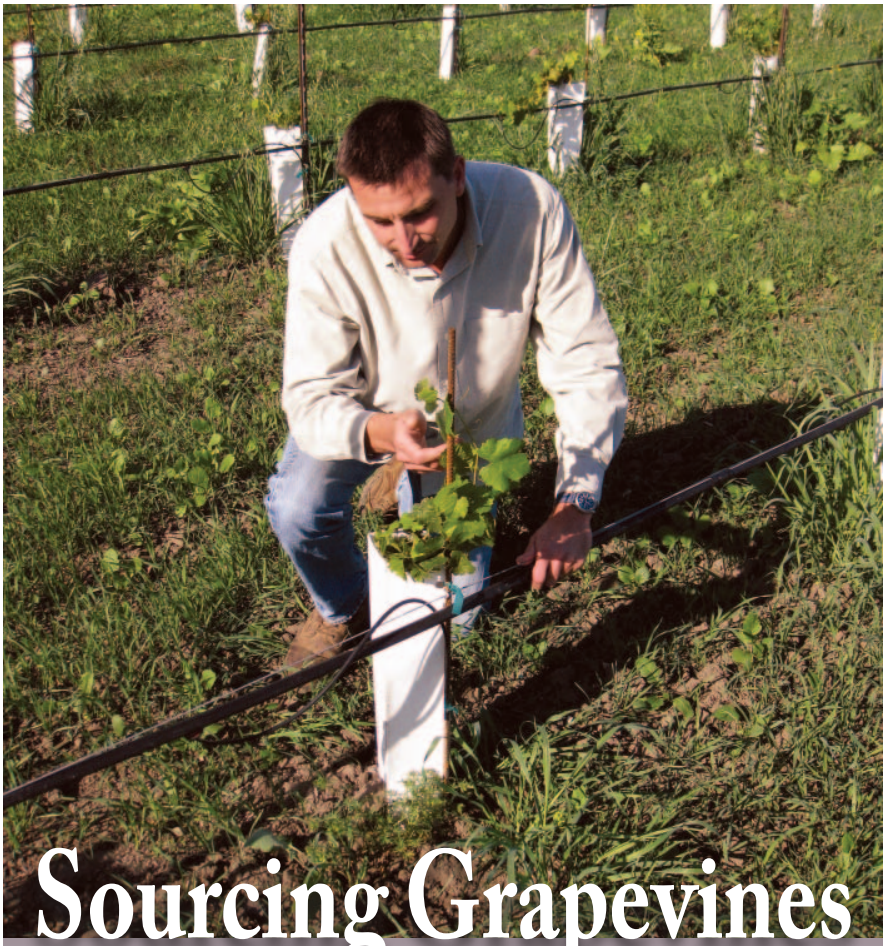

Sourcing Grapevines FOR A NEW VINEYARD

Considerations for choosing high-quality, disease-free vines

Story and photos by James A. Stamp, Ph.D.

Grapevine plants are not created equal. Vines come in several shapes and sizes and are available from a range of commercial nurseries, with the larger ones located exclusively in California. Different grapevine nursery products demand specific treatment, but common to all is the requirement that vines be planted on time. On-time planting is essential for the creation of high-quality vineyards, and timely implementation of the steps leading to plant day is critical to achieve this goal.

Presented here are the main elements to consider when sourcing vines for a new vineyard, with particular emphasis placed on those actions that will allow the grower to realize best return on investment.

TIMING IS KEY

When it comes to planning a vineyard, vines frequently receive the least consideration.

Timing is crucial in planting a new vineyard. Potted vines should be planted when root systems have just filled their container volume.

Managers, engineers and consultants often take care of the preplant decisions – site selection, soil preparation and amendment, block, irrigation and trellis design – without consideration for planting time and the vine's cyclical annual growth, dormancy and bud-break physiology.

In reality, plant time should be established first – with particular attention given to the vine product type, climatic conditions, historical seasonal weather patterns, soil type and selected rootstock. The goal of on-time planting is to ensure that the vine has sufficient time to establish a functional root/soil interface, which in turn will support active shoot development and the laying down of lignified canes capable of withstanding winter dormancy. The overarching goal of on-time planting is to ensure that vines emerge from their first winter period stronger than when they were planted.

