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Converting Mature Vineyards to Other Varieties

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This picture of a mature vine of the DeChaunac (S-9549) variety was taken October 5, 1975. Just a year earlier in 1974 this was a mature Concord vine. This conversion system is described in this report.

NEW YORK STATE AGRICULTURAL EXPERIMENT STATION, GENEVA, A DIVISION OF THE NEW YORK STATE COLLEGE OF AGRICULTURE AND LIFE SCIENCES, A STATUTORY COLLEGE OF THE STATE UNIVERSITY, CORNELL UNIVERSITY, ITHACA

INTRODUCTION

Much has been written about grape grafting (1, 2, 3, 4) yet the grafting of mature grapevines has not been a commercial practice in New York because results have been erratic and unpredictable. Occassional successes, however, indicated grafting could be successful, if properly executed. Research was therefore initiated to determine the factors important in achieving consistent success with grafting mature vines.

During this 7-year investigation, many small screening trials involving 5-10 grafts were conducted. The experience gained as a result of these trials identified techniques and vine characteristics which contribute to successful field grafting.

Observations were concentrated in five areas:

1. Factors influencing the callus development of scions and trunks.
2. Techniques for placing and maintaining scions in contact with trunks.
3. Ways to maintain moisture in the scions.
4. Ways to maintain an adequate environment around the graft for callus development.
5. The application of the information acquired.

The topworking of mature grapevines has traditionally involved cutting off the vine and grafting cuttings to the stub of the trunk. This traditional method has proved risky and expensive for New York vineyards because of the following reasons:

1. There is a loss of crop while the new vine is being formed.
2. If the graft fails, the vines are weakened and re-grafting becomes very difficult.
3. Cutting the old trunk induces profuse growth of suckers which is a management hardship.
4. The growth of scion shoots is excessively vigorous and leads to shoot and scion breakage.
5. The excessively vigorous shoots may not properly mature and are susceptible to winter injury.

The process described here permits the grafting of the vine before the top is cut off. Grafts made in this way make limited growth the first year, usually about 10-30 inches or more, but they grow vigorously the second year. During the second year, the grafts usually develop enough cane growth so that there are enough buds on the new variety to produce a commercial crop the following year. Thus, a full crop is borne on the stock variety for two years, and the new variety is cropped the third year.

Advantages of this new process are:

1. It is possible to change from one variety to another without appreciable crop loss.
2. The top of the stock vine is not cut off until after the graft is well established; consequently, there is no danger of weakened vines because of graft failure.
3. There is no managment problem with the forcing of suckers as occurs where tops are cut off before grafting.
4. The limited growth during the first year is less subject to breakage and generally allows sufficient cane maturation to insure winter survival.
5. More than 80 per cent surviving grafts may be obtained.
6. Although complex, the process can be easily learned.

In this 7-year study, more than 700 grafts were made and examined. A pictorial description of this new process is presented in this report followed by a detailed analysis of each step. If the whole process is followed carefully in the vineyard, it will give excellent results.

Distinctive features of this new process are the use of a plastic tube containing water and affixed by a cork to the top of the scion to maintain moisture in the scion along with various refinements in the grafting process itself.

PROCESS IN PICTURES

This process involves a series of important details that must be carried out at a particular time and in a particular way in order to achieve success. The following sequence of photographs shows the process in its entirety with abbreviated remarks. The text following these photographs tells why these things must be done in the manner presented.

PREPARATION OF THE SCIONS

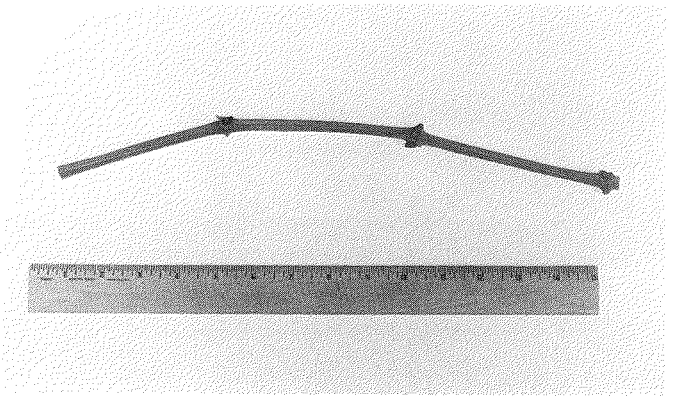


Figure 1.—These are scions as they were cut for storage. An entire internode is left above the top bud and the cut at the bottom is just below the bottom bud.

Figure 2.—At the time of grafting, the scions are cut with a diagonal cut 1½ inches above the top bud and 3 inches below the bottom bud with a straight cut across the scion.

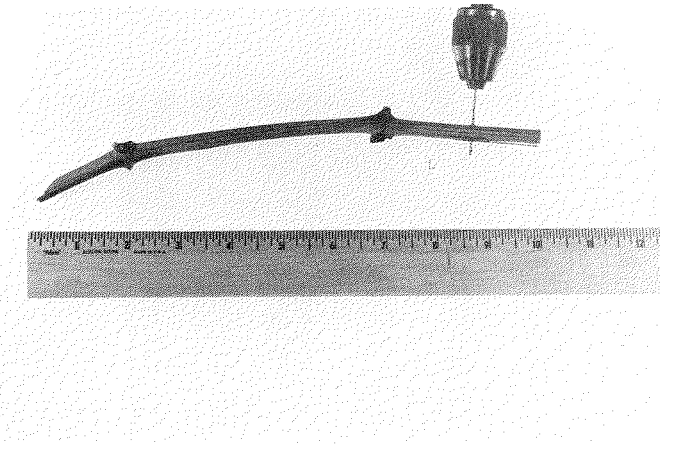


Figure 3.—A hole for the nail that will support the scion and the weight of the tube is drilled 1⅛ inches from the bottom of the scion. See text for drilling instructions.

