

Timely Trunk Renewal to Overcome Trunk Disease

Trunk diseases threaten vineyards around the world, and the International Organization of Vine and Wine (OIV) has now taken an active interest. This column describes a new systematic approach to overcome trunk diseases in mature vineyards. The basic concept of timely trunk renewal (TTR) is certainly not new, but the application to trunk disease—especially to entire vineyard blocks—is practiced by very few growers.

Trunk renewal is not a new process for California. University of California Extension workers Jim Kissler and Bob Sisson used trunk and cordon renewal in the 1980s and showed that that retraining from the cordon or the trunk works very well for infected vines.

However, the process and its application to the present battle with trunk diseases generally has been overlooked. The present emphasis in California is to encourage early preventative practice such as double or late pruning and wound protection with chemicals.

In the past five years I have interacted with many scientists in the international trunk disease research community. Several of them made useful comments on a draft protocol for trunk renewal, which have been incorporated below.

Grapevine trunk diseases

There are four major grapevine trunk diseases, all caused by different, taxonomically unrelated fungi. These diseases are called Esca, *Eutypa* dieback, *Botryosphaeria* dieback and *Phomopsis* dieback.

Esca is a major problem in Europe, but it is less common in California.

Eutypa dieback occurs around the world and in California. It is the trunk disease that has been the most thoroughly examined on a scientific basis.

Botryosphaeria and *Phomopsis* dieback are also global but not so well understood by researchers nor recognized by many growers. The extent of *Botryosphaeria* infection in California relative to *Eutypa* was described by J.R. Úrbez-Torres (2006).

There is presently no single, universally agreed control strategy for these diseases once they are established in the vineyard. My belief is that trunk renewal will fill that role, just as the use of grafted grapevines led to control of phylloxera.

The principal means of spread of trunk diseases is by winter pruning-wound infection with wind-dispersed or splash-dispersed spores (depending on the pathogen), which are released in rainy weather. Trunk diseases are insidious, especially *Botryosphaeria* dieback, which does not show symptoms until long after infection.

Surveys from grapevine nurseries around the world have detected the causal pathogens of Esca and Black foot, and other fungi contaminating grafted vines, which can lead to infection in new vineyards. Thus, the problem will likely worsen.

The damage

Under extreme conditions, vine death due to Esca and *Botryosphaeria* can occur before the vine matures and begins to form fruit, but commonly they and the other trunk diseases first show symptoms (dead spurs, stunted shoots or foliar symptoms) between five and seven years of age. As more and more vines develop symptoms, yields decline.

Grower attitudes vary as to how much damage is a threshold level for removal and replanting, but I hear a figure of 20% yield loss frequently. California economic studies indicate that early intervention of wound protection is necessary to restrict disease spread and loss of income, much earlier than 20%.

Trunk renewal in perspective

Present recommendations for trunk disease control in California are for preventative action starting in young vineyards and include delayed pruning or double pruning and treatment of pruning wounds with fungicides such as Topsin M (thiophanate-methyl; United Phosphorus Inc., King of Prussia, Penn.) and Rally (myclobutanil; Dow Agrosciences LLC, Indianapolis, Ind.) before a rain event or with non-chemical materials, such as boric acid (Tech-Gro B-Lock; Nutrient Technologies, Inc., Dinuba, Calif.) or VitiSeal (VitiSeal International LLC, San Diego, Calif.). Boric acid only controls *Eutypa*, but with addition of Topsin M all diseases are controlled.

TTR can be seen as supplementary to these procedures, namely in mature vineyards, and allows for the treatment of early symptom vines and those most at risk because of their location near infected vines.



Figure 2. A vine in England with two suckers in line with the vine row and on both sides of the trunk. These are ideally placed to replace the existing diseased trunk with two healthy trunks, each one supporting a cordon. The trunk could be removed either the following winter or the next winter, with minimal or no crop loss.



LUCIE MORTON

Figure 1. Dr. Pierre Galet, French scientist, with a native *Vitis Berlandieri* vine in the Davis Mountains of Texas. Note the multi-trunks and their spread along the ground.