GRAPEVINE PLANT PRODUCTS

Table 1 summarizes grapevine plant products, their pros and cons and recommended planting times. Vines are available potted or bareroot dormant. Potted vines should

AT A GLANCE

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- Plant time should be established first, with attention given to vine type, climatic conditions, historical seasonal weather patterns, soil and rootstock.
- Evaluate source rootstock and scion blocks for disease symptoms.

be planted when root systems have just filled their container volume, a point in time that would ideally coincide with optimal soil and air temperatures.

Holding vines in containers past their prime causes severe damage to root system architecture (pot-bound vines, root binding), leading to stress and vine decline. The planting window for best performance from potted vines is very limited – a matter of perhaps only two weeks. Initiation of potted-vine propagation must be timed to coincide with best time to plant – about 14 weeks later – usually in May in California.

Dormant vines are best planted as soon as possible in the spring to provide for the longest growing season and shortest time in cold storage (at the nursery). There is a direct correlation between extended cold storage and uneven and irregular vine development. Cold-stored vines metabolize carbohydrate energy reserves better channeled to the support of root and shoot development in the vineyard. Rootstock rootings and potted vines permit delayed selection of scion choice, but there may be consequences associated with this (Table 1). The success of field grafting may be severely affected by difficult weather conditions, while the creation of fresh wounds on the rootstock may stimulate crown gall development. Crown galls, which develop at the graft union, may ultimately girdle and kill the vine.

Extended cold storage can result in uneven and irregular vine development, as in these off-colored spur tissues of dormant bench graft.

SOURCING VINES

The world over, it is traditional to blame the nursery when things go wrong in the vineyard. Certainly this was true at the turn of this century, when the requirement for rootstocks new to the California industry prompted rapid propagation, poor product quality and cries of "Black Goo" (now recognized as Petri disease). Clearly, though, nurseries can be at fault for selling misidentified scion or rootstock varieties, diseased, or physically imperfect vines. Consider the following when ordering vines:

1. Vine defects such as incomplete graft unions, incomplete root systems and poorly healed disbudding sites correlate with physiologically immature wood and the presence/activity of fungal pathogens. These pathogens are air and water borne. Select a nursery with clean working surfaces and good sanitation practices, as this will tend to correlate with better product quality.

2. Evaluate source rootstock and scion blocks for disease symptoms and check to see that the blocks you examine or request are the ones used for your orders. In my experience, nurseries tend to exchange rootstock and scion materials to fill inventory shortages. Plants derived from California Department of Food and Agriculture (CDFA) certified increase blocks are supposed to be

TABLE 1

Product	Place order (for planting spring 2013)*	Ideal plant/ graft time	Pros	Cons
Dormant rooting	Jan. 2012- Feb. 2013*	Jan.-May 2013	Delayed scion choice	FG problems, weather, CG
Budwood for FG-spring '13	June 2012- Oct. 2012	May 2013	Fresh wood, reduced CG?	
Budwood for FG-fall '13	Sept. 2012- Sept. 2013	Sept. 2013	Graft heals through winter	Wood may be unavailable, immature or old, CG problems
Dormant BG	Sept. 2011- March 2012	Jan.-May 2013	No FG, reduced CG issues	
Green potted BG	July 2012- Feb. 2013*	May 2013	Delays time of materials selection	Plant time critical, quality difficult to control
Dormant potted BG	Not recommended			Severe root binding and damage to root architecture
BG: bench graft	FG: Field graft	CG: crown gall		

*Place orders earlier for in-demand rootstocks (420A, VR 039-16, 1616C) and scion selections

virus-free, but a recent study demonstrated that this is not always the case. In an independent analysis of 2009 riesling samples (originally published in Wine Business Monthly), 37%, 20%, 13%, 43%, 20% and 60% of 420A, 3309C, 101-14 MG, Riparia Gloire, 1103P and 1616C CDFA certified increase blocks, respectively, were positive for leafroll or corky bark viruses when tested between 2000 and 2010.