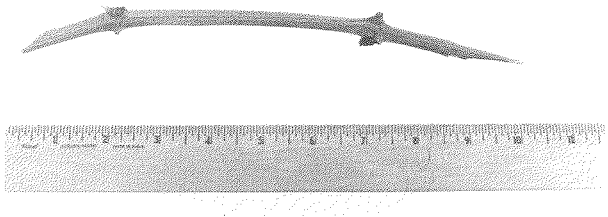


Figure 4.—The scion wedge is cut starting ⅛ inch below the nail hole for the outside surface and ⅛ inch above the hole on the inside surface. The two points at the base must be distinctly separate so they form a fork. The outside face should be about an inch long while the inside face will be about 1¼ inches long.

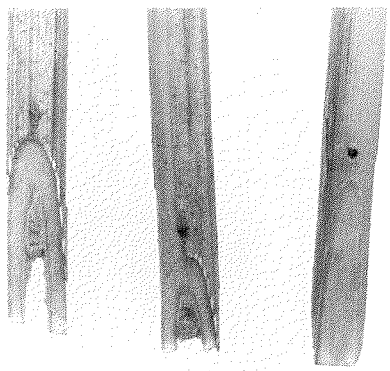


Figure 5.—The proper and improper cutting of the scions is shown in this close-up of the outside faces of some scions. The scion on the left is cut properly. The pith was removed simply to demonstrate the fork. The scion in the center is cut too short and stocky. The blunt tips are too stiff to adapt to the curvature of the trunk. The scion on the right is cut with a flat surface and also will not adapt to the trunk curvature.

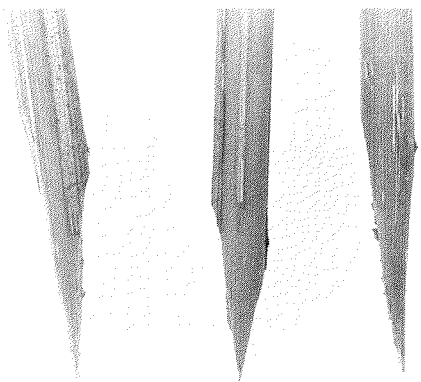


Figure 6.—This side view of the scion shows the relative difference in length of the two sides of the scion wedge and the fact that the scion comes to a point. This latter is important. The left scion is cut correctly.

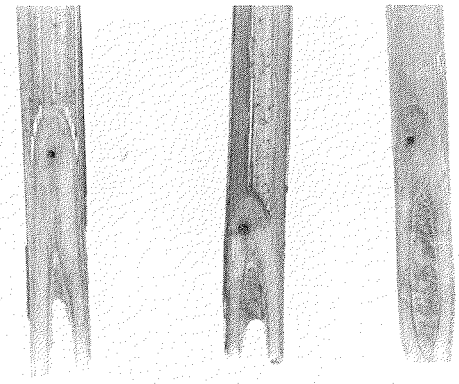


Figure 7.—This is the inside face of the scion showing the cut started above the nail hole. The left scion is cut correctly.

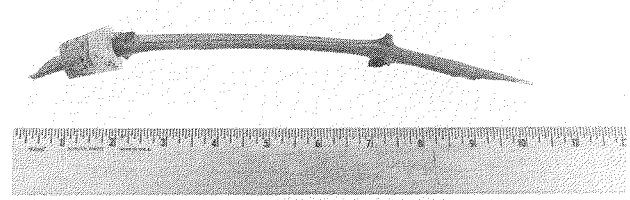


Figure 8.—The cork is placed on the top and pushed down to the thickening above the top bud.

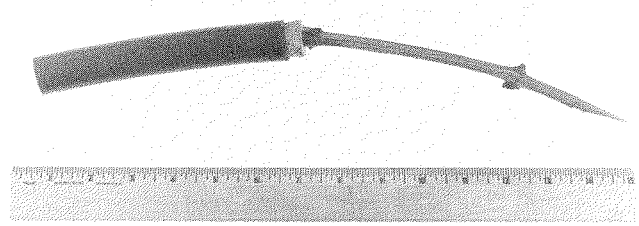


Figure 9.—The tube is held in one hand and the cork pressed into the tube firmly with the other. With large quantities of scions, it is advisable to use a device to hold the tube while the cork and tube are pressed into place. A piece of ½ inch dowel about 4 inches long inserted in a hole in a board is useful to provide support for the tube while the cork is pressed into it.

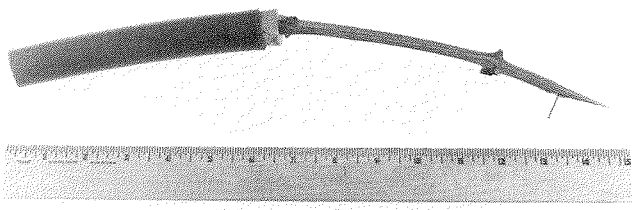


Figure 10.—The nail is pushed part way through the hole.

