allow trees of every desired variety to be planted, even if dwarf trees are used. If there is only room for a few trees the number of varieties may be increased by growing more than one on a tree.

Different kinds of stone fruit can be grown on the same tree. On a peach stock it is possible to grow peaches, neclarines, apricots, and Japanese plums. Apples and pears are incompatible and cannot be grown on one tree.

When several varieties or kinds are grown on one tree, any excessively vigorous or inherently weak varieties should be avoided or the tree may become lopsided.

Repairing damaged trees: If the bark of the trunk or a main limb is badly damaged, the tree or limb may eventually die through ringbarking. Certainly its vigour will be severely reduced. Such damage may be repaired by a form of grafting known as bridge grafting.

Budding

Budding should be done when the current season's growth is fairly mature, but before the bark has hardened and become difficult to "lift". This period varies with different fruits, but normally occurs as follows: apricots in January; apples, pears, and plums in February; peaches and neclarines in mid-February to mid-March.

Cherries may be propagated by budding in December-January, but more usually by grafting in spring.

Selection of bud wood: Wood buds formed on shoots of the current season's growth are used. Wood buds are smaller and less plump than blossom buds and are pointed. On peach, neclarine, Japanese plum, and apricot both wood and blossom buds are formed on shoots of the current season.

Buds may occur singly or in clusters of two or three. If the identity of a single bud is in doubt, a double or triple bud should be used, as one is certain to be a wood bud.

Bud wood should be taken only from trees known to be free from serious diseases and to be good croppers.

Shoots on the outside and top of the tree, which get maximum light, usually have good foliage and bud development and will make the best bud wood.

Bud wood as thick as a lead pencil and carrying well developed buds should be selected.

To prevent shrivelling of the shoots when they have been cut from the tree, all leaves should be removed immediately by cutting through the petiole, or leaf stalk, leaving about 1 cm attached to the shoot. The retained portion of the petiole serves as a handle when the bud is later inserted in the stock. Immature wood at the tip of the shoot should also be cut off.

If necessary the bud-sticks can be kept in good condition for several days by rolling them in damp sacking or moist sphagnum moss and storing them in a refrigerator.

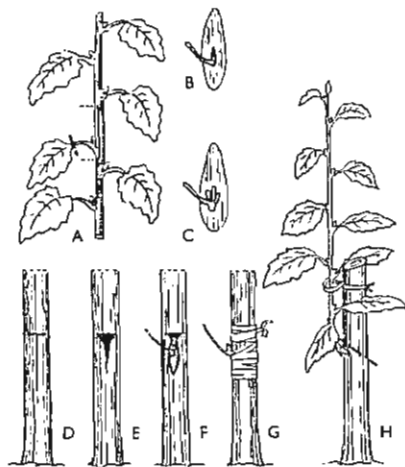


Fig.1: Budding. A: A shoot of the current season's growth with buds, showing the shape to cut the bud and the place at which to remove the leaf. B: A single bud ready for insertion. C: A triple bud ready for insertion. D: The incision made through the bark of the stock. E: The bark opened. F: The bud inserted. G: The bud tied. H: Growth from the bud tied to the angle of the stock, which is cut off where marked after mid summer.

Bud preparation: To prepare a bud, remove it from the bud-stick by inserting a sharp knife 1 cm below the bud and, with the blade held almost flat, cut under the bud to emerge 1 cm above it. The cut should be shallow to avoid including a piece of wood at the back of the bud.

Method of budding: The method described is known as "shield" or "T" budding and is the most popular.

In young seedling trees the buds are inserted at a height of 7-10 cm to ensure that the union of the scion and stock is well above ground level.

When mature trees are being budded, buds should be inserted in suitably placed 1-year-old wood. To encourage the production of this 1-year-old wood, the tree may have to be "headed back" (pruning off about two-thirds of the length of leading growth at the top of the tree) the previous winter.

The lower portion of the seedling stock, or branch of mature tree, should be trimmed clean of any shoots and leaves. A vertical cut about 3 cm long is made through the bark of the stock at the required height, but not into the wood. The cut is crossed at the top by a horizontal cut, the two form a T.