We are all familiar with vineyards where individual vines are trained to a single trunk as has become the convention, but it is only a convention. In nature, and for about 40 million years, Eurasian vines have been forest dwellers; vines have been multi-trunked and unpruned, see Figure 1.

It is probably in the past 5,000 years or so that vineyards have been monocultures, with each vine trained to a single trunk. Multi-trunks are a practice used commercially in places with severe winters to replace cold-damaged trunks, such as in New York state, and to combat crown gall that sometimes develops on cold-damaged trunks. It can be used to fight trunk diseases, too.

East Coast-based viticulturist Lucie Morton suggests growers start out with two trunks to help with the inevitable development of trunk diseases, and I thoroughly endorse this. It can also lead to earlier yields from new vines.

Scientific studies in Australia since 1988 have shown that the cumulative yield losses due to *Eutypa* dieback can be mitigated by taking healthy suckers from the base of the vine to replace the trunk. This technique works with other trunk diseases also. It takes advantage of saving the vine root system.

Suckers arise from “base” buds at prior node positions on the vine trunk. Depending on circumstances, a proportion will burst in any growing season. These are typically seen as a nuisance by vineyard managers, who will normally have a program to remove them, either manually, mechanically or by chemical spray. Timely trunk renewal depends on the presence

of suckers and can lead to a totally new attitude to suckers if trunk diseases are present in a vineyard. The catch cry may be, “Save those little suckers!”

Trunk renewal can be a “cure” for trunk disease, in that a diseased trunk and cordons are replaced with healthy, new parts to eliminate the infection. This helps improve yield and may slow the spread of disease by removing potential inoculum sources from a vineyard. There is, however, no guarantee that re-infection will not occur, and pruning wounds must be protected by fungicide application.

Growers might contemplate replacing one trunk with two, as done in the eastern United States. These new trunks can be free of trunk disease infection if located sufficiently low on the trunk, below wood cankers or discoloration due to the trunk pathogens. Australian guidelines suggest a 4-inch separation below staining; in New Zealand, the recommendation is 8 inches.

An alternate approach that may be more suited to working with a vineyard crew is to cut at a fixed height 12 inches above ground. One grower in Cognac,



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France, cut off higher, at 18 inches, and the dead trunk was useful support for replacement suckers and plastic vine guards during retraining. Whichever height is chosen, this should be approximately 8 inches below any staining on the most affected vines.

Aims and application of TTR

Given that “trunk/cordon renewal” is an accepted strategy for trunk disease (in the sense that the infection may be removed), the pertinent question is when should it be applied?

Should the process be initiated with observation of the first dead cordon or vine? Or, should one wait until the disease is seen to be more widespread throughout the vineyard (10% or 20% symptomatic vines). Should only the very devigorated vines be treated with trunk renewal, or perhaps should adjacent

vines showing the very first symptoms—or even no symptoms—be included?

There is the question of what should be done, and to how many vines? Removing all trunks in one year will cause obvious crop loss, yet some growers are inclined to treat all vines in a block the same way, even though they may suspect that infection varies. Other growers compromise by doing portions of a block in consecutive years (including replacement of training wires), to spread out yield loss.

In any event, the most expensive way of treating trunk disease is total trunk renewal in a block, as it involves unnecessary crop loss for the sake of “management uniformity.” Sucker training to new trunks and arms can precede trunk removal, and no crop need be lost. Replacing the removed vine framework is achieved more quickly with two new trunks, although I understand that some

