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WINE TRIALS:

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WINE TRIALS: THE FUTURE OF WINE SCIENCE



Catena Zapata winery sponsors unique
research presentation at UC Davis
Lance Cutler

BODEGA CATENA ZAPATA WINERY of Mendoza, Argentina has been carrying on serious, scientific wine research for 20 years under the direction of **Laura Catena**, general director. By 2008, as part of their ongoing research, Bodega Catena Zapata was doing 250 microvinifications a year. In 2010 that number had climbed to 2,000 annually. These microvinification trials are critical for any vineyard trials but often present a problem because of the difficulties with being precise and reproducible while still providing information that transfers directly to commercial winemaking. The winery decided to sponsor **Fernando Buscema**, executive director of their research program, for the two-year MS program at UC Davis, focusing on learning how to run these microvinifications in the best possible way. Working primarily with **Dr. Roger Boulton** and

relying on new state-of-the-art equipment in the UC Davis experimental winery, Buscema released the most extensive Malbec *research ever conducted*.

As founder of **Catena Institute of Wine**, Laura Catena felt it was time to let the wine world in on Buscema's research and the other areas they were studying. She recently hosted an event called "The Future of Wine Science: A Dialogue with Experts from UC Davis and the Catena Institute of Wine." The event was a collaboration between UC Davis, the Catena Institute of Wine and **MundoVino**, a member of **The Winebow Group**, which represents Bodega Catena Zapata nationally. A select group of wine writers, sommeliers and wine experts attended the all-day event on August 31, 2015 that featured a who's who list of Davis experts and Catena Institute researchers.

Some Background on Bodega Catena Zapata's Research Start

Bodega Catena Zapata has led the way in Argentina's viticulture and winemaking research since the 1990s. **Nicolás Catena Zapata**, the third generation of the family, had a Ph.D. in economics; and while spending time in California in the 1980s, he was impressed by California's attempts to compete with the classic wines of Europe. He saw that research conducted at UC Davis had contributed to California's burgeoning wine industry. When he returned to Argentina, he decided to learn all he could to improve his wines until they could compete on the world's stage.

Nicolás focused his efforts on Chardonnay and Cabernet Sauvignon, the major players in France and much of Europe, and he seemed to be making progress. His wines were improving. By 1995, he showed his wines at a **Wine Spectator** event in New York, but his wines got little attention. That year, Nicolás' daughter, **Laura**, got involved in the research. She felt that her father needed to do something different, and she decided that their winery had a unique opportunity with Malbec, the most planted grape in all of Argentina.

Laura Catena, who graduated magna cum laude from **Harvard University** with a degree in biology and has a Doctor of Medicine degree from **Stanford University**, was appalled by the unscientific way the winery was doing its research. She brought a more pragmatic and empirical methodology, insisting on replicating experiments and compiling data to make informed decisions.

"We wanted to promote knowledge and understanding through science," explained Catena. "Our goal in this research is two-fold: we want to elevate our Catena wines to a level that competes with the finest wines in the world, and

we want to share our knowledge to elevate wine quality for all of Argentina."

By 2002, Catena realized she needed to hire full-time researchers to run the experimental programs and organize data. They hired **Alejandro Vigil** as research and development director. Vigil transformed the team and brought in new expertise. In 2004 he partnered with the agronomy school in Mendoza to study high-altitude viticulture, which was a major focus for Bodega Catena Zapata. By 2007 Vigil joined the enology team full-time and is now the winemaker. His place on the research team was taken by **Fernando Buscema**.

Developing the Malbec Program

Catena's first project was to develop the Malbec program. Bodega Catena Zapata identified 134 different Malbec selections among its vineyards. They worked with these clones for years, finally selecting five clones based on positive features, like small clusters, small berries and naturally low yield. In 2007 these five clones were sent to UC Davis where they compared the Argentine clones against five clones from France.

In research carried out by **Roy Urvieta** from the Catena Institute, characteristics between the Argentine and French clones were compared. The Argentine clones produced significantly lower yields than their French counterparts, averaging 22.5 kg per plant compared to the 69 kg per plant of the French selections. A bit surprising was the fact that the clones from Argentina behaved the same way in California as in Argentina, with the lowest and highest yielding clones performing the same in both locations.

The conclusions were not as evident when it came to studying the flavonoids and anthocyanins between the French and Argentine selections. Of the 24 compounds

analyzed there were differences in just seven. The French clones did have more tri-hydroxylated anthocyanins, while the selections from Argentina contained more di-hydroxylated anthocyanins. Urvieta hypothesized that the higher UV-B and more stressful conditions in Argentina may have caused the Argentine clones to develop more of the di-hydroxylated anthocyanins.