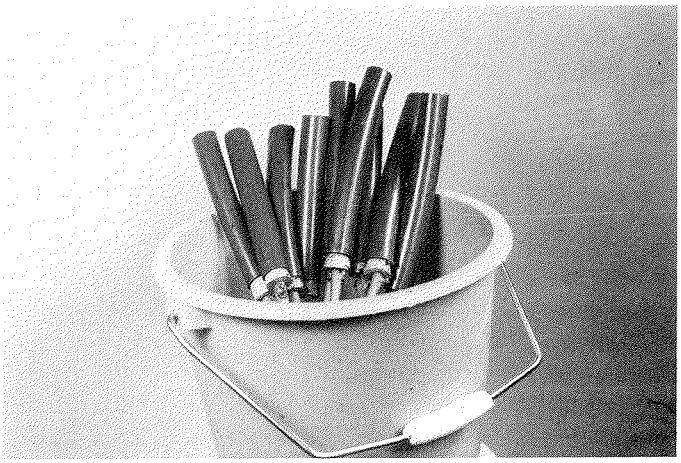
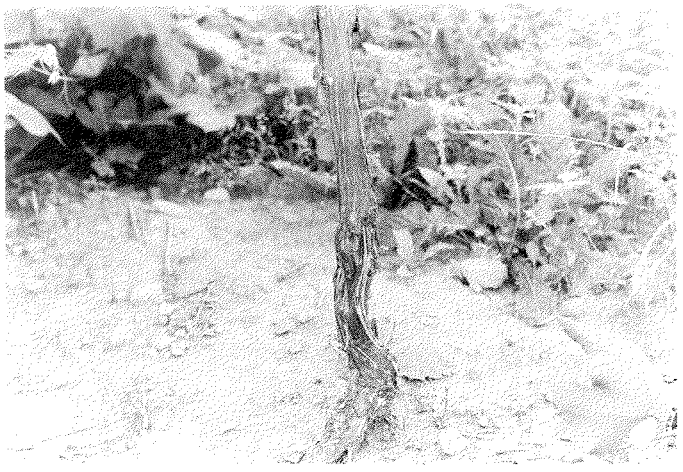


Figure 11.—The scions are now placed upright in a pail with 2 inches of water in the bottom to keep the end of the scion wet. The tubes are filled with water and are allowed to stand for at least an hour to determine any leakers to be repaired by pressing the cork in more firmly. The scions can be prepared as much as 24 hours in advance and left in the pails until taken to the fields. If the scions are left this long, however, the nail should not be inserted until just before taking the scions to the field. The nails will rust in water in a few hours and stain the scions.



PREPARATION OF THE TRUNK

Figure 12.—A typical Concord trunk to be grafted. Note the injury at the bottom which would make grafting close to the ground very difficult.

Figure 13.—Close-up of the straight portion selected for grafting.

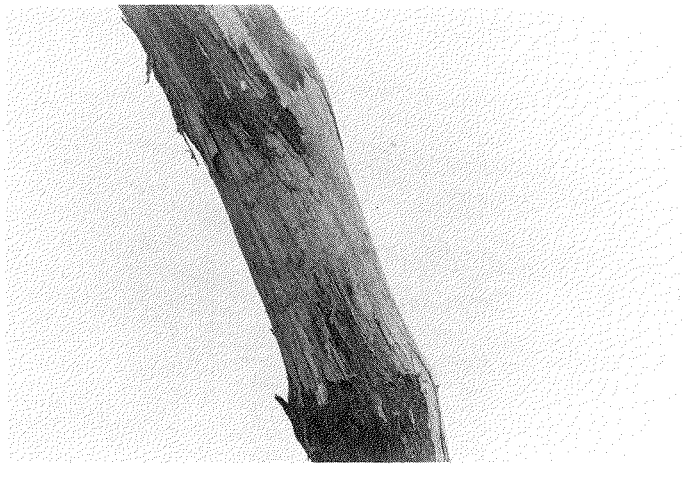


Figure 14.—The loose bark is peeled off the trunk.

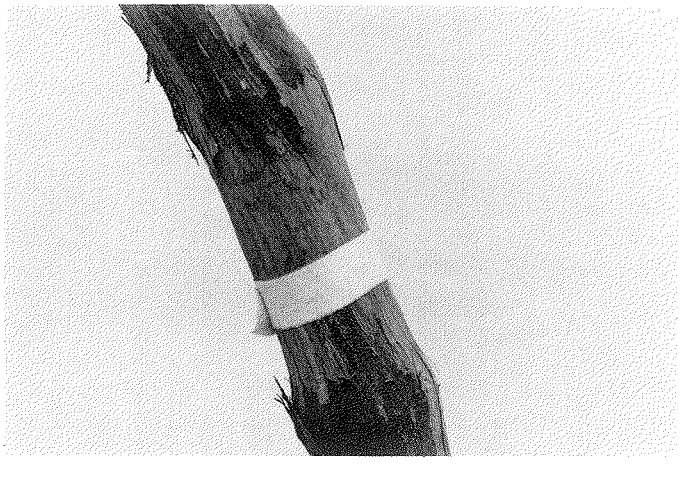


Figure 15.—A piece of ¾ inch grafting tape is wrapped around the trunk. This is very important.

Figure 16.—The bark is ringed by a cut all around the trunk, 1 inch above the tape.

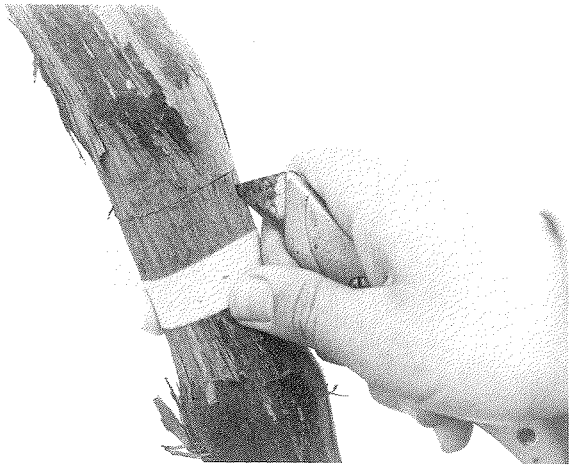


Figure 17.—Two cuts are made from the ringing cut down to the edge of the tape to form the flap of bark under which the scion will be inserted.

All of the above preparation of the trunk can either be done at the time of grafting after the phloem has loosened or in advance during the last 10 days of May before the phloem has loosened.

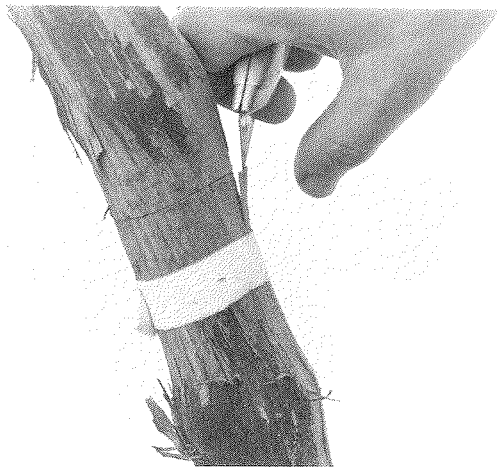


Figure 18.—At the time of grafting, after the phloem has loosened, the flap of bark is lifted by the point of the knife at one corner.