3. Where possible, select younger increase blocks and check with the Foundation source (Foundation Plant Services, UC Davis, for CDFA materials) as to the recall of any materials.

4. Perhaps one of the most frustrating practices at some nurseries is to fail to notify clients that their order will not be filled. This data is available to the nursery or client up to six months in advance of vine delivery. Therefore, examine plants in the nursery row to estimate the quantity of high-quality vines available to fill your order.

5. CDFA standards relating to vine-quality characteristics such as root system, graft union and top growth are minimal. Experience has shown that an average of about 25% of dormant bare-root product shipped from California nurseries fails to meet minimum standards. Most nursery contracts provide a 48-hour post-delivery period for inspection and rejection of vines. Use this time to your advantage.

PATHOGEN STATUS

As mentioned above, independent analysis has demonstrated that a large proportion of CDFA certified nursery increase blocks are contaminated with economically important viruses. Consequently, it is highly recommended that both rootstock and scion materials are subjected to independent virus analysis before order placement.

Procedures vary, but for most important viruses, collection of woody tissues in the fall provides the best chance of detecting virus. Fanleaf, on the other hand, is best detected in fleshy shoot tips in early spring. In developing a sampling strategy, it is useful to know the origin of vines (i.e. did they all originate from a single Foundation vine) and how many vines may be required to produce sufficient cuttings or buds to fill an order.

Pay a visit to the grapevine nursery to inspect vines for quality and potential disease symptoms.

With this information, a multi-year evaluation and testing strategy should be developed while acknowledging that it costs about $250 to test each vine. Visit the nursery in the fall to verify trueness to type of the variety, observe the presence of disease symptoms, and estimate whether your order will be filled with high-quality vines.

Some laboratories encourage submission of composite samples while others don't. This clearly can make a substantial difference to the budget of a testing program. Judicious sample collection can help to alleviate this problem.

In addition to viruses, grapevine nursery stock is commonly contaminated with fungal and bacterial pathogens. Many fungal pathogens, such as those associated with Petri disease and esca, are opportunistic, only presenting a problem under stressful situations. However, these fungi are known to negatively impact callus formation and propagation wound healing, and so again, careful pre-plant examination of stock is essential. And of course, physically sound plants are more able to withstand the myriad biotic and mechanical stress factors playing on the newly planted vine.

In addition to these all-pervasive fungal pathogens, *Agrobacterium vitis*, the causative agent of crown gall disease, is an ever-present problem common to all viticultural regions of the United States. Although East Coast growers suspect they have a monopoly on the problem, crown gall is a significant nuisance in all winegrowing regions of California. In fact, possibly because the last two springs were unusually wet in California, crown gall development is seemingly more of a problem now than in recent memory.

Unfortunately, there are no preventive measures available for crown gall, as confirmed by professor Tom Burr of Cornell University. Strategies can be adopted, however, that may reduce or limit the

likely damage or incidence of gall development:

Bleeding vines below the point of bud insertion can lead to crown gall issues.

1. Avoid field grafting. If working with rootstocks particularly prone to crown gall, such as 420A, avoid bleeding the vine below the point of bud insertion.

2. If you do field graft, do it in the spring rather than fall. (With fall field grafting, the point of grafting is usually mounded with dirt over winter, which would allow possibility of damage/dirt/infected dirt getting into the union, thus triggering crown gall development.)

3. Avoid potted vines, especially dormant potted product. Nurseries propagate potted vines in containers of no more than 2-3 inches in diameter and 4-6 inches deep. In such a small container the vine root system is damaged in shape – and never recovers – and both roots and shoots are unable to grow properly to heal propagation wounds and develop to suitable size.

4. Carefully inspect all dormant bare-root product. Reject vines with galls, incomplete graft unions and non-healed propagation wounds.

5. Only work with nurseries that appear to have clean facilities.

6. Ensure that vines are planted sufficiently early in the season to permit tissues to heal and lignify before winter frosts.