Catena said, “Twenty years ago we wondered if we planted a Malbec vine from France, whether it would taste the same as our selections. So we brought in French Malbec and realized that the plant material was different. This study proves that the plant material is different, and we believe it shows that Argentina has more desirable Malbec selections than France.” **WBM**

The Most In-depth Study of Cultivars Ever Attempted

The centerpiece of the event started with a tour of the LEED Platinum Teaching and Research Winery at UC Davis that introduced attendees to the special equipment that made the study possible. Then Fernando Buscema and Boulton gave a presentation of their research on Malbec cultivars and how they used the state-of-the-art UC Davis winery to conduct their experiments.

Buscema’s M.S. thesis at UC Davis is the most in-depth study of Malbec ever published. It is also the largest single comparative cultivar study ever attempted. The project studied Malbec—comparing 26 different blocks in Mendoza with 16 different blocks from six different counties in California. The blocks selected from Argentina were as uniform as possible. The same irrigation methodology was used; and if hail-protection netting was used, all of the vines in the block had to have it.

Buscema harvested between 500 and 1,000 kg

of fruit from each block between 24° to 25° Brix. The Argentine wines were fermented in 500 L plastic bins while the California wines were fermented in 250 L stainless steel fermentors. Winemaking was conventional: 150 mg of SO₂ was added at crushing, and 24 hours later 200 mg per liter of Lalvin EC-118 yeast was added. A day later 100 mg/liter DAP was added. Fermentation temperatures were kept between 22° and 25° C. After 11 days of fermentation on the skins, the wine was pressed, and the free run juice was inoculated with Lalvin VP41 malolactic bacteria. Once ML was complete, free SO₂ was brought to 35 mg per liter. Twelve bottles of each wine were sealed and kept standing at 15° C until analysis.

Roger Boulton commented, “Only someone with Fernando’s enthusiasm and dedication could get this 60-year-old professor up at four in the morning to pick grapes from 16 locations all over the state. I have waited 25 years to do this kind of research. It would have been a complete waste of time to attempt before, but now with this new equipment we have here at the research winery, we are able to exactly replicate each fermentation, isolating out the specific vineyard contributions.”

Using HPLC liquid chromatography, Buscema focused on 30 phenolic compounds with a system called chemotronics to develop a fingerprint of the various wines. The research revealed that the Mendoza wines showed similarities but were significantly different from the California counties. All of the California counties separated from each other except for Sonoma and Monterey. All four of the Mendoza locations separated from each other although two were closely associated. Buscema determined that as expected, the phenolic compounds present in Malbec wines are affected by site characteristics. The study

suggested that California and Argentine Malbecs are different compositionally, and that chemotronics could be used to explore new regions.

That research led them to a methodology that allows them to isolate specific factors they wish to study. State-of-the-art equipment allows them to focus on those factors, running their experiments in triplicate. The information gleaned from these experiments is readily adaptable to real winery production.

Since obtaining his degree, Buscema adapted his techniques to look at different sections within Catena Zapata's legendary Adrianna vineyard located at a 5,000-foot elevation. He discovered overlap in most sections of the vineyard, but four plots stood out as unique. They experimented with individual lots from the four designated sections using the same rigorous technique he developed at UC Davis. Over time their research proved that three of the plots consistently produced wines recognizably different from one another. They are now trying to figure out if it is soil type or possibly different microbes in the soil that contribute to these differences. If they unlock and identify the keys to differences in the vineyard, they might be able to replicate those conditions that improve quality and consistency from one vintage to another.

A Day of Research Findings

The day began in the vineyard where Josh Puckett, the head of plant production at Foundation Plant Services, walked participants through the rows planted eight years earlier with the Argentine and French clones. Laura Catena reiterated that her winery is focused on learning how to make wines that compete with the world's best while also spreading the information gleaned in their research to improve

Argentine winemaking as a whole. Puckett explained how the vineyard management team selects clones, plants them, clears them for disease and then offers them to nurseries for distribution to winegrowers. Buscema went over data gleaned from the original experiments while people tasted the differences between the French clones and the Argentine selections. Exhibiting his gentle humor, Buscema said, "You see, these vines bring Argentina with them even though they are in California."

Dealing with the Possibility of Phylloxera

Only 6 percent of Argentina's vineyards are grafted onto resistant rootstock. The rest of the vines are own-rooted, which leaves them susceptible to phylloxera. Phylloxera is present in Argentina, but thus far it has caused very little damage. The Catena Institute of Wine is aware that being lucky is not the same thing as being safe, so they are researching phylloxera and how it might affect the vineyards in Argentina while trying to come up with a program to monitor the pest and develop a strategy to protect the vineyards before there is a major problem.