Figure 19.—The flap is moistened immediately by a squirt of water from a squeeze bottle.

Figure 20.—The scion ready to be slipped under the bark.

Figure 21.—The scion is pushed down under the bark until it can go no further.

Figure 22.—The nail is carefully driven in to hold the scion firmly. Try not to batter the scion itself.

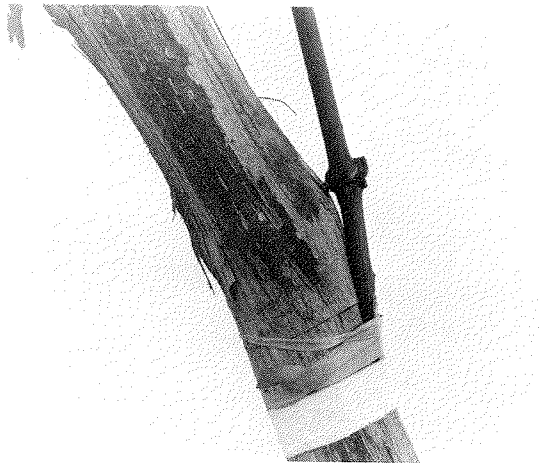


Figure 23.—The grafting rubber is wrapped around the trunk to hold the flap against the scion.

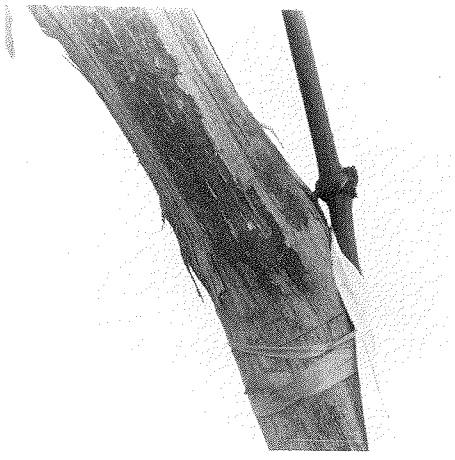


Figure 24.—The tape is removed and the same piece of tape is placed behind the scion and brought down over the union to keep paint off the cuts of the scion and trunk.

Figure 25.—The union is now painted to maintain a humid environment for callusing.

Figure 26.—This is how the completed graft looks. A small cork has been placed in the top to reduce evaporation and to keep out spray material.

SEQUENCE OF GROWTH

Figure 27.—This photograph, taken in December 1974, shows the author holding the tip of a cane from a graft made the same year. This is a Riesling scion grafted onto the variety, Leon Millot. The scion grew about 30 inches.

Figure 28.—This is the same vine showing the crop borne by the Leon Millot vine in 1975. The Riesling variety grew vigorously during this year.

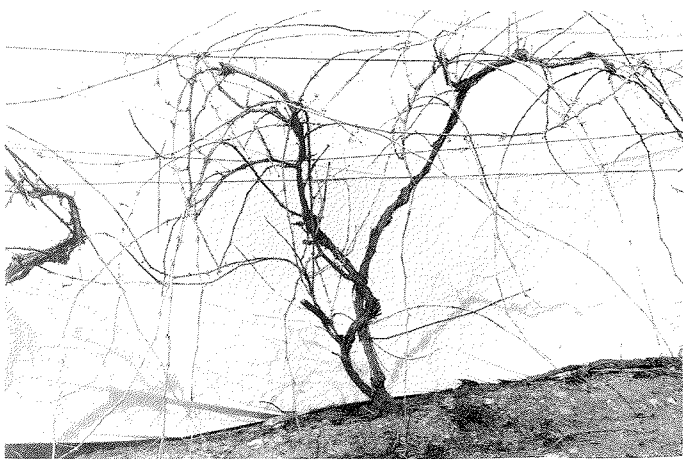


Figure 29.—This photograph, taken in December 1975, shows the growth made by both the scion and stock varieties in 1975.

Figure 30.—At the end of March 1976, the stock vine was cut off with a slanting cut just above the graft union. This cut should be painted.

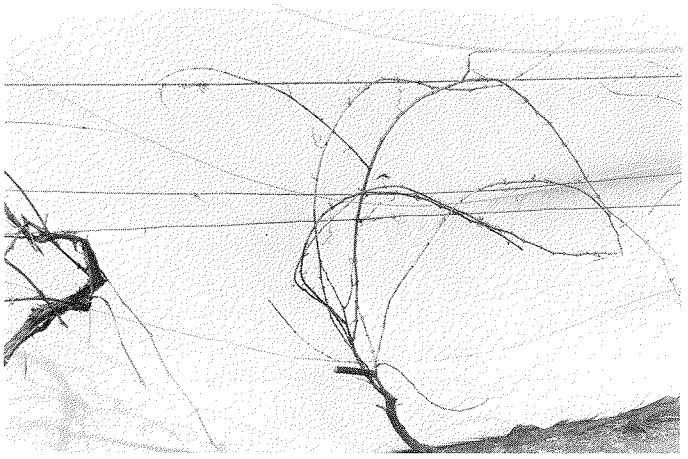


Figure 31.—With the top of the stock vine removed, the growth of the Riesling is more clearly visible.

Figure 32.—The Riesling variety is pruned to 4 canes with a total of 70 buds. These buds will be thinned to 30-40 after growth starts, and clusters will be thinned. The canes and tips of canes removed by pruning were examined and indicated 20 per cent bud injury. Although there was no thermometer at this site, the nearest similar site indicated a minimum temperature of -11 F in January 1976.

