



Wood Sources for Cutting

Certification program for virus-free planting stock

The proper selection of vine propagating wood received very little attention until the 1950's. This was when the extent of our virus disease problems became more apparent through USDA and University of California research findings. In the mid-1950's a California State Department of Agriculture certification program was established to control the distribution of grape planting stock certified as free of known virus diseases. Over 100 grape varieties and rootstocks were indexed as free of known virus diseases through selection and heat therapy at the University of California at Davis. UC now maintains Foundation and Mother Blocks of such vines for distribution to participating nurseries through the Foundation Plant Materials Service (FPMS) at Davis. In turn, these nurseries established increase blocks which serve as our main expanded source of certified wood.

Unfortunately, these certified wood sources often do not satisfy dormant wood demands for our acreage expansion. This leaves a grower or nurseryman with two alternatives: make cuttings from the best commercial vineyard available or undertake greenhouse rapid mist propagation from the limited certified sources.

Choosing a Commercial Vineyard Source for Cuttings

The incidence of virus problems varies widely with variety, rootstock and vineyard history. Certain table grape and wine varieties tend to have higher incidences, as more were grafted onto diseased rootstocks used for phylloxera resistance. This is especially true of the table grape varieties Calmeria, Cardinal, Emperor, Italia, and Ribier, and the wine varieties Alicante Bouschet, Barbera, Carignane, French Colombard, Petite Sirah, Rubired, Ruby Cabernet, and Semillon.

The raisin varieties, Thompson Seedless, Muscat of Alexandria, and Zante Currant, have fewer problems because most of the original vineyards were planted on own roots. Unfortunately, some were ultimately grafted 20 to 40 years ago onto nematode-resistant rootstocks, such as 1613, which carried fan leaf and leaf roll viruses.

Black Monukka is our biggest problem raisin variety. It is widely infected with leaf roll virus, explaining the poor and variable fruit maturity and coloration among vines.

Follow these guidelines when selecting a wood source vineyard:

1. Know the original wood source of the vineyard if possible. Preferably, it should be traced back to a certified source.

2. Know the fruiting and production history-- that it has normal leaf and fruit characteristics, is a consistent, good producer, and does not contain off-type vines, even if originally from a certified wood source.
3. Never cut wood from a vineyard grafted onto an unknown wood source or one that contains replants grafted onto resistant rootstock of uncertified origin.

Diseased 1613 nematode-resistant rootstock has contributed the most to virus problems in our area. It was widely distributed until the late 1950's when virus-free sources finally became available. In some instances, fan leaf virus has been transmitted from a few 1613 replants in a vineyard by dagger nematodes, *Xiphenema* index, to ultimately infect most of the vines within the vineyard.

A list of certified nurseries with virus-free plantings can be obtained from your County Farm Advisor's office.

Making Cuttings

The cane wood for cuttings should be mature, medium size, round, and with internodes of moderate length. Those with long internodes and flat in cross section should be avoided. They indicate very rapid growth and a tendency for lower stored reserves. The most common length of cuttings for direct field planting is 16 to 18 inches. The cut at the base of the cutting should be straight across and close below a node (about 1/4"). The top is cut at a 45o angle, 1 to 2 inches above a node. The difference in cutting angle gives an easy identification of the top and bottom of the cutting.

Two or three cuttings can be made out of a strong, well-matured cane. Some growers

prefer to make only one cutting per cane, using the base portion. Trials at the Kearney Field Station showed no improved stand with base cuttings only, but in one trial they produced slightly larger rootings than field-run cuttings.

Mallet or "T" cuttings are sometimes used, leaving a short section of two-year-old wood at the base of the cutting. The idea is to provide more stored food reserves for starting the new plant. Field trials have shown no advantage of a mallet cut over a standard cutting.

Cuttings should be made within 4 to 5 days after pruning during dry weather. A 7 to 10 day delay is only acceptable during wet or foggy weather. Cuttings suspected of excessive field drying can be immersed in water for 24 to 48 hours before storage. Longer immersion may be detrimental. This technique is a poor substitute for cutting fresh wood.