Another presentation featured Dr. Andy Walker, whose research program focuses on developing new rootstocks resistant to phylloxera, fanleaf and other pests and diseases. He gave an introduction about the pest, its history and how it spreads. He explained that phylloxera feeds on both leaves and roots and is primarily transferred by wind and machinery but can even be brought in on resistant rootstock.

In vineyards comprised of mostly sandy soils and places that use flood irrigation, (which describes a lot of Argentina), phylloxera tends to be less of a problem. Flood irrigation and lighter soils allow for large, spread out root systems; so if phylloxera is present it causes less



damage. Once drip irrigation is introduced (and this is happening more frequently in Argentina), the root systems become more confined, making them more susceptible to the pest. As the root systems deteriorate, they are less able to intake potassium, so lack of potassium in vines can be an early indicator of phylloxera infection.

Dr. Summaria Riaz followed Dr. Walker and spoke about the different types of phylloxera and the work done by Catena Institute researcher Celeste Arancibia. Arancibia has identified specific strains present in Argentina. Currently research is focused on fingerprinting the types of phylloxera present and determining if they are known strains or mutant strains. Changes in viticulture techniques in Argentina

will have a definite impact on the phylloxera threat. The Catena Institute has dedicated itself to developing a strategy for defense that it will share with the entire industry.

Making Argentina's Wine Industry Stronger

In addition to making world-class wines based on knowledge from scientific research, Laura Catena wants to improve and protect the future of Argentina's wine industry. To that end, they have begun studies of less successful varieties, lower altitude vineyards and high-yielding vineyards in the hopes of showing farmers how to improve quality and increase income from their grapes.

The next session included tasting experimental lots from the Catena Institute, working from these types of locations with these varieties. A Criolla from Serrera Vineyard in Tupungato exhibited white pepper, intense dark color and rich mouthfeel in spite of a low 11.5 percent alcohol. Grenache is another variety found in Argentina but little known. The selection from La Antonia Vineyard in Rivadavia had some peach aromatics but remained somewhat dull on the palate with a bitter finish. It was thought that overcropping was the main issue.

A Cabernet Franc from Angelica Sur Vineyard in El Cepillo was served next. It was big, with green tannins that made it astringent, but showed some promise. The biggest surprise was a Bonarda from Patagonia, a typically cool region. Although it came from a three-year-old vineyard, the wine showed delicious black fruit, with depth and a fine tannic backbone. The tasting ended with Malbec Cortado from Angelica Vineyard. This is sweet Malbec developed by Catena Zapata by leaving small clusters of grapes hanging on the vines until they are picked around 30° Brix. The wine was very sweet and lush with a lot of Port character. Buscema said that the Catena Institute of Wine has a goal of advancing their region to the first world of wine. Whatever they find out will be used to help Mendoza become one of the world's top wine regions. "The institute is an attempt to fast-track Mendoza by virtue of first-class wine science."

Current collaborative projects at the Catena Institute of Wine include:

- The quality of Malbec and its relationship to UV-B, low night temperatures, light quality, soil microorganisms and the effects of natural stress hormone ABA and drought
- Melatonin and harvest time
- Identification of phylloxera strains in Argentina

- Compounds from winemaking residues with biological applications
- Rewriting the sustainability code as it applies to Argentina
- Physiochemistry of soils and its impact on wine quality and uniqueness.

Conclusion

A lot of winemaking is based on tradition, myth and observation. Assumptions may or may not be true, but winemakers cling to them nevertheless. Winemakers have very definite opinions about what goes on during a cold soak, the best temperature for fermentation, the contribution of concrete tanks and how we use oxygen in winemaking. In most cases, they are simply opinions. When scientific research is applied to aspects of winemaking, the information is readily adapted into the winemaking community. Until Brad Webb and Louis Martini isolated ways to reproduce malolactic bacteria, it was a hit-or-miss operation in wineries. After scientific research taught us what was going on, isolated the proper bacteria and developed delivery systems, malolactic fermentations became predictable and easy. Today there are several ML products that are efficient, reliable and used throughout the industry.

It is not often that wineries are willing to finance specific scientific research into aspects of winemaking. That Laura Catena and the Catena Institute of Wine have been conducting this exploration of winemaking using scientific methodology is certainly to be commended. That they have decided to share it with their Mendoza competitors and the rest of the wine world makes it a generous gift that will likely influence how wine is made for generations to come. **WBM**