Figure 33.—This is a view of the union of a graft of Riesling onto Leon Millot. The picture was taken in the fall of the year the vine was grafted. Note the swelling associated with the ringing and the peeling away of the tape and paint as a result of the expansion of the trunk and scion.

Figure 34.—This shows a union at the end of the second year. The scion is firmly attached at the bottom and sides.

Figure 35.—This 8-year-old graft is the first made by this process. The scion is now larger than the original trunk, the stub of which can be seen. It should have been cut off closer to the scion and painted.

DETAILS OF THE PROCESS

The necessary details are in the following categories:

1. Collection and storage of the scions,
2. Time of grafting,
3. Means of maintaining moisture in the scion,
4. Preparation of the scion,
5. Preparation of the trunk,
6. Attachment of the scion, and
7. Maintenance of the graft after it has started.

COLLECTION AND STORAGE OF CUTTINGS

Scions should be collected while dormant, preferably after leaf fall in late November or early December in New York so as to avoid any bud injury resulting from extremely low winter temperatures. This is particularly important with tender varieties such as those of the *Vitis vinifera* species. The cuttings should be packed immediately in moist sawdust, peat moss, or sphagnum moss at temperatures of 28-34 F. Since the scions must remain dormant until the time of grafting, they must be kept in refrigerated storage. Cuttings that are stored without covering with moist material will not remain in sound condition even though the humidity of the storage is 100 per cent and the cuttings are watered occasionally. Small lots of cuttings may be stored in plastic bags in a refrigerator, providing the temperature is properly maintained and providing the cuttings are packed in moist material.

Cuttings to be used should be from high quality canes which means from exposed canes at the top of the vine. The best canes have a dark exterior color and a relatively small pith area when cut. The wood should be a healthy green without any browning of the xylem or phloem. Buds should be uninjured. Bud injury can only be determined by

cutting buds on sample cuttings. If it is necessary to collect cuttings later in the winter, they should be examined for injury. Do not underestimate the importance of healthy wood and proper storage! Those who have knowingly used injured wood for grafting because it was all that they had available have achieved dismal results and agree that using less than healthy cuttings is a waste of time.

The cuttings are collected as three bud cuttings (Fig. 1). The cuttings are cut off just below the bottom bud and an entire internode is left at the top. Both the top and bottom of the cutting will be cut back at the time of grafting (Fig. 2).

The diameter of the cuttings should be in the range of 10/32 inches to 12/32 inches. This measurement should be at the middle of the internode above the top bud and, since a grape cutting in cross-section is oval, the measurement should be at the wide diameter. For measuring large numbers of cuttings, a simple caliper can be made by cutting notches of the appropriate width in a wooden garden stake. Attention to the diameter of the cutting is important because one must obtain bored corks with a hole of the proper size to provide a seal between the scion and the tube. It is for this reason that we express cutting diameter in 32nds of an inch since the diameter of holes in the corks is expressed this way. A cutting measured in the way described will take a cork with a hole 1/32 of an inch less than the diameter of the cutting. Thus, a 10/32 inch cutting will take a 9/32 inch hole and result in a good seal.

TIME OF GRAFTING

There is approximately a 2-week period when the grafting can be done successfully. This period is from the time the bark of the stock variety loosens (roughly June 1 for the Concord variety in New York State) until bloom. The reason for this time limitation is that this is the time of formation of the new phloem and the formation of the callus associated with this particular tissue. The exact time of bark loosening can only be determined by trial and error in your vineyard. Some varieties may be a few days later than the Concord variety. In areas with earlier growing seasons, the loosening of the phloem will be earlier, but still will occur about 2 weeks before bloom.

The proper timing is critical for successful grafting. In this grafting process, the means of placing the callusing surface of the cutting in contact with the callusing surface of the trunk is by inserting the wedge cut at the base of the scion underneath a flap of bark cut on the trunk. This is commonly known as a bark graft, but we have refined the technique. Since the bark can only be easily loosened from the trunk starting about June 1 with the Concord variety, this becomes the earliest time that grafts can be made on this variety. The loosening of the bark signifies the start of formation of the new phloem (bark) which occurs over an approximately 3-week period and occurs before the formation of the new xylem (wood) of the trunk. During this time of development, any phloem of the trunk that has been cut starts to form white succulent callus providing the callusing surfaces are maintained under conditions of high humidity. This white succulent callus is part of and attached to the phloem of the trunk, and is of the same nature as the callus formed by the phloem at the base of the cutting. These masses of similar callus grow together easily, and this is what makes grafting possible. The earliest we have seen the callus visible on any grafting wound is June 6, and the major callusing occurs at approximately bloom. It is for this reason that the scion should be in place within the time limit set, i.e., to be available to receive this "flush" of succulent callus from the trunk when this occurs. The callus that forms at a later date after the xylem has started to develop is of no use in establishing the graft, but is of value in developing a sound union later.

If the scion is in place at the proper time, then the graft will take about 3 weeks to a month after grafting. Because the scion does not start active growth until near the end of June or early July and stops active growth by the first week in August, it is apparent that the scion shoots have a much reduced season in which to elongate and have a much reduced total growing season in which to ripen their shoots to survive a cold winter. Despite this short season, the scion shoots do ripen off at least for a few inches at the base of the shoot and sometimes for the entire length. The ability of the scion shoots to ripen off adequately the first year is a major advantage of this process for those who wish to graft tender varieties onto mature vines of other varieties.

MAINTAINING MOISTURE IN THE SCION

A plastic tube filled with water and affixed to the top of the scion provides moisture for development of the scion. This tube plays the largest part in the ability to graft onto vines without first cutting off the trunk. It is not necessary to paint the scion itself, only the graft union.

The tube is essential for success. This method of watering permits us to apply the process routinely to all vines down the row without regard to the conformity of the trunk. The grafting wound on the trunk is dry, thus the tube is the only source of water for the scion. Moisture control by painting alone is seldom successful.