To provide for the insertion of the bud the flap on either side of the vertical cut should be lifted carefully with the knife. The stock is then ready to receive the bud.

The bud (held by the petiole) is inserted under the bark of the stock at the horizontal cut and forced gently downwards until the top of the bud shield will slide in flush with the horizontal cut. When in position, the bark flaps should overlap the bud shield on either side.

The operation is completed by tying the bud. A common method of tying is to begin at the bottom and work upward to just above the horizontal cut.

Suitable materials for tying include thin rubber strips or non-adhesive plastic tape.

Tying should always be done firmly, especially just above and below the bud, and the taping material should cover the incision, except at the bud, which must be left exposed. The whole operation should be done quickly to prevent drying of stock or bud.

A successful take is indicated if the bud is fresh after 3 weeks. In addition, if the petiole still adheres to the bud shield, it can be readily detached by a flick of the finger if the bud has taken. If the season is not too advanced, a failure can be replaced by inserting a fresh bud in another part of the stock. Should any signs of growth constriction begin to appear around the area of the bud the tie should be released 3-4 weeks after budding by running a sharp knife up the tie at the back of the stock. The buds will usually remain dormant until the following spring.

At the first signs of growth in spring, the branch or tree framework beyond the bud should be cut back to 10 cm above the bud. This portion retained above the bud, known as the snag, later serves as a support to which the bud-shoot can be tied with twine to prevent wind damage. This should be done when the shoot is about 15 cm long.

For several weeks after cutting back, shoots will arise on the stocks, and these should be rubbed off as they appear. Failure to remove these shoots may seriously retard growth from the scion bud.

The snag should be removed in late summer by cutting at the point of union with the scion, with a slight downward slope away from the scion. Snagging is done with secateurs, or with a pruning saw on larger stocks. Some skill is required to avoid injury to the scion and also to ensure a neat wound that will heal rapidly. All wounds should be painted immediately with a fungicidal wound dressing.

Grafting

Grafting should be done in spring, when growth has begun and the sap is flowing. From the advanced "green tip" to the "open cluster" stage is generally accepted as being the best time for grafting. However, some plants such as grape and kiwifruit can bleed excessively if cut at this time so these plants are best grafted outside the period of strong spring sap flow. For these plants suitable grafting times are either during the dormant period or later in the spring after the initial growth flush.

Where either budding or grafting can be done, if one method fails, there is a second chance later with the other method.

Selection of grafting wood: The wood must be:

- From trees of a desirable type, with good cropping performance and freedom from serious diseases.

- Dormant. If it is collected as late as possible before growth begins, the storage period is lessened. August is a good time, but collection may be earlier if necessary.
- The previous season's growth (one-year-old wood), and carry leaf buds.
- Left whole when collected. The tips should not be cut off as the wood may dry out prematurely, as well as providing a wound entry for disease.
- Of a diameter which will yield a number of scions about the thickness of a lead pencil, after part of the base and tip have been discarded.
- Stored where it will stay dormant and not dry out. It should be placed in moist, but not too wet, sawdust or sand, covered wholly or just heeled-in, and stored in a cool but frost-free place or heeled-in in a shaded part of the garden or wrapped in a plastic bag and placed in a refrigerator.

Methods of grafting: There are three principal grafting methods:

- Heading back of the limbs of the tree or stock and inserting a scion or scions in the remaining part.
- Refurnishing established trees. In this method the main limbs or leaders are retained at from half to practically full length, according to the vigour of the trees. All heavy laterals and sub-leaders should be entirely removed. Light laterals are retained, however, as they are the most desirable wood on which to graft. The framework retained is refurnished by the insertion of scions of the new variety at suitable intervals throughout the length of the leaders. This method is used to rework a branch for pollination purposes.
- Bridge grafting is used when the bark on the trunk or main arms of a large tree has been so damaged that there is danger of loss of the tree or limb through ring-barking.