7. Ensure that vines are planted sufficiently high in the ground so that the graft union is well clear of the soil.

8. Protect fragile vines with a carton to reduce potential frost damage.

Grapevines are generally very vigorous and "weedy" – they like to and do grow fast. If you consider most plants that you might buy at Home Depot of equivalent size and vigor – fruit trees, for example – they would be in at least a 1-gallon pot and probably in a 5-gallon pot. Fruit trees are usually bare root, with roots up to 2 feet long.

ROOTSTOCK SELECTION

Rootstock selection should be one of the first decisions in the vineyard development planning cycle. Rootstock varieties are single species or hybrids of the *Vitis genera* selected from wild vines growing the length and breadth of North America, frequently in hot and arid southern states. Rootstocks are selected for vigor, effect on maturation and scion ripening, tolerance to drought, wet soils and salinity, resistance to soil pests (in particular, nematodes), and tolerance of other factors such as elemental extremes.

Site and soil studies should be undertaken in advance of land purchase with usually one backhoe pit dug per acre – fewer or more depending on site variability. Knowledge of the surface and subsurface chemistry and physics of the site along with location, elevation and anticipated climate, permit the selection of an appropriate rootstock.

Rootstock selection should be done right the first time, and it is not a business for the inexperienced. Analysis of the soil will permit calculation of total available water-holding capacity, a component critical for rootstock selection. This, in conjunction with soil depth and the presence of any undersurface barriers to root growth (hard

EAST COAST PERSPECTIVE

James Fisher of Soil Solutions LLC in Malvern, Pa., offers these tips for planting in the eastern United States:

- Examine vines during the production cycle and order early to help ensure that delivered vines are true-to-type.
- Be clear on which clones work for you. If the nursery falls short of your order, it may try to substitute clones, resulting in a mix of genetic materials.
- Virus contamination of supposedly clean stock is an on-going problem. Again, visit the nursery to evaluate vines for disease symptoms and submit samples for laboratory analysis.
- Because of the prevailing cold and wet weather, crown gall is a major issue for East Coast vineyards. Inspect the graft union of every vine prior to planting.
- Continued inspection throughout the first growing season is highly recommended to allow culling of diseased vines from the block.
- Keep broadleaf weed populations in check in order to reduce the possible transmission of tomato ringspot virus to vines by the nematode vector, *Xiphinema americanum*

pan), will help determine which rootstock best suits the site conditions. For example:

Vigor and dry farming: 110R and 1103P are vigorous rootstocks that are frequently considered for dry-farming programs. Both have deep root systems and are easy to propagate and field graft. St. George is also good for dry farming in deep soils. Recent observations suggest that 110R may exhibit incompatibility in some circumstances, highlighting the importance of pathogen testing of plant materials.

Nematode tolerance: VR 039-16, a *Vitis vinifera x rotundifolia* hybrid, is the only choice for soils contaminated with Xiphenema index, the vector of fanleaf virus. These pathogens are particularly prevalent in the Rutherford region of Napa Valley, where VR 039-16 is used almost exclusively in contaminated soils. 420A, 1103P, 101-14 MG and 1616C all have moderate to high resistance to root knot nematode.

Heavy wet clay soils: 1616C is a good choice for high-quality fruit and wine production in heavy clay soils too cold and wet for 420A. Partly because of its respectable nematode resistance, interest in 1616C has grown dramatically in recent seasons from California growers producing some of the very best wines. This rootstock is moderately vigorous, but like 420A, seems to be particularly prone to crown gall development. For this reason, bench grafting of 420A and 1616C is preferred over field grafting.

Phylloxera resistance: The rootstocks currently farmed in the United States were selected for their resistance to phylloxera. By and large this resistance is holding up well, although there is some evidence to suggest that under particularly difficult field conditions 101-14 MG – when stressed by nematodes and phylloxera – can show some decline. Professor Andy Walker of UC Davis recently reported that on challenging sites, both 101-14 MG and 1103P have been colonized by the aphid, but damage was not observed. Walker noted some phylloxera damage to Freedom, a rootstock chosen for its nematode resistance and widely used in California's Central Valley region.