This tube should be 6 inches long with an inside diameter of ¾ inch. This particular size will hold approximately a 10 day supply of water, and yet is not too heavy to be manageable. The best material for the tube is ¾ inch black plastic pipe such as is used for water lines. This tubing is inexpensive, light, readily available from many sources, cuts easily with a band or jigsaw, has a uniform inside diameter, and takes a number 9 cork. This matter of the uniform inside diameter of the tube is important because it makes it easy to fit the right cork to the right tube size if all dimensions are exact and consistent. As many as 600 pieces of tubing can be cut in 30 minutes by two men using a band saw. The tubes are permanent and the corks long-lived.

The cork must have a hole in it to fit the scion. Boring the hole requires a tube type cork borer. There are both hand

operated and motorized models available. A drill cannot be used since the cork simply crumbles and the resulting hole is useless. The labor cost of boring the cork is greater than the cost of the cork itself. A better alternative is to buy pre-bored corks which cost no more than plain corks. Rubber corks do not work well because they are so stiff that they do not easily adapt to the shape of the scion which is oval in cross section.

Corks are sold in numbered sizes. A No. 9 cork fits ¾ inch tubing, a No. 8 corks fits 11/16 inch tubing, and a No. 7 cork fits ⅝ inch tubing. These tubing sizes are actual sizes, not the advertized size.

PREPARATION OF THE SCION

At the time of grafting, the scions are taken out of storage and placed in water to keep moist while being prepared. Cut surfaces of the scions should be kept moist at all times. The following steps are involved in preparing the scion.

The scion is cut off using a knife to make a diagonal cut 1½ inches above the top bud. This is where the cork is attached (Fig. 2).

Next, cut the scion off 3 inches below the bottom bud using pruning shears to make a straight cut across the scion. A hole is bored through the center of the scion 1⅛ inches above the bottom end of the scion (Fig. 3). This hole is to accommodate the finishing nail that will attach the scion to the trunk. The size of the hole, of course, depends on the size of the nail used. We have used a ¾ inch long finishing nail (called a brad in the United States), number 18 gauge. A No. 55 gauge drill bit fits this nail. Nails of a different gauge can be used, but be sure the hole drilled fits the nail snugly. You should not use flat headed nails or tape to attach the scions since these suppress the development of callus and the expansion of the scion.

Small finishing nails are best because the head is large enough to support the weight of the scion but small enough to pull through the hole as the scion expands.

Drilling the nail hole is important because it is nearly impossible to drive a pointed nail through a scion without splitting. The point of the nail acts as a wedge and causes the split. Staples should not be used in place of nails.

The bottom of the scion is now cut to form a wedge (Figs. 4-7). This is done by starting the cut with a grafting knife at a point about ⅛ inch below the nail hole. Cut to the end of the scion so that the cut comes out at the middle of the scion at the bottom. This is the side that will be directly under the flap of bark, and this is the side from which you will eventually insert the nail in the hole. The scion is then turned over and a cut is made on this side starting about ⅛ inch above the nail hole continuing to the bottom of the scion so that the two cuts form the wedge. The cut on this side that will be next to the trunk is started above the nail hole, and is consequently longer. This is to allow a flat surface which can rest against the bark at the top of the cut that you will eventually make in the trunk. This helps keep the scion firmly in place. This slight elevation of the scion from the actual surface of the trunk permits the callus developed on the inside surface of the scion to better unite with the callus from the side of the pruning cut on the trunk. In addition, it tends to keep the bottom points of the scion flat against the trunk. This is important because the callus of the trunk starts to grow at the last point of attachment of the phloem and xylem. The callus then grows out over the tips of the scion forming the first and most important point of attachment. The joining of the sides takes place later.

The first cut made should be about 1 inch long. The other cut is about 1¼ inches long. There are 1⅛ inches of scion below the nail hole with which to work. If the wedge is made properly, the tip will be essentially two points, or a fork. This fork is important because it allows flexibility of the scion to adjust itself to the curvature of the trunk upon which it will be grafted. If the scion is cut so the wedge is an unyielding flat surface, the two sides of the scion will be elevated from the curved trunk. The trunk callus will grow under the scion and the graft will either not take or the union will be so poor the scion will subsequently fail.

The tip of the scion must be in two distinctly independent parts. It is this flexibility of the scion points that permits the tip of the scion to adapt to a trunk as small as ¾ of an inch or as large as 3 inches in diameter. When viewed from the side, the scion should come to a distinct point so as not to pry up the flap of bark.

The perforated cork is now placed on the upper end of the scion (Fig. 8). The corks should be soaked in hot water for an hour before they are to be used. If they are pliable, they will accept and adapt to a wider range of scion diameters. The cork is placed on the scion with the small end of the cork upward and the cork is pushed down to where the upper node swells. This helps insure a tighter seal.

The grafting tube is now placed on the cork (Fig. 9). This must be a firm fit. Once the tube is firmly on the top, the nail is put in the nail hole at the bottom to hold it in preparation for nailing in the field (Fig 10). The prepared scion is now placed upright in a pail with a couple of inches of water in it to keep the bottom of the scion moist (Fig. 11). The grafting tube is filled with water and the scions should stay there for an hour at least so that any leakers may be located and fixed. Leakers are determined by watching the water level at the top of the tube. Fixing a leaker involves either pushing the cork and scion in the tube tighter, or if that fails then a cork with a smaller hole should be used.

The scions are carried to the field in the pail with water in the bottom to keep the base of the scion moist and with water in the tube to keep the top from drying out. Once the scions are attached to a trunk, the tubes should be filled with water.

