



## Grafting Grapevines

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### Reasons for Grafting

Vines are grafted to change varieties, either from one fruiting variety to another or from a rootstock variety to a fruiting variety. Changing varieties is always expensive and becomes more expensive the older the vines.

When changing fruiting varieties, the vines are usually three or more years old with trunk diameters from an inch and a half on up. The reasons for change are either to convert to a variety for which premiums are anticipated, or to eliminate a variety for which there is little market demand.

While conversion of an older but fairly healthy vineyard is sometimes justified in the case of anticipated premiums, grafting over is normally only justified with healthy young vineyards not more than ten to fifteen years old.

### Success of Grafting

With fairly young healthy vines, good grafting wood, and proper grafting techniques, success rates should exceed 90%.

It is impossible; however, to predict what will happen in any particular case, and also difficult to account for the poor takes which sometimes occur.

### Possible Combination Problems

Some fruiting varieties should not be grafted to other varieties because of virus disease problems.

For example, one-third to one-half of Emperors grafted on Almeria will not color because of the leaf roll virus affecting Almerias. Italias should not be grafted to anything because most, if not all of the commercial vines, are infected with fanleaf virus.

Not all potential problems are known, but many such difficulties can be avoided by checking with your Farm Advisor.

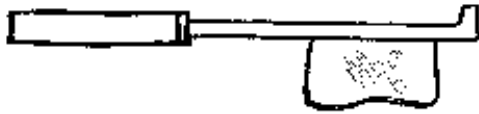
### Selecting and Storing Grafting Wood

Just as the possible diseases the understock might carry should be considered, disease-free grafting wood is also important. Lining up supplies in advance insures a healthy source of grafting wood.

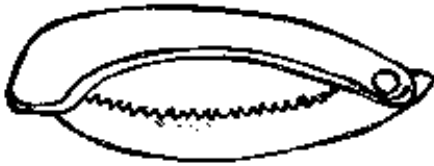
If possible, store the grafting wood on the vine until late in the dormant season, but cut before the buds begin any growth. All except very early leafing varieties could be left on the vine until about the latter part of February. Late varieties could be left until early March.

After cutting, keep the wood moist to prevent any drying out. Keep it cool to prevent any development of the buds. A well drained pit where the wood is covered by soil at least a foot deep will usually keep the wood dormant until late March.

If stored in the soil, keep the wood free of soil or sand as these particles dull the knives of the grafters. Asphalt paper or plastic can be used to keep soil away from the wood. Wet the wood when burying, and keep the covering soil moist, but not saturated.



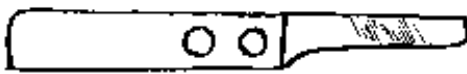
SPLITTING TOOL



SAW



WEDGE KNIFE



SCION KNIFE

If the vines will not be grafted until April or later, store in cold storage with temperature between 32° - 36° F. If kept below 36°, the wood will stay dormant for several months.

If kept in cold storage, put wet newspaper around the cuttings and place in plastic bags. Storing in lined bins with moist wood shavings is also satisfactory. Peat or sphagnum moss could be used also, but some of the fine material sticks to the wood making the grafting a little more difficult.

Sulfur dioxide should not be introduced in the cold storage area unless the cuttings are well protected in plastic bags.

Select the medium to large diameter mature wood for the particular variety in question. If sufficient wood is available, use only the basal portion of the cane eliminating the first two or three buds which are too close together.

The next four to six buds are the best. The larger wood is easier to work with, especially for notch grafting.

## Sawing Off the Vines

The tops of the vines may be cut off and hauled out of the vineyard any time before grafting, but a fresh cut made within one-half hour of grafting is necessary.

Chain saws are normally used for this chore. With bark grafting, when the bark slips, care must be exercised to keep from tearing off the bark as the cut is completed.

## Make Saw Cut to Relieve Bleeding

If vines are bleeding at the time of grafting, make a saw cut near the base of the vine about 1/4 inch deep to relieve the pressure. The sap will stop flowing almost immediately. In a few cases, two such cuts on opposite sides of the trunk may be necessary.

While the graft could be made with the sap flowing, the grafting compound would wash off.

The saw cuts seal up in a week to ten days and the sap may again flow from the top, but this does no harm.