Kinds of grafts: Styles of grafting are many and varied, some requiring special tools and a high degree of skill. Others are quite simple, just as effective, and need no other equipment than a sharp knife, a pruning saw, and a supply of tape, or a hammer and 1.5 cm shoe laces. The simple grafts are described here.

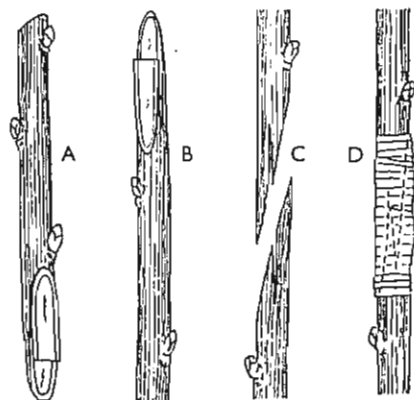


Fig.2: Whip and tongue graft when the stock and scion are of equal size. A: Scion. B: Stock. C: Stock and scion. D: Graft completed and tied.

- *The whip and tongue graft* is used for nursery stocks, 1-year-old trees, and light lateral growths on established trees.

This type should be adopted whenever the scion and the stock are of about equal thickness, or when the stock is only a little thicker than the scion.

No special precautions are required in fitting when the scion and stock are of equal thickness, but when the stock is larger, care must be taken that the cambium layers of both scion and stock are in contact. This necessitates placing the scion to one side of the stock.

Whip and tongue grafts should be tied and, as with budding, rubber or plastic tape are suitable for tying. If, after growth begins, swelling of the wood at the union is noticeable the tension of the binding should be released by cutting.

- *The rind or bark graft* is used for trees headed back or if the stock is too large for a whip and tongue graft.

Before grafting, trees or branches should be headed back to a height where the bark is clean and healthy all round; the sawn stumps should be well smoothed over with a knife.

Scions should be cut to a length of 3–4 buds and prepared with a flat bevel. A thin strip of bark is taken off the side of the scion which is to be in contact with the unlifted portion of the bark on the stock.

With a grafting knife, a vertical cut of about 4 cm is made into and through the bark of the stock. One side is freed with a sideways movement of the knife. The scion is then inserted under the raised portion and, keeping it close up to the unlifted bark, it is pushed down until the top of the bevel is almost flush with the stock, i.e., with little or no cut wood of the scion showing.

These grafts must be tied or tacked in. If a tack is used, it should be inserted through the overlap of bark and scion near the top of the graft and at a slight angle towards the unlifted side of the bark.

- *The bridge graft* is used for repair work on the trunk or a main limb which has been damaged.

The damaged portion should be cleaned and the bark cut back to healthy, clean tissue both above and below the damaged area.

Scions should be prepared at both ends in a similar way to that for the rind graft. They are then inserted under the bark both at top and bottom. The scions should be cut slightly longer than the gap to be bridged, so that they will stay firmly in position. Tacks may also be used to keep them firm.

Sealing of grafts: All grafts must be treated with some kind of sealing material to exclude air, water, insect pests, and disease spores. Several types of good sealing material are marketed, the most suitable being green crude petrolatum or a bitumen emulsion.

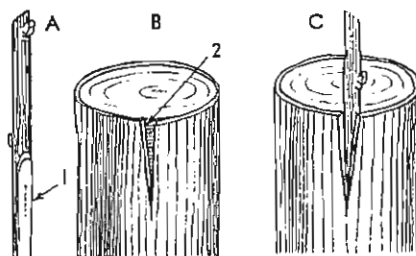


Fig. 3: Rind or bark graft. A and B: The edge of the scion (1) has been trimmed for better contact with the unlifted edge of the bark (2) on the stock. C: This scion inserted in the stock.

The sealing material should completely cover the point of union and any lying material used, as it is essential to exclude air and water until growth begins. When correctly applied, some modern plastic bud tapes give an excellent seal around the graft union and do not require the application of a sealing compound.

In addition to covering wounds on stocks and at the point of contact of stock and scion, it is advisable to place a dab of petrolatum or other sealing material on the tip of the scion. All wounds made by the saw cuts when trees are headed should also be protected.