PREPARATION OF THE TRUNK

Preparing the trunk involves first finding a smooth straight piece of trunk somewhere below the bottom wire (Figs. 12-13). This could be anywhere from ground level up to 18 inches to 2 feet above ground level. The spot selected

should not be either directly above or directly below a knot. It should be located where the graft will not be hit by equipment. On east to west running rows, it can be on either the east or west side of the vine. On north to south running rows, it is preferable to have it on the south side. These locations are best so that the scions can get as much sunlight as possible. Once the right spot is found, the shreds of old bark are peeled off around the entire trunk at this point and a piece of grafting tape is wrapped tightly around the entire trunk (Figs. 14-15). **This is a very critical part of the entire process.**

It is this piece of tape that keeps the bark from peeling back too far when the scion is inserted under the flap of bark that will be cut. If the flap of bark should be peeled back too far at the time of grafting, the trunk callus must grow back this distance and uniting of this trunk callus with the scion is delayed. The union must take place in time for the shoots of the scion to make terminal growth and for the scion itself to make lateral growth; that is, to develop new xylem and phloem itself all in a very limited period of time.

Now, with the grafting knife, ring the vine with a cut through the bark all around the trunk about an inch above this piece of tape (Fig. 16). Then, make two vertical cuts starting at this horizontal cut and bring these vertical cuts down to the edge of the tape (Fig. 17). This forms a flap of bark that will cover the outside face of the scion and which will unite with the scion through much of its length (Fig. 18). This flap should be approximately as wide as the scion. If the bark has started to loosen, this flap is easily pried loose from the trunk with the point of the knife in an upper corner of the flap. When the flap is pried loose, the surface of the trunk will be white. Once pried loose, this flap of bark should be moistened with water from a plastic squeeze bottle to prevent any drying before the graft is sealed (Fig. 19).

The ringing of the trunk makes the graft take a little earlier and does promote a better union at the sides of the graft.

Preparing the trunk may be carried out as much as 10 days before the bark slips. Getting this operation out of the way early permits the actual grafting of more acreage by the same number of people within the limited time available. The actual grafting, of course, can only take place after the flaps of bark have loosened, and this can only be determined by trial.

ATTACHMENT OF THE SCION

Once the flap is moistened, the scion, with the nail already partly through the hole, is slipped under the bark and pushed down firmly (Fig. 20-21). The underside of the scion will rest on top of the bark at the top of the trunk wound, thus elevating the scion from the exposed surface of the trunk. If all the dimensions are properly observed, the top of the flap will come up to a point just below the nail when the scion is inserted under the flap. If the dimensions are not exact, the top of the flap may come up to the nail of the scion and curl up rather than lie flat against the face of the scion. In this case, simply cut off a piece from the top of the flap.

Do not jam the scion down under the flap of bark and tape. The scion and trunk will grow together; you cannot force them together by undue pressure. Tap the nail in until the scion is firmly attached (Fig. 22). A grafting rubber is now wrapped two or three times around the trunk and flap, starting just above the piece of tape (Fig. 23). This is a long, thin strip of rubber traditionally used to secure grafts. The loops of rubber wound over one end with the other end tucked under a loop provide adequate pressure to hold the flap on the face of the scion and still allow for expansion as the callus forms and the scion and trunk swell. The rubbers are only temporary—they disintegrate in a few weeks and need not be removed. Grafting tape should not be used. The trunk itself will increase in diameter substantially, and the corresponding increase in circumference puts great pressure on the development of the callus if tape is used.

The piece of tape around the trunk is now removed (Fig. 24). This is very important because of the effect of the restrictive pressure on the growth of the callus. This same piece of tape is now used to protect the surfaces of the scion and trunk wounds from contact with the grafting paint. This is done by stretching the piece of tape behind the scion where it meets at the trunk and bringing the two ends down, crossing over so that they cover the edges of the graft. The entire wound is sealed by daubbing with liberal amounts of grafting paint (Fig. 25). The objective here is to maintain high humidity around the graft.

Covering the graft union with tape to keep paint off the callusing edges is important as it affects the formation of a sound union. Grafting should be done when there is no threat of rain. The black asphalt water emulsifiable paint will dry on the outside in a few hours in warm weather (Fig. 26). On the other hand, a heavy rain right after grafting and before the paint has dried can wash paint down into the grafting wound and be as harmful as though directly applied. The proper grafting paint is water soluble when wet, but impervious to water once dried.

MAINTENANCE OF THE SCION

Buds of the scion will start to swell within a week as a result of the water in the tube, and a shoot about 2 inches long will develop even if the graft does not take. Scion shoots several inches long indicate the graft has taken. This will be in about 3 to 4 weeks. Once active shoot growth starts as indicated by elongation of the internodes, expansion of the flower clusters, and several inches of growth, the tubes are no longer necessary. Wait until the vines are dormant before removing the tubes, at which time the cork will easily slide off the end of the scion.

There is enough water in the grafting tube to maintain the scion for a week to 10 days. The tubes, however, should never be left this long without checking and refilling. They should be checked a day after grafting to determine if there are any leakers. These can usually be repaired in the field by carefully tightening the tube on the cork. Sometimes, leakers will seal themselves just by normal expansion of

the cork. The tubes will normally lose about 3 milliliters (½ inch) of water per day. A plastic squeeze bottle with a thin plastic spout can be used to refill the tubes. It takes about 2 hours to add an inch or two of water to the tubes in an acre of grafts.

Adequate disease control measures must be practiced. Thus, Riesling scions grafted onto a Concord vine will still be susceptible to powdery mildew and must be protected by sprays. This is also true with French hybrids. The spray program in the vineyard should be tailored to the grafts rather than to the stock vines.

Shoots of the graft should be exposed to sunlight as much as possible. Cut off tips of shoots or even entire shoots of the stock vine to prevent shading. Any shoots from the stock vine that come into contact with the scion or are at all near it should be cut back. No tendrils should be permitted to encircle the scion or tube since a strong wind could put pressure on these.

Grafting below the bottom wire when possible makes it convenient for tying up scion shoots when necessary, and also for positioning the shoots of the stock vine or for cutting off tips so that the foliage of the graft can be exposed to direct sunshine at least part of the day. Suckers growing below the graft should be removed as early as possible.