## Use Grafting Compound Plus Latex Paint for Protection

After the graft is completed, coat the cut-off top of the stump, the split or notch and the cut portions of the scion with grafting compound (use the black asphalt emulsion sold under the names Tree Heal or Tree Seal).

Use these materials as they come from the can unless very thick. If necessary to thin, add only small amounts of water since a little water thins the mixture a lot.

Use the grafting compound liberally, being especially careful of the cut sides of the scions, the easiest areas to miss. A one-inch wide paint brush with the bristles cut a little shorter to stiffen them is most satisfactory.

Improved coverage can be insured if the grafts are examined an hour or so after the original coating

from the opposite side of the row from which they were first covered. Cover any missed spots.

After the asphalt compound has dried, cover all the asphalt-coated area and the entire scion with white interior latex paint, the kind sold for painting interior walls of houses.

The paint may be diluted with water to flow more easily, such as two parts paint to one part water. Paint reduces water loss from the scions, keeps the grafted area cooler, and considerably improves the take.

After these two treatments, the scions need no more attention until they begin growth. Gum may push up the grafting compound and the vines may begin bleeding a week or so after grafting, but no further coating is necessary.

### **Length of Scion**

Either one or two-bud scions are satisfactory. Many grafters prefer two-bud scions although one-bud scions give just as good results, require less grafting wood, and are less apt to break off.

No case has ever been observed of an unsuccessful graft due to bud failure.

### **Place Scions So Buds Face Direction Growth Is Wanted**

Training is much easier if the grafter places the scions so the buds are pointed in the direction growth is desired.

The position of the bud (or buds) in relationship to the cuts on the scion is inconsequential although some cuts are easier with buds in certain positions.

### **Time of Grafting**

Trials have shown the best results with cleft and notch grafts are usually obtained by late grafting; that is, from early April to mid-April.

The probable reason for this late timing is the comparatively late activity of the cambium layer on the trunks of established grapevines.

The cambium does not begin activity until early April and does not become active enough to cause the bark to slip until mid to late April, depending upon the variety and the year.

Healing between the stock and the scion takes place only as a result of a union between the two active cambium layers. Grafting much before cambial activity begins simply lowers the percentage of successful grafts.

If a large acreage requires conversion, grafting may need to begin by mid-March or so in order to finish by mid-April. Late grafting frequently will require the scion wood be kept dormant in cold storage.

### **Buds Begin Slowly**

The scion buds begin with a distressing slowness. The buds may swell and show green tissue up to a quarter inch in length. This can lead to a false optimism of a virtual perfect stand followed a few days later by a pessimistic feeling when the buds dry up.

This bud development occurs without any healing taking place. Each bud contains three growing points. The loss of one does not affect the success of grafting since a secondary bud may push later.

Success of a scion is not counted until a strong shoot at least one-half inch in length has developed.

Regardless of how early the grafts are made, only a few buds start in late April. Most begin in May and on up to mid-June. An occasional bud will start even later, sometimes to mid-July.

### **Tie the Developing Shoots**

Once the buds begin to grow, the shoots may develop with great rapidity and require weekly attention for training. The scions can be broken off by the weight of an untied, vigorous shoot.

Bark grafts are especially prone to breakage since their mechanical attachment is poorer than either cleft or notch grafts. The ties must be especially loose since the shoots greatly increase their diameter.

## Let Both Scions Grow

For all except small vines, two scions are used per vine.

If both scions take, let both grow. If only one takes, it can be trained to a head or bilateral cordon by topping to force side buds.

The trunk remains alive on both sides if both scions grow. If one grows, only the trunk on that side remains alive but the other side dies back from the large cut area.

## Removing Suckers

The trunk will sucker profusely. While suckers do not seem to affect the success of the graft, they are the most quickly removed when less than 12 inches long.

## Irrigation

Irrigation does not appear to affect the success of the grafts. Obviously the vines cannot be using much water, but irrigation does not hurt the grafts.

An occasional shoot may wilt in hot weather, but this is an overstress on the conductive system in the union rather than lack of water.

They always recover by throwing out side buds somewhere on the shoot.