Cuttings are usually put in bundles of 100 each, with the basal ends even, and are tied at each end with wire or plastic twine.

Storing and Conditioning Cuttings for Planting

The storage method should prevent drying and ultimately enhance root initiation with warming temperatures. It is preferred to have some root initiation at the base of the cuttings when they are field planted. The early stages of root initiation can be detected by cutting into the inner bark at the base of the cutting. The root primordia will first appear as slight swellings or "pimples". They will then extend through the bark and develop to a white "rice" stage (less than 1 inch long). This is the best stage of planting.

Further root development into the "spaghetti" stage (more than 2 to 3 inches long) is not advantageous. These roots are broken off

during planting, thus wasting stored food reserves in the cuttings. Good stands are sometimes obtained with "spaghetti"-stage cuttings, but nurseries have experienced larger, more saleable root systems on rootings planted at the early "rice" stage.

Bud break normally precedes root growth by 1 to 2 weeks during storage and conditioning. Therefore, some shoot breakage and dry-back during and after planting is often unavoidable. Usually, a secondary bud will push behind any damaged shoots. Excessively advanced cuttings with shoots over 2 to 3 inches long at planting also contribute to an undesirable loss of stored food reserves.

Cuttings sometimes produce a white starch-like substance called callus, mostly at the base ends. Callusing is a warm temperature response, occurring readily at 70°F to 85°F, slowly at 60°F and none at 50°F. Callusing is not necessary for root initiation or the cuttings' success. It is merely a response which can accompany root initiation when cuttings are exposed to the higher temperatures just mentioned.

Sand Pit

This is the most common method. The area should be well drained and located where no water collects from rainfall run off. It is best if the pit is slightly elevated to assure water runoff.

Sand should be hauled in for bottom drainage of the pit and to cover the cuttings, unless the pit location is already quite sandy. Make sure the sand is free of nematodes--either by fumigation, hauling in clean sand from a canal bottom, or buying concrete or plaster sand.

The pit is dug to about an 18-inch depth and the bundles are stacked in upside-down and against one another. Upside-down stacking is a long-standing commercial practice intended to enhance root initiation at the cuttings' base. This response has been verified by research findings.

The cuttings are then covered with 6 to 8 inches of sand. Some of the sand will naturally fall into the spaces between bundles, but one should not intentionally wash or force the sand down into the cuttings. This can lead to water-saturated zones which exclude air.

Use water sparingly in the pit area. Sprinkle lightly at first to assure that all the sand is moist. Occasional light sprinklings are only necessary to re-wet the surface sand when it dries down an inch or so. Many more problems are encountered with over-watering than under-watering, especially when the vines are covered with medium to fine textured soils. The saturated soil excludes air; root and shoot initiation stops, and souring occurs.

Root initiation, bud break, and callusing: The sand pit serves three main functions: to keep the cuttings moist, to keep them dormant until late winter, and to ultimately provide gradual warming for root initiation and bud break.

The temperature of a sand pit will typically be in the low 50's during mid-winter. By early March it will begin warming to the mid to high 50's and ultimately to the low 60's by late March to early April. Visible signs of root initiation and bud break will begin in mid to late March under these temperature conditions, provided the cuttings have been in sand storage for at least 6 weeks.

This storage gradually conditions the cuttings towards root initiation and bud break, even at the 50° to 55°F range. Thus, the duration of storage also influences the time of root initiation and can be used to hasten or delay the time of planting.

For example, cuttings made before mid-January may have good root initiation by March 15-20; February cuttings may take until late March to early April to reach the same stage of development. Root initiation in March cuttings may be delayed until mid-April.

Weather extremes can cause a 3 to 4 week spread in the optimum planting stage from year to year. The stored cuttings should be examined weekly for root initiation as the planting time is approached.

The rate of development can also be influenced by manipulating pit temperature. Shading the area, covering the cuttings with a loam soil, and keeping the surface firm and damp will slow the warming process. The warmest conditions would be a sand pit fully exposed to sunlight and with the surface 1 inch to 2 inch fluffed with a rake or covered with plastic.