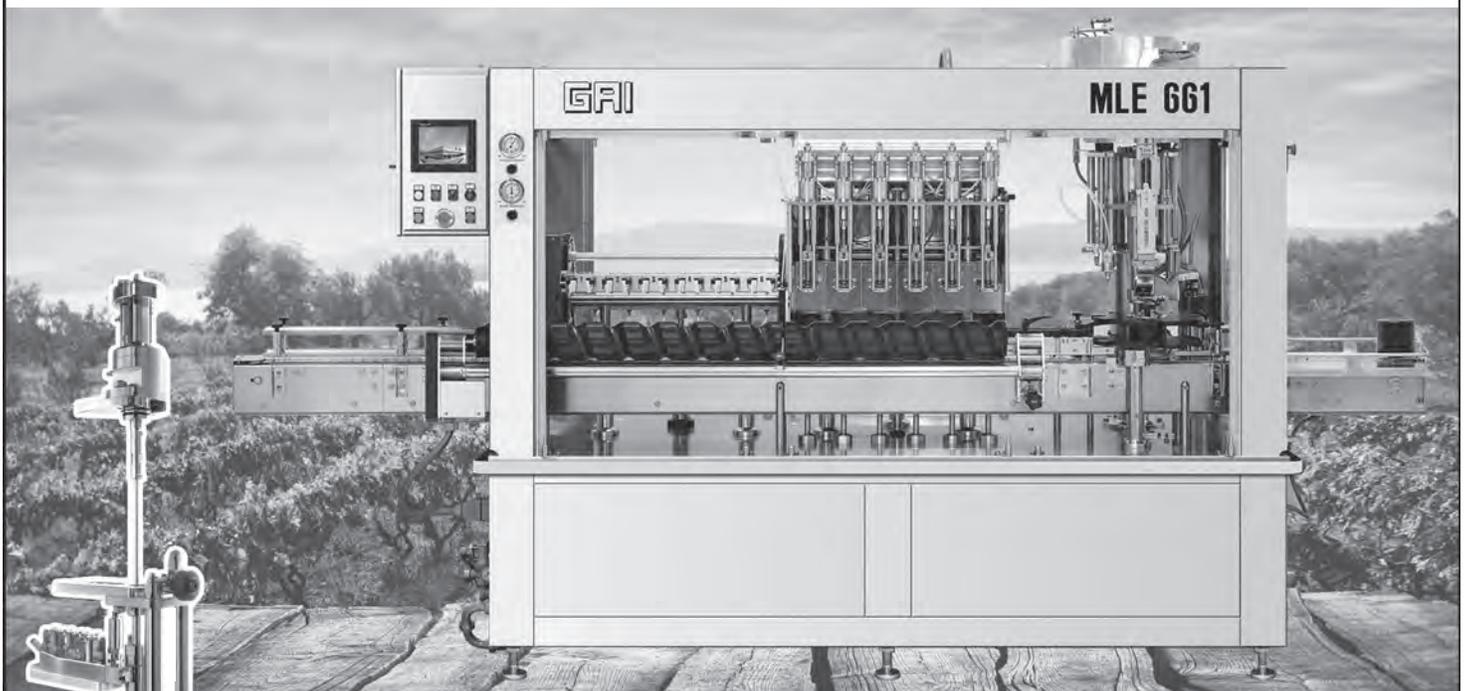


RICHARD SMART

Figure 3. A 30-year-old Sauvignon Blanc vine in Martinborough, New Zealand. Were the trunk not renewed 10 years ago, it would have died from trunk disease. Now it is healthy.

Table 1	Low infection (0% – 2%)	Medium Infection (2% – 10%)	High Infection (more than 10%)
Low risk	1	2	3
Medium risk	2	3	3
High risk	3	3	4

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managers may be concerned with such a departure from convention.

Removal of the old trunk can be an issue. Especially if spur-pruned, the fruiting wires may be ingrown in the wood, and often trunks, cordons and wires need be removed, and trunks destroyed.

The broad aim of the TTR protocol is to reduce the impact of grapevine trunk disease on vineyard profitability. The protocol aims to:

- 1) Retain health and recover yields to profitable levels, before yield losses are too severe.
- 2) Manage the disease to conserve production where possible, in vineyards at an early to moderate stage of infection, or those with a higher risk of infection.
- 3) Minimize costs and maximize revenue in all instances.