## Cleft Graftings

Cleft grafting is the simplest method of grafting and requires relatively little skill. After the top is cut off (preferably a half hour or so prior to grafting), the stock is split with a splitting blade or a cold chisel.

The split is held open with the splitting tool as the scions are prepared and fitted into the stock.

As the tool is removed while fitting the first scion, a large screw driver may be used to open up the other side while fitting the second scion.

The scions are cut tapering from the bud down with an even, straight cut. The internodal length should allow a cut of at least two inches. The outer edge of the scion is cut slightly wider than the inner edge to insure contact of the cambium layers.

The bottom of the scion need not terminate in a sharp point. Usually a better fit is obtained if the bottom tapers to about 1/16-inch width.

The bark on the trunk is thicker than the bark on the scion. The cambium layer lies between the bark and the wood. It is this layer that produces the union between the stock and scion.

The scion is placed so that at the top the cambium layer of the scion is slightly outside of the stock cambium. The bottom of the scion slants inward to insure that the cambium layers cross at one point.

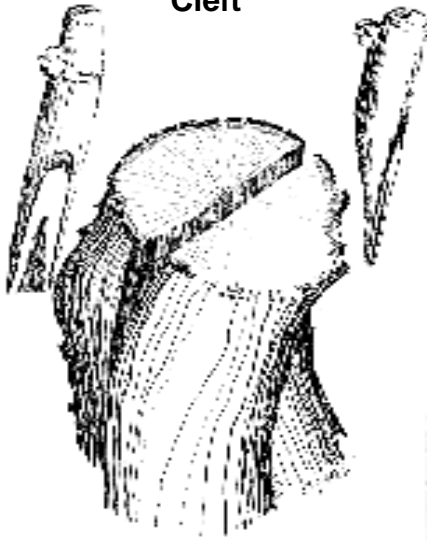
Skilled grafters use only a very slight slant so that the cambium layers coincide over a considerable distance.

The pressure of the stock is sufficient to hold the scions in place except for small vines. If necessary, friction tape can be used to close the top of the stock.

Cleft grafts leave a deep split that does not heal unless the scions eventually grow large enough to cover. When small vines are cleft grafted, the growth of the scions may force the split apart.

After grafting, apply grafting compound and latex paint.

## Cleft



with a knife to take out a wedge-shaped piece of wood.

The wedge is about 5/16-inch wide at the top of the cut and tapers to the saw cut both at the bottom and at the inside on top.

The saw cut is usually made with a small curved pruning saw. Thus, the knife cut will not quite reach the extremities of the saw cut.

In the beginning the common tendency is to make the knife cut too wide at the top. If this is done, it takes large diameter scion wood to fit. How wide the top cut can be depends upon the size of the scion wood. It is far easier to work with large wood.

The scion is then cut with a taper similar to that of the stock and tapering quite sharply from outside to inside. The outside to inside taper of the scion must be slightly more acute than that of the stock so that the contact is made in the cambial area.

Again as with cleft grafting, the scion position slants very slightly from the top inward to insure cambial contact.

The scion is placed in the notch and pounded down with the handle of the grafting knife. The friction between the stock and scion is sufficient (if properly made) to hold the scion tightly in place.

In order to hold with friction alone, the notch must be fairly deep as described. With shallow notches the scions will fall out.

After grafting, cover with grafting compound and paint.

While grafters untrained in the use of notch grafts are frequently reluctant to try this system, the extra skill required is usually gained within a few hours. The method is slightly slower, however, requiring about 20% more time than cleft grafting.

## Notch Grafting

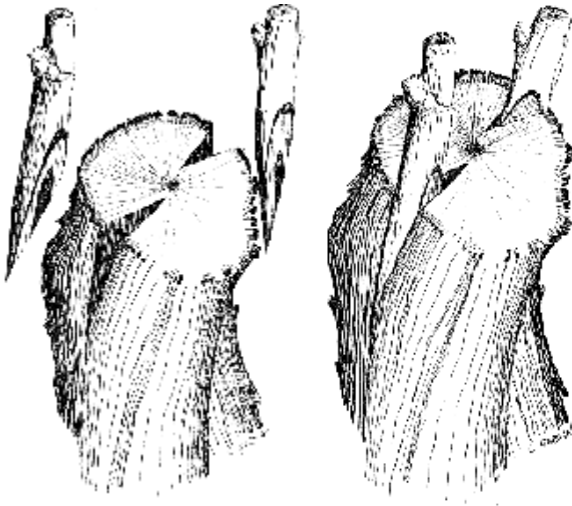
Notch grafting is a more complicated grafting method and therefore has been little used on grapevines.