Clear or black plastic sheeting can aid warming, but clear plastic is the most effective. Clear plastic creates a greenhouse-effect, allowing the sun's rays to penetrate and warm the air and soil underneath while limiting the loss of heat from upward radiation.

Callusing is not common in sand pit storage unless the cuttings are held until late April or May when pit temperatures near 70°F or if plastic sheeting is used for warming.

Sawdust or Wood Shaving-Packed Bins

Some growers prefer this method because of its flexibility. It should never be used on a large scale without previous experience. Also, only pine or fir sawdust or shavings should be used; problems are occasionally experienced with other wood sources such as redwood and oak.

The cuttings are packed in bins with moist sawdust and stored in a shaded area or a well ventilated, cool building. They can then be moved into a greenhouse or heated room for root initiation several weeks before planting. Good root initiation should develop in 10 to 14 days at 80°F, 21 days at 70°F, or 4 to 5 weeks at 60°F. Merely placing the bins out in the sun for warming is a poor practice as the top can overheat while the center is still cool.

Sawdust bins lined with thermostatically controlled heating cables can be used, but are only practical on a small scale.

Moist sawdust is also very useful for covering stacks of cuttings temporarily in buildings and shaded areas. Extreme caution should be used with sawdust out in the open, even with short term storage. It can warm up quickly on sunny days, exposing the cuttings to excessive heat.

Cold Storage

Avoid cold storage if possible. Never plant immediately out of cold storage as the cuttings will be fully dormant. This exposes them to drying in the field while they wait for 3 to 4 weeks or root initiation and bud break.

If cold storage is necessary, as for delayed plantings, the cuttings should then go through a conditioning process before planting. Either place them in moist sawdust at 70o-80o for 2 to 3 weeks or a sand pit for 3 to 5 weeks before

planting. Make sure some root initiation is showing.

Using Rooting Hormones

The plant hormone (growth regulator) IBA (indolebutyric acid) is widely used in commercial nursery production to aid root initiation, especially in ornamental cuttings. However, it has limited value in the rooting of dormant grape cuttings in California.

Generally, our commercial grape varieties root readily with normal care and with little or no additional benefit from IBA treatment. However, IBA treatment could be considered with the more difficult to root nematode-resistant rootstocks Saltcreek and Dogridge. A hastening and increasing of root initiation from IBA has been demonstrated in such rootstocks.

The treatment involves dipping several inches of the basal portion of the cuttings with Hormex #5® powder or a 5000 ppm solution of IBA. A 50 to 100 ppm IBA solution can be tried, but requires soaking at room temperature for 24 hours. Pure IBA is not soluble in water. It must first be dissolved in ethyl alcohol and then diluted with water. The IBA treatment is most responsive at 75° F to 85°F rooting temperatures.

More research is needed to fully demonstrate the usefulness of this material with California grape varieties and conditions.

Planting and Care of Cuttings

Preparation of the vineyard site should be coordinated as closely as possible with the conditioning of the cuttings.

The date of planting in the spring does not appear to be an important factor in sandy to medium textured soils, providing the cuttings

are properly conditioned. However, in heavy soils--loams and clay loams--it may be desirable to gear root initiation to a mid-April planting. This allows time for these colder soils to warm to a more optimum temperature for root development by planting time.

Planting Method

Cuttings are most easily planted by pushing them into a slot loosened with a subsoiler shank. If necessary, a long spade can be used to open the loose soil enough for cutting placement. The soil is then firmed by stepping on both sides of the cutting.

This keeps it in place during settling-in with water. They should be checked again soon after the first irrigation to see that they are all still in place. Some growers prefer to "mud-in" cuttings by pushing them in during irrigation, but this practice is difficult to coordinate on a large scale.

Contract machine planting has become a popular method of planting either cuttings or rootings. The field is premarked with a tractor and the planting and furrowing-out are done in one operation.