General assumptions

- 1) The protocol defined below is not applicable to vines with unhealthy root systems, which may be caused by root pathogens or for other reasons, or to vines with other diseases such as virus.
- 2) The cordons and, to a lesser extent, the trunks of mature vines are likely to have more wood cankers and discoloration than those of young vines. The greater the proportion of such wood symptoms, the greater is the impact on yield.
- 3) Present abiotic stresses may compound damage from trunk disease. Sometimes the stress should be addressed before trunk renewal, as for example with poor soil drainage.
- 4) Use of healthy suckers arising from base buds well below wood symptoms offers the opportunity for trunk renewal while retaining the original root system.

Vineyard procedures for the protocol

Normally a vineyard is made up of discrete blocks, which may differ in grape variety, clone, rootstock and date of planting etc. The following protocol is designed to be applied at the block level.

1. Trunk disease infection assessment: Each block needs to be assessed for trunk disease, and this assessment can be at various degrees of accuracy, from visual ratings of numbers of dead spurs per vine, for example, to counts of vines with the presence of canopy symptoms. Dead, missing vines, replants and otherwise symptomatic vines need to be recorded also.

Timing of inspection depends on the predominant trunk diseases in the vineyard. Foliar symptoms of *Eutypa* are most apparent in spring. Symptoms of Esca do not start to develop until approximately mid-June. Dead spurs and stunted shoots are best observed later in the growing season, when vegetative growth ceases.

2. Trunk disease risk assessment: All vineyards in California are attacked by one or more trunk diseases, eventually. Obviously the older the vineyard, typically the greater the level of damage. The time it takes for canopy symptoms to first appear, the rate at which the proportion of symptomatic vines increases and the severity of yield losses are all influenced significantly by grape variety.

The varieties Sauvignon Blanc and Ugni Blanc are among the most susceptible to Esca. Merlot seems to be more resistant to *Eutypa* dieback than Cabernet Sauvignon, although they are both similarly susceptible to *Botryosphaeria* dieback. In California, seedless table grapes (namely Thompson seedless) are very susceptible to *Phomopsis* dieback.

It is not possible to present a general table of trunk disease susceptibility, since experience suggests that this may vary from region to region, maybe vineyard to vineyard. The best approach



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Multi-trunking for vine longevity

By Lucie Morton

Because U.S. grapegrowers with vineyards east of the Rocky Mountains can experience very cold winter temperatures, the practice of maintaining more than a single trunk from the start is common. It is especially critical for those growing *Vitis vinifera* varieties as opposed to traditional native American vines and hybrids with greater cold tolerance.

Today, as the relatively young wine industry and its vines mature, it has become clear that this practice will also prolong the life of a vineyard by renewing aging and diseased vascular systems.

As Richard Smart discusses—and a search of the International Council of Grapevine Trunk Diseases (ICGTD) website icgtd.ucr.edu will confirm—there are many different fungi involved in vine decline caused by xylem plugging and wood dessication. These fungi can coexist with vines for many years without being particularly detrimental, or they can lead to problems with vines of all ages starting with very young plants in the nursery.

As with any disease complex, climate

has a huge influence on which symptoms and associated fungi are more prevalent and how much their presence will affect vine health. The eastern United States includes Florida in the south stretching to Ontario, Canada, in the north and westward to the Rockies.

Farm wineries in this region are generally small in size. For example, the two largest vineyards in Virginia hover around 200 acres, but many are much smaller. Most vineyards are far apart geographically and in sites that have not had vineyards previously. Therefore, wind-blown spores from neighboring vineyards are not a big problem. Fungi introduced by plant material from elsewhere may or may not survive in this new environment.

My photo of a circa 25-year-old Cabernet Sauvignon/5BB vine planted in the mid-1970s in Virginia shows the progression of Esca disease three different-aged trunks on the same vine. I took the photo in about 1999 in a Virginia vineyard with 20-plus year old Cabernet Sauvignon vines that were being pulled out.