Other issues: Riparia Gloire has poor tolerance of both wet and dry soils, but is often selected for high-quality production. Because of incompatibility issues, 3309C is a poor choice for field scion selections of unknown viral status. Due to its high vigor, St. George may result in poor fruit set in shatter-prone varieties such as merlot. Schwarzmann is rarely used, but is a good choice for sites with extreme nematode pressure. Because of inherent magnesium deficiency, 44-53M is often the only choice in soils with high concentrations of this element (serpentine).

FUTURE DEVELOPMENTS

As part of the National Clean Plant Network, funded by the 2008 Farm Bill, centers of excellence have been established across the country, charged with supplying pathogen and pest-tested plant material. As a result, in 2009, the Grape Clean Plant Network established rigorous new standards for grapevine foundation material in the United States. Materials meeting these standards will be known as Protocol 2010 and must have been propagated from a meristematic dome (the apex of a shoot tip) no greater than 0.5 mm in size and must also test negative for an extensive list of pathogens (including *Agrobacterium vitis*, the causative agent of crown gall). A limited selection of these materials is already under propagation at some commercial nurseries and

CALIFORNIA GRAPEVINE NURSERIES

Nursery	Contact	E-mail	Specialty
Casa Cristal	Andrew Zaninovich	info@casacristal.com	Wine grapes, table grapes, raisin grapes
Cal Western	Anthony Silveira	calwestern@msn.com	Wine grapes, table grapes, raisin grapes
Duarte	John Duarte	john@duartenursery.com	Potted vines, 42-inch-long vines, wine and table grapes
Guillaume	Eckhard Kaeskamp	eckhard@guillaumenurseries.com	Proprietary French selections
Herrick Grapevines	Bob Herrick	herrickgrapevines@hotmail.com	ENTAV (French) selections
Martinez Orchards	Ernie Bowman	ernie@martinezorchards.com	Wine grapes and dormant rootings
Mercier	Sebastian Traviesa	sebastian.traviesa@mercier-groupe.com	ENTAV (French) selections
NovaVine	Sam Caselli	scaselli@novavine.com	VCR (Italian), TCVS (French) selections
Sunridge	Andrew Jones	grapevinejones@gmail.com	ENTAV (French) selections; wine, table and raisin grapes
Vintage Nurseries	Dustin Hooper	dustin@vintagenurseries.com	Wine, table and raisin varieties. California Table Grape Commission

should be available in plant products by 2014.

THE BOTTOM LINE

If, like the vast majority of those who purchase grapevines, you were unable to undertake field evaluation of the vines that were just dropped off at your ranch, you still have 48 hours to examine and reject plants. Although nurseries don't advertise this fact, they are well aware of this provision in their contract and usually abide by your decision, as the final bill has still to be paid.

Remember, the worst-case scenario is the requirement to dig out vines at the beginning of the second year after participating in endless discussions about the causes of vine failure in the first season. It's far better to plant only 50% of the order as good vines than to remove the whole lot within the first 12 months. As should be obvious from this discussion, however, this scenario should and can be avoided if you realize that plant material quality is the key to successful vineyard development. ■

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Comments? Please e-mail us at feedback@vwm-online.com.

COMMERCIAL DIAGNOSTIC LABORATORIES

Company	Contact	Website	E-mail	Services*
Agri-Analysis	Alan Wei, Ph.D.	agri-analysis.com	apwei@agri-analysis.com	V, F, B, DNA
ALL Crop Solutions	Anna-Liisa Fabritius, Ph.D.	allcropsolutions.com	info@allcropsolutions.com	V, F, B
CA Seed & Plant Lab	Parm Randhawa, Ph.D.	calspl.com	randhawa@calspl.com	V, VE, F, B, DNA
Eurofins STA Laboratories	Judit Monis, Ph.D.	eurofinsus.com/stalabs	juditmonis@eurofinsus.com	V, F, B
FPS, UC Davis	Vicki Klaassen, Ph.D.	fps.ucdavis.edu	vaklaassen@ucdavis.edu	V, VE, F, B, DNA

*Services. V: viral, VE: virus eradication, F: Fungal, B: bacterial, DNA: varietal identification