It possesses the advantages of not leaving a deep, unhealed split, of not being affected by crooked grain, and placing the scion better both in relation to smooth areas on the trunk and in respect to the desired position on the vine.

The notch is started with a saw cut about two inches down the side of the stock and about 3/4 inch deep at the top. Then one side of the saw cut is opened up

This figure comes from practiced cleft grafters and relatively unpracticed notch grafters, so the difference with comparable training may well be less.

### Notch



This bark flap is then peeled away from the trunk remaining attached at the bottom. Approximately the top third to half of the flap is cut off (usually cut across while still on the trunk before peeling back).

The scion is then placed against the trunk underneath the flap and two brads used to secure the scion, one through the bark flap, and one through the scion near the top of the cut off trunk. Seven-eighths or 1-inch long, #18 brads will hold the scion. A staple gun could also be used.

Cover with grafting compound and latex paint.

Results with this method have not been as consistently good as with either cleft or notch grafting although equivalent at times. The healing is also somewhat inferior since the growth of the scion is on the outside of the trunk.

The cut off area of the trunk does not cover over easily.

### Bark Grafting

Bark grafting is perhaps the easiest method of grafting and requires the least skill. The bark on the trunks of older vines will not slip until late April in the San Joaquin Valley.

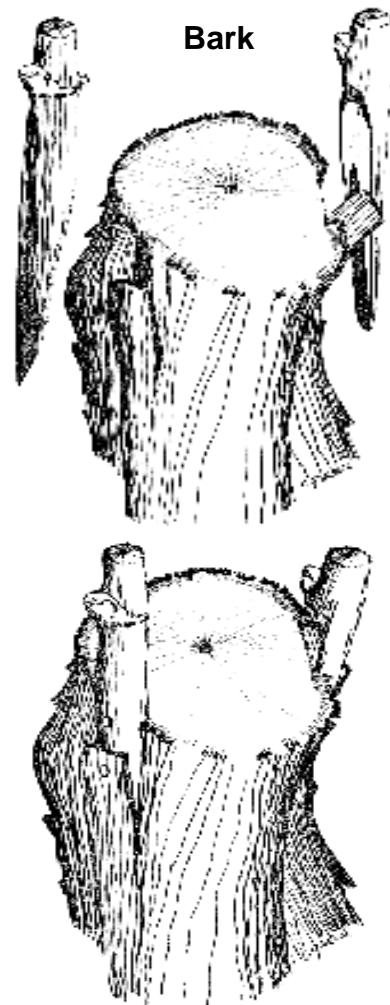
The actual date of possible grafting will vary with the variety and the year. It is simply a matter of testing to find the earliest possible date.

The bark does not slip in all places on the trunk at the same time. Even though some bark may be found slipping, the date for grafting may well come a week later before all areas will slip uniformly.

After the top is cut off, the loose outer bark is removed from the grafting site. The scion is prepared first making a straight but slanting cut about two inches long, usually on the side opposite the bud, and a cut on the opposite side about one-third as long.

Hold the long cut of the scion against the trunk and slit the bark on both sides as wide as the diameter of the scion and as far down the trunk as the scion length.

### Bark



## Whip-Grafting

One or two year old vines may be whip-grafted at any convenient height above the soil surface. This method is used generally for vines too small for cleft or notch grafting, or too large for chip-budding; that is, vines up to about 3/4-inch in diameter.

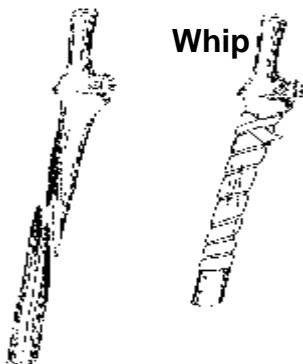
If scion wood can be found to match the understock, such a match is desirable. In many cases the understock will be of larger diameter than the scion wood. If so, then the cambium layers are matched on one side only.