Multiple trunking was done here as a hedge against winter damage. These trunks are 22, 15 and seven years old. Petri disease was very much in the forefront of controversy then (1998 being the founding of the ICGTD and 1999 being the first international meeting in Siena), and by then it had been linked to Esca and vine decline.

This vine has all the symptoms of classical Esca disease where there is black goo staining in young xylem tissue, brown wood in older wood, and the classic white rot caused when basidiomycetes finish off what ascomycetes starts. Occasionally, there will be tell-tale “tiger-stripe” foliar symptoms perhaps due to *Botryosphaeria* fungi in the mix with the *Phaeoconiellas* and *Phaeoacremoniums*.

To protect one’s investment from losing economic viability over time, one should consider a combination of close vine spacing, cane pruning, multiple trunking and/or trunk renewal. Like grafting, it brings along some extra cost and cultural inconvenience that should be factored in with an increase in productive lifespan.

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Esca progression in three different age trunks from one original vine root system.

for growers and their advisers is to try and develop guidelines for their local region.

That said, resistance to one trunk disease does not confer resistance to another. Because the trunk diseases occur in mixed infection in a vineyard, growers should assume that multiple diseases will be present.

3. Combining risk and infection to decide an appropriate management strategy. Table 1 has three classes of risk and three classes of infection, and a suite of four suggested management strategies for each cell in the table. The infection values in the Table 1 heading are indicative only, and may vary from region to region and vineyard to vineyard in application.

Strategy 1: Pre-harvest inspection is generally not necessary, as some symptomatic and dead vines are evident at winter pruning. Remove dead vines and burn. Encourage and retain suckers on symptomatic vines, and commence trunk renewal.

Strategy 2: Perform pre-harvest inspection to identify early stage symptomatic vines. Begin trunk renewal for any symptomatic vines and adjacent vines if clumping and staining are evident.

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Strategy 3: As above, and begin program of water-shoot generation and training to replace all trunks within one or two years.

Strategy 4: For all vines, winter-prune very hard, remove all trunks in spring, train suckers for replacement trunks, or, remove all vines and replant.

Notes

- Basal suckers may be encouraged by a hard pruning in winter followed by late spring trunk removal. They may also be encouraged by careful bark removal on part of the basal trunk. Suckers may need to be trained in transparent plastic tubes to protect them from herbicides, and generally they need to be staked or tied to the trunk as they can break off easily in the first year. Plastic tubes can provide training support. Suckers will usually grow very strongly, even if the parent vine is not immediately removed. Often a reasonable bud number can be retained at winter pruning at the end of the first growing season, to produce some yield in the following growing season. This is facilitated by training two new trunks per vine.
- When removing trunks, the cut should be below the stain by 4 to 8 inches, and the final cut should be made at a 45° angle, facing south for the Northern

Hemisphere. This assists drainage of sap and drying the cut surface.

- Treat all wounds with a protectant fungicide, especially large cuts and especially if this is being done in the dormant season.
- Remove all vine parts from vineyard and burn as soon as possible.
- Encourage two suckers—one on each side of the vine—in line with the vine row. If small, spur-prune them in winter. Two suckers can be used to form two trunks, a helpful insurance against new infections, or an extra in case of damage.
- It is imperative to protect new trunks and cordons from infection. Protecting a pruning wound with a fungicide spray, paste or paint/fungicide mixture is strongly suggested. Fungicide sprays only provide protection for about two weeks. Avoid making pruning cuts in wet weather.

Conclusion

Adoption of this protocol will allow vineyards to recoup some losses from the ravages of trunk disease, assuming you time it before significant yield losses already have occurred. The sooner the protocol is adopted, the less loss of yield there will be, and the infection will spread more slowly.

The aim was to develop a systematic method for growers to address trunk disease issues in commercial vineyards, so they might maintain vineyard productivity while at the same time containing spread of the diseases. Experience in many countries shows that the sooner that trunk renewal begins, the more successful it will be to control spread of disease and yield loss. [PWV](#)

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Editor's note: For more information, go to practicalwinery.com. Back issues: "Research update: Grapevine trunk diseases in California," January/February 2005.



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