The scions should not be permitted to fruit, and flower clusters should be removed when they develop.

Woodchucks are attracted to the grafting paint and will eat it. Once they have started on the paint, they will eat the developing shoots on the scion and may cut the entire scion off. Therefore, it is preferable to attach the graft above the reach of the woodchuck.

Shoots from the grafts that grow out into the row or grow long enough to droop down and be subject to breakage should be tied up with string loosely tied around the shoot.

The 1-year-old grafts should be pruned after the buds start to swell in the spring of the following year in order to determine any bud injury. Since the 1-year-old graft will be producing canes that will be left for fruiting in the third year, the graft should be pruned to provide an adequate number of canes, without being overloaded. Thus, buds approximately equal to the number of canes that will be left is adequate.

In the second year the trunk of the stock vine should be cut off and the 2-year-old grafts pruned in late winter after the danger of extremely low winter temperatures has passed (Fig. 30-32). This allows one to determine the degree of bud injury, if any, and compensate for this by leaving additional buds. At this time, the vine will be balanced pruned according to its size just as any other mature vine. The cut of the stock trunk should be painted.

In vineyards that are to be harvested mechanically, it is best to hand pick the grapes while the grafts are in their first and second year. Mechanical harvesting at the end of the third year when the new variety is in its first crop year should not be harmful since the scions are very firmly attached.

If grafts do not grow or develop shoots and ripen off, they should be examined after the vines are dormant to determine the reasons for failure. Four common sources of failure are described below.

1. Raising the tip of the scion away from the surface of the trunk after the grafting is completed will result in failure of the graft. The solution is simply to attach the graft so that it is in an upright position. If it must be attached to a greatly sloping trunk, put it on the underside.

2. Failure to cut the scion wedge as a fork seems to be a common problem. The tip of the scion wedge should not be an unyielding flat surface against the curvature of the trunk, but should be cut as a fork so the individual points will adapt to this curved surface as a result of pressure of the grafting rubber.

3. Too short a scion wedge leads to the same problem as above. A very short wedge, even though cut as a fork, cannot adapt to the curvature of the trunk. The face of the scion wedge should be at least 1 inch long.

4. Allowing the tubes to go dry will result in failure.

If any grafts fail, the vines may be regrafted the following year since they have not been weakened or the trunks injured.

CONCLUSION

This new process offers a useful tool for small growers who are dependent upon the income from their vineyards and who cannot afford to abandon, pull out or cut off any acreage of healthy vines simply because the variety is temporarily in over-supply. The possibility of conversion to a new variety and reconversion to the stock variety at a later date, if conditions warrant, offers a substantial flexibility to the growers.

It is estimated that it takes about 12 man days to graft an acre of grapes. Material costs will be about $90 per acre. Total cost of grafting and materials will be about $350-$400 per acre if the labor is hired. With large scale trials of several acres, the greatest efficiency will be effected by using a crew because of the many diverse operations. On the other hand, two people should easily be able to graft an acre or more within the limited time (2 weeks) available, particularly if they prepare the trunks in advance in the 10-day period before the bark loosens. In a cost comparison, the grafting process and what it accomplishes is much cheaper than pulling the vineyard and replanting. This latter involves a matter of several thousands of dollars when the loss of crop for several years is considered.

In 1973, 83 per cent surviving grafts were obtained from 98 that were made by this process. In 1974, we achieved 80 per cent success of 87 grafts. In 1975, 20 interested people from New York, Michigan, and Pennsylvania grafted vines in their own vineyards in numbers ranging from 14 to more than 500. Successes in these individual trials ranged from 79 to 100 per cent with an average of 87 per cent of 1,500 grafts made.

Delaware, Catawba, Aurore (S-5279), DeChaunac (S-9549) and Riesling have been grafted onto the Concord

variety with no sign of incompatibility since the vines have all grown vigorously. White Riesling has been grafted onto 13 different varieties. Varieties on which the Riesling has made vigorous growth in these first two years are Leon Millot, Delaware, Duchess, Concord, and Cayuga White.

The grafting process described here is for healthy vigorous vineyards; it will not make weak vineyards any better. In general, naturally vigorous varieties grafted onto weaker stock vines will also be weaker growing. Naturally, weak growing varieties grafted onto more vigorous stocks may grow more strongly themselves.

MATERIALS NECESSARY

Materials needed for this procedure are listed below.

1. Pruning shears—anvil type.
2. Hand drill or drill press.
3. Small hammer.
4. Band saw or jig saw or hack saw.
5. Plastic pails.
6. Plastic squeeze bottle (a plastic detergent bottle will work)
7. Finishing nails, ¾ inch, Number 18 gauge.
8. Number 55 drill bit to fit nails.
9. Utility knife with replaceable blades.
10. ¾ inch black plastic water pipe.
11. Water emulsifiable black asphalt grafting paint.
12. Grafting tape, ¾ inch.
13. Grafting rubbers 8 inches x ⅝ inch.
14. Bored corks.
15. Scions.

REFERENCES

1. Alley, C. J. 1964. Grapevine propagation I: A comparison of cleft and notch grafting; and bark grafting at high and low levels. Am. J. Enol. Vitic. 15:214-217.
2. Alley, C. J. 1965. Bark grafting grapevines at high and low levels. Cal. Agr. 19(3):14-15.
3. Jacob, H. E. 1936. Propagation of grapevines. Calif. Agr. Exp. Sta. Cir. 101: 18-19.
4. Jensen, Fred, 1971. High level grafting of grapevines. Am. J. Enol. Vitic. 22: 35-39.
5. Kimball, Keith and John Einset. 1971. Converting mature Concord vineyards to other varieties by means of grafting. Proc. of the N. Y. State Hort. Soc. 116:146-155.

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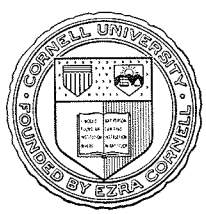

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