

Preservation of the Genetic Diversity of Wine Grape Varieties: The Old Vine Conference

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Old Vine From Angelica Vineyard – Photo Credit Catena Zapata

Recently, I did some research on “old vine” heritage grapevines after seeing a post on LinkedIn that showed a vineyard with characteristic “red leaf” symptoms likely due to viral infection. There are “old vine” projects throughout important winegrowing regions in the world. The definition of an old vine ranges from 35-50 years, but if you ever heard me give presentations at meetings, my motto is: “vineyards should live to be over 100 years”. My search brought me to the Old Vine conference held last October.

A non-profit company registered in the United Kingdom with a mission to safeguard and preserve old grapevines through research and education. The non-profit organizes yearly conferences. In 2023, the old vine hero award was given to Dr. Laura Catena, the managing director of Catena Zapata winery. Many of you know that I am originally from Argentina. Hearing about an award given to a compatriot in my field inspired me to write about her presentation.

Malbec, Argentina’s Signature Variety

Dr. Catena’s presentation: “How an agricultural philosophy is using science to preserve the past” focused on the history of Argentine viticulture as it relates to old germplasm. Especially, how her family’s winery put Argentina’s malbec wine into the world’s map. The malbec variety is originally from France and was brought to Argentina in the mid-19th century by a French viticulturist named Miguel Pouget. Dr. Catena referred to her father, Nicolas, as responsible for starting to use malbec in a single variety wine in the mid-1990s.

After the vineyards grown in France were affected by phylloxera in the 1800’s, many malbec plantings (among other varieties of grapes) were decimated by the pest. However, in the absence of phylloxera, the plants brought to Argentina survived and became an important reservoir of malbec’s genetic material. The family business celebrated last year the 100th birthday of their Angelica vineyard planted in 1922. Presently, collaborative work with INTA (the equivalent to our USDA) is helping Catena and other vineyards characterize the present germplasm.

Sélection Massale, the Renewed use of an Old Practice

In the past, and due to economic restrictions, importations were not allowed into Argentina. Therefore, it was unusual for grape growers to plant clones of specific varieties. Instead, cuttings of the original plants introduced from France in the mid-1800’s were propagated to make new plants. These were generally planted on their own roots (i.e., not grafted). The vineyards are most often planted with cuttings that have been selected in the vineyard based on visual observation or the quality of wine produced from its grapes. Generally, a number of “good looking” or well performing vines are marked in a vineyard and used to collect budwood that will be propagated or grafted to produce new vines. This process of field selection is known as sélection massale. Since the selection is done based on visual aspects and vines are generally not grafted, viral symptoms are generally masked, therefore vines infected with virus are often selected.



Dormant Old Vines in a California Vineyard

The advantage of using field selections versus a clone of a given variety is the genetic diversity that can be found in the vineyard. Of course, not always this is an advantage, as a vineyard with genetic diversity might be more difficult to manage because some vines may be taller or more vigorous than others, may need more or less water, nutrients, etc. As it relates to wine production, some of the fruit from some vines may mature earlier than others creating difficulty during the harvest of the fruit. However, an interesting study from the Catena Wine Institute showed that the variation among the vines was so wide that some vines could produce only one bottle of wine, while others could produce up to seven bottles. On the other hand, the genetic variation in the vineyard allowed more resilience as the vineyard overall was more resistant to inclement weather such as freeze, hail, or wind.

Viral Disease Introduction to Argentina Occurred with Imported Vines

At some point in history Argentina's nurseries and vineyards started their own clonal selection. In addition, the Argentine market eventually opened its business to import plant material from nurseries in Europe and recently from California's Foundation Plant Services (FPS). According to Dr. Catena, this is when the majority of viral and fungal

diseases were introduced into Argentine vineyards. Vineyards planted with older field selections at Catena Zapata appear to be healthier than the newer introductions planted. This information matches research by Jimena Balic performed by Santa Carolina Winery in Chile. Dr. Balic reported at the 19th International Congress of ICGV the detection of more virus infected vines in nursery propagated clones compared to Santa Carolina's own heritage field selections. Interestingly, a study in California by Kari Arnold determined that the older vines were infected with more viruses than the newer plantings

We know that important viral diseases (fanleaf, leafroll, rugose wood, and red blotch) are present in Argentina. Further, . Many of the original field selections have now become infected with fanleaf (transmitted in the soil by nematodes) or leafroll (transmitted from vine to vine by mealybugs). As a trained medical doctor, Dr. Catena mentions that the winery is serious about keeping viruses out of the vineyard. However, the imported plants that brought the viral diseases have spread along different vineyards not only affecting a broad area since introduced. Since virus testing is expensive and ranges between \$150-\$250/sample compared to the cost of \$4 per plant, not every plant can be tested. Catena Zapata's strategy is to test their grafted clones but the field selections that are not grafted are rarely tested

Argentina Grapevine Certification Program is Different from California's

In Argentina each nursery is responsible for maintaining and testing their own mother and increase blocks. In other words, there is not a central foundation block such as what is maintained by FPS.

Besides a few commercial nurseries, many wineries have nurseries that provide the cuttings or grafted plants grown in their own vineyards. Just like in California, there is a list of viruses that the certified vines must be free of. Similarly, the certification of grapevine plants in Argentina is optional. In reality, very few vineyards are planted with certified vines and most vineyards are planted with non-grafted vines as phylloxera is not yet ubiquitous.

Disease Testing and Elimination

During my long career as a plant pathologist working in diagnostics and pathogen elimination, I was fortunate to have been able to apply tissue culture techniques to preserve heritage clones in California. I am also fortunate to have visited vineyards planted with these clones. Feedback from clients has always been that the vines perform similar to the original selection or clones but have the advantage of being healthy and more productive, even 30 years after being planted. I have covered diagnostic testing and tissue culture disease elimination in other articles.

I will mention here briefly, the meristem tissue culture technique. The method relies in growing the apical meristematic dome of a vine cutting to create a new plant. The smaller the meristem size is, the higher probability of eliminating viruses, especially those that are phloem limited. In her presentation, Dr. Catena mentioned that she expects that the meristem culture method may improve over time. In my opinion the method works

very well. It requires manual labor and experience but it is the best method available for disease eradication. Perhaps one day, we could replace technicians with sophisticated robots with the capacity of dissecting minute portions of the meristem under the microscope! However, in my experience technicians I have worked with have been able to perform the repetitive tasks over and over with fine and quick precision (almost like robots!). The meristem tissue culture is a true and tried method that promises to improve the health of new grapevine plantings.

Conclusions

I have learned through Dr. Catena's presentation and the Old Vine Conference that there is a huge amount of generic diversity that needs to be preserved in grapevines. The health status of different vineyards varies and depends a lot on their care and isolation. The use of meristem culture for disease eradication offers an advantage in heritage selection preservation. One usually thinks that the method is used solely for virus elimination but an added bonus is the elimination of bacterial and fungal pathogens. Tissue culture methods of grapevine heritage selections and clones are performed in a laboratory in vitro under sterile conditions. Another tissue culture application is the preservation of plant material in small vessels creating a germplasm repository bank. The preserved plant material would be readily available for propagation and planting to replace affected vines in the case of viral infection (or other issue) in a vineyard.

***Judit Monis, Ph.D.** provides specialized services to help growers, vineyard managers, and nursery personnel avoid the propagation and transmission of disease caused by bacteria, fungi, and viruses in their vineyard blocks. Judit (based in California) is fluent in Spanish and is available to consult in all wine grape growing regions of the world. Please visit juditmonis.com for information or contact juditmonis@yahoo.com to request a consulting session at your vineyard or virtually.*