After grafting, trees may need further attention. Exposure to the weather sometimes causes further splitting of the bark and weak spots occur in the seal, which should be renewed to prevent air and water reaching the point of contact between scion and stock. A sharp knife should be run across the ties of grafts when growth begins and swelling becomes obvious.

Rootstocks

As the name implies, a rootstock provides the rooting system on which the desired variety (called the scion) is budded or grafted.

Correct choice of rootstock is important, as the stock influences the behaviour of the tree throughout its life, especially its size, the age at which cropping begins, and the yield.

Knowledge of the many types of stock available enables a choice to be made for a particular purpose. This may be the production of a dwarf, quick-cropping tree for the small home garden or a large, slower-maturing tree suitable for farm or commercial orchards.

The rootstock must be compatible with the kind of fruit which is to form the top or scion variety.

Greatest compatibility is between varieties of the same kind of fruit, but plums, peaches, nectarines, and apricots are compatible with each other. Pears may be worked on quince rootstocks, though not all varieties are compatible. Pears are not compatible with apples.

Table 1 summarises recommended stocks for tree fruits for home gardens.

TABLE 1: RECOMMENDED ROOTSTOCKS FOR HOME GARDEN FRUIT TREES

Rootstock	Remarks
SCION: APPLE *	
Northern Spy or Merton 793	Vigorous; suitable for most home orchards where medium to large trees are desired; not suitable for wet soils; suitable for espaliers.
Malling 7 or Malling-Merton 106	Semi-dwarfing; suitable for small home orchards and for vigorous varieties, or for weak varieties to be grown as dwarf bush trees, pyramids, or cordons where Malling 9 may be too dwarfing.
Malling 9 or Malling 26	Dwarfing; suitable for dwarf trees (pyramid, bush, or cordons). Not suitable for weak-growing varieties or on poor soils. Inclined to have brittle roots.
SCION: PEAR	
European pear (<i>Pyrus communis</i>)	Vigorous; suitable for larger home orchards where medium to large trees are desired. Grow from seed of cultivated varieties, especially Winter Nelis and William's Bon Chretien.
Quince (Malling Quince A or BA 29)	Semi-dwarfing; smaller and earlier cropping trees. Some pear varieties do not thrive when worked directly on quince, and for these the quince stock must first be worked with a compatible variety of pear. Suitable for espaliers.
SCION: QUINCE *	
Quince (Quince A or BA 29)	For general use.
SCION: APRICOT	
Apricot	Suitable generally, but difficult to propagate. Grow from seed (stones) of vigorous varieties.
Myrobalan plum	Suitable for the heavier types of soils. Grow from cuttings.
Peach	Well drained soils only. Trees may be somewhat shorter lived. Grow from seed (stones) from mid-season or late varieties of good vigour – Golden Queen very suitable.

* As most apple and quince rootstocks are generally raised from stools, it is rather difficult for the home gardener to raise rootstocks of these kinds.

SCION: CHERRY

Mazzard For general use. Grow from root cuttings or seed.

Colt Grow from cuttings

SCION: PEACH AND NECTARINE

Peach For general use. Grow from seed (stones).

St Julian A Semi-dwarfing. Grow from (plum) cuttings.

SCION: PLUM (EUROPEAN)

Myrobalan For general use. Grow plum from cuttings.

SCION: PLUM (JAPANESE)

Myrobalan For most varieties, except plum vigorous kinds. Grow from cuttings.

Peach For vigorous and shy-cropping varieties. Trees may be somewhat shorter lived. Grow from seed (stones). Well drained soils only.

SCION: CITRUS

Sweet Recommended for lemons orange only.

Poncirus trifoliata

Semi-dwarfing and hardy; enables trees to withstand lower temperatures. Suitable for all citrus except Eureka, Villa Franca, Genoa, and Meyer lemons. Excellent for home gardens; produces medium sized trees, fruiting is earlier, and fruit quality improved. Best for oranges and mandarins. Grow from seed.

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