Depending upon the diameter of the wood involved, the sloping cut will usually measure from 1-1/2 to 2-inches in length.

To provide greater rigidity, a tongue is cut in both the stock and scion, the cut starting about 1/4 of the way down from the point of the scion and stock.

After being fitted together, the graft is wrapped with grafting rubber or electricians tape, then coated with the asphalt grafting compound and coated with latex paint.

Since the understock is usually one-year-old wood, and since the cambium layers on this type of wood become active earlier than that on the trunks of older vines, the grafting should be completed by the end of March.



## Green Wood Grafting

Green wood or green grafting is an operation normally done with rootstock vines that have been planted in the vineyard the previous years.

It is an alternative method to fall chip-budding with some advantages and some disadvantages.

The chief advantage is the graft is above the soil surface so no scion roots can possibly develop. If chip-buds are placed in the rootstock vines too low, where soil touches the fruiting variety, scion roots will form.

These must be cut off annually or else the vine will eventually develop its own root system. Green grafting eliminates this possibility, but is a somewhat more expensive method of converting the rootstock to the desired variety and additionally, the vines do not develop quite so rapidly.

To green graft, one shoot is trained up the stake. Although tender wood can be successfully grafted, the operation is made easier by using more mature stiffer wood, that which is lignified and showing white pith.

This maturity does not usually develop until late May so green grafting ordinarily takes place from late May until about mid-June. The earlier the work can be done, the better since hot periods are less likely to be encountered and the vines have a longer growing season in which to develop.

The success of grafting depends upon many factors, an important one being the vigor of the rootstock and temperatures at time of grafting. Grafting weak vines is apt to result in failure. Also, grafts may fail during extreme hot spells.

Generally speaking, there is no point in trying to graft a vine with a diameter at the point of grafting of less than 5/16-inch. Preferably the vines should measure 3/8-inch in diameter or above. Leave the weak vines for fall chip-budding or green grafting the following year.



Steps in green grafting process are:

1. Keep the vineyard well supplied with moisture. Irrigate within a week or so before grafting, immediately after grafting, and once a week until the graft takes.
2. Disbud and deleaf from the base of the vine up to the point of grafting (one to two feet above the ground surface) at least four days prior to the grafting operation, but not more than seven days before.
3. Obtain scion wood the same diameter as that of the rootstock vines and of about the same maturity. Cut leaves off the scions, but do not injure the buds.

Grafting sticks will keep for up to a week after being cut off the vine if stored to prevent drying out and kept at about 70°. Wood is usually cut fresh every day unless the source is distant.

4. Use a whip-graft, a single sloping cut 1 to 1-1/2-inches in length. Match the diameters of the stock and scion wood as closely as possible. Use one-bud scions.
5. Wrap completely with one-half inch wide green nurseryman's polyethylene tape. Start the wrap from the bottom. Spiral up rapidly overlapping on the previous wrap, but do not overlap the edge more than 1/8 inch.

Keep the tape smooth and tie with tension but do not try to stretch the tape very much. Tie off tape at the top of the graft.

Wrap only once from bottom to top. Polyethylene prevents moisture loss but does allow some gas exchange (oxygen and carbon dioxide) if wrapped once with the overlap indicated. Rubber tape and string have also been used in the past and some grafters may still prefer these materials because of familiarity. Rubber tape sometimes deteriorates too rapidly.

String must always be cut off as the graft increases in diameter or else the string acts as a partial girdle.

Polyethylene tape has enough stretch to allow considerable growth. It will never come off by itself and must be removed eventually but can safely be left on the vine until about August. For some reason a lump develops at the bottom of the graft when using polyethylene tape.

6. Sap will usually flow through the scion and exude from the top within a few minutes after grafting. If not, the chances of success are diminished. Failure of sap to come through the graft is usually an indication of insufficient soil moisture, weak vines, or of course, a poor fit.
7. The buds will usually start growing in ten days to two weeks after grafting. Sucker growth below the point of grafting should be removed at about weekly intervals. If a graft is obviously failing due to drying of the scion, the vine may be regrafted.
8. Tie the developing shoot from the scion bud up the stake and develop the head or cordons as desired.

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