Other methods include hand planting with a shovel or planting into holes jetted out with water. Care should be taken when backfilling the narrow water-jetted holes to avoid leaving air pockets.

Planting holes should never be made with a pointed steel bar. The compacted sides of the hole will restrict root growth.

Cuttings are typically planted with 4 to 5 inches of top showing above ground level. This allows for some soil to be thrown back to the plant in later cultivations with 2 to 3 inches of the cuttings or two nodes still showing.

Irrigation

Avoid drying of the cuttings during planting and irrigate them in as soon as possible. One or 2 irrigations down the vine row are always necessary to settle the soil around the cuttings and remove air pockets.

Most growers prefer to cultivate lightly and throw some loose soil back towards the cuttings after the initial irrigation(s). This helps warm the soil and reduce soil drying and cracking around the cuttings.

The next few irrigations can be applied in furrows 6 to 8 inches from each side of the plants. By late summer these can be moved out to 12 inches or more, depending on the wetting characteristics of the soil.

Avoid over- and under-watering. It is best to wait about 3 to 4 weeks to irrigate again after the cuttings are first settled-in unless the soil cracks badly or the weather is very warm and dry. Over-watering at this time can slow early root development by lowering soil temperatures and oxygen.

By early summer the cuttings can be on a regular irrigation schedule, ranging from 7 to 10 days on sandy soils to 12 to 21 days on finer textured soils. The objective is to maintain continued active shoot growth until late summer. Intentionally stressing the plants to "force" deeper root penetration is not recommended. It will temporarily stop vine growth and can stunt their development.

Avoid standing water. This can be minimized by proper land planning and ripping prior to planting and by quickly draining low spots after irrigations.

Fertilization

Nitrogen fertilizer is often not needed the first growing season except on sandy soils. If so, one application in late June to mid-July is sufficient, except in coarse sands where two applications 4 to 5 weeks apart may be needed. Hand placing or side-dressing ammonium nitrate in furrows about 12 inches from the plants is recommended. Sixty to 80 pounds of ammonium nitrate per acre or 2 to 2-1/2 ounces per vine is a safe, effective rate. Caution should be used when applying an all-ammonium fertilizer such as ammonium sulfate or anhydrous ammonia. Vine burn sometimes occurs with their close placement in sandy soils.

Pest and Weed Problems

Rabbits, squirrels, caterpillars, and spider mites are the most damaging pests to the foliage of young vines. The vulnerability of cuttings makes it extremely important to protect the foliage from these and other vineyard pests.

Hopefully, precautions will be taken prior to planting to prevent or avoid nematode and phylloxera problems in the soil. It is especially important to preplant fumigate for nematodes in a nursery row areas intended for replants.

Weeds are very competitive with young vines. Perennial weeds, such as Bermudagrass, Johnsongrass, and bindweed, should be eradicated before planting. The emergence of annual weeds, especially grasses, can be greatly minimized by treating the vineyard site before planting with a preemergence herbicide such as Treflan®, Surflan®, or Devrinol®. Follow label recommendations.

Use of Double Cuttings

Planting two cuttings per site is sometimes practiced to improve percent stand. Mathematically, an 80% single-cutting stand could be increased to 96% with two cuttings. This assumes that 80% of the second cuttings also grew, as follows:

<u>Single cuttings</u>	<u>Double cuttings</u>			
	<u>1st</u>	<u>2nd</u>		
80% growing	80% growing		= 80% stand	} total 96% stand
20% dead = 80% stand	20% dead x 80% growing		=16% fill in	

Some growers have experienced this level of success and its economic advantages. However, if much of the losses are due to field conditions, such as rabbits or standing water, rather than normal cutting mortality, then the advantages of double cuttings will be reduced. This is because chances are higher that neither one can survive the adverse conditions.

The extra, surviving cuttings should be cut out by midsummer. By then, the poorest of the two can be selected and easily cut off below the soil surface with a sharp spade or shovel. This minimizes the survival chances of the extra cutting. Waiting until fall or winter to cut out the extra vine increases its ability to sucker-out from below and become an extra nuisance.