Enology Notes

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***Enology Notes* #152** **January 8, 2010**

To: Grape and Wine Producers

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Subject:

1. France Study Tour
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1. France Study Tour, a Review. The following is a few highlights of the recently-concluded France Study Tour of the wines of Languedoc, the Rhône, Bandol and Cassis I helped lead December 1-9, 2009. For a review of the 2007 visit to the AOCs of Provence, see *Enology Notes* #138.

a. Institut Coopératif du Vin (ICV). We visited the ICV station at Maurin-Montpellier, which conducts research and extension activities for its members. In southern France, 80% of the wine is produced by ICV members. The ICV has 10 Enology Centers and employs 165 people working with 400 cooperatives, with 1000 estate wineries producing about 12 million hL.

This impressive center has departments working in a number of areas including the following :

- Harvest preparation
- Maturity management and evaluation
- Wine production
- Organoleptic training and reviews
- Juice and wine analysis

- Regular technical meetings and bulletins

The Director, a colleague, Daniel Granes, who has done presentations in Virginia, showed us the facilities and hosted an evaluation of several applied research wines. The ICV approach involves practical assistance to its members. As such, Daniel spoke of the integration of the Institute's efforts in the 4 Ps: Packaging, Price, Promotion, and Product in the marketplace.

Several of their very interesting research activities are outline.

Biogenic Amines. In one ongoing study, they are evaluating the impact of un-inoculated and inoculated MLF on biogenic amines. It has been estimated that less than 1% of the wines produced in southern France use cultured MLF organisms. Wines which undergo un-inoculated MLF generally produce much higher levels of biogenic amines.

Found in many fermented foods, including wine, these bacterially-produced pharmacological agents result from the decarboxylation of amino acids. Biogenic amines play a role in allergic reactions, including headaches, even at relatively low levels. Currently, biogenic amine content in wines is not regulated in the United States.

YAN Calculator. The ICV is also working on a YAN calculator. They know the nitrogen requirements for their marketed ICV yeast strains. Their spreadsheet, to be online in early 2010, will allow one to plug in the N value of the juice and easily determine how much N, and in what form, to add, depending upon the strain and juice chemistry (see *Enology Notes* #133, 139, 141, and 143).

We participated in several sensory evaluations at the ICV. One trial involved nutrient management of Merlot, comparing YAN addition sources: organic nitrogen (Fermaid O) vs. mineral N (DAP). The wines differed in both aroma profile and mouthfeel. We discussed their work in the area of yeast nutrition, and the desirability of adding inactivated yeast pre-fermentation. It is believed that such additions help to 'fix' the aromatics (see *Enology Notes* #141 and 151).

Remote Sensing. They are also using remote sensing as a means of categorizing vine vigor and fruit homogeneity. Using the New Hollander HQS harvester (see below), they separated fruit based upon vigor (using Chlorophyll Index, etc.) and produced wines. Previous studies, including those we have conducted in Virginia, suggest that fruit with a high level of asymmetric ripening produces wines with a poor mouthfeel, as a result of the impact of acidic and phenolic elements and lower aromatic potential, while homogeneous blocks produce wines which have a greater mouthfeel integration, body, and fruit-derived aroma potential.

The ICV produces an impressive array of practically-oriented information, much of which is available in English on their website, at www.icv.fr. I strongly urge you to visit their website!

b. SITEVI 2009. We attended SITEVI, the agricultural and enological exposé in Montpellier, consisting of over 800 exhibitors from over 22 countries. I believe this is the largest viticultural and enological equipment salon in the world.

Innovation awards are given each year for new wine industry products that improve efficiency, grape quality, and/or wine quality. This year, twenty-three exhibitors were honored. The following are those I found most interesting.

Force A: Portable device for tracking fruit maturity non-destructively. This tool is an autonomous, compact, light-weight, portable, multiparameter optical sensor. It monitors maturity by determining polyphenols, including anthocyanins and chlorophyll content.

As outlined in *Enology Notes* #150, a continuing concern is the large degree of asynchronous ripening in some vineyards. This system could be used to monitor cluster variation non-destructively. Variation is an inherent part of biological systems and occurs in vineyards among berries, bunches, and vines.

A crop with asynchronous clusters or berries has a mixture of developmental stages, resulting in berries with optimal qualities diluted by berries which may be inferior.

Variability of visually uniform vines (below), expressed as a percentage of the coefficient of variation, was reported by Gray (2006), indicating the inherent nature of vineyard variability. While soluble solids concentrations may be fairly uniform, with a coefficient of variation usually less than ten percent, the variance can be much greater if the fruit is not uniform across the clusters, or if the cluster microenvironment is variable among vines:

- Brix – 4 to 5%
- pH – 3 to 4%
- Titratable acidity – 10 to 12%
- Berry weight – 6 to 20%
- Color – 13 to 18%

Many variables can be measured at the vine level, including soil characteristics, node number, shoot number, cluster number, vine position, etc. The variables that contribute to variation between berries include berry size, berry composition, seed number, seed size, and berry position. New technologies, such as the Force A system, may allow producers to gain an understanding of the degree of vine and cluster variation, and selectively harvest, when desired.

New Holland Agriculture: Austomotewur HQS. HQS is a harvester that can automatically sort grapes into the trailer, either to the right or left, based on maturity or other harvest quality parameters. At the ICV, we participated in a sensory evaluation of wines made using this system.

We now know that something as simple as canopy side can make a large difference with regard to fruit composition and wine quality. Therefore, the ability to separate fruit in a rapid mechanical system represents an advancement.

As reported in *Enology Notes* #147, the effect of canopy side on grape and wine volatiles of Cabernet franc was evaluated using two electronic nose systems (conducting polymer-based and surface acoustic wave-based), during two growing seasons by Yamuna Devarajan, an MS student in the Enology-Grape Chemistry Group at Virginia Tech.

Fruit from north/south- and east/west-facing vine rows was evaluated by both electronic nose systems and compared with physico-chemistry indices: berry weight, Brix, TA, pH, color, total glycosides, and phenolic-free glycosides.

Statistical analyses generally indicated grape physico-chemistry indices were not able to differentiate between canopy sides (east vs. west, or north vs. south). However, both of the electronic nose systems provided 100% discrimination of canopy sides for grapes, and for wines produced from those grapes.

In an earlier study, we evaluated the influence of grapevine canopy side on anthocyanins (see *Enology Notes* #65). Anthocyanins are present in the fruit and subsequent wine as either monomers (unbound), small polymeric phenols (SPP, bound with other phenols up to 5 sub-units) or larger polymeric phenols (LPP, bound to more than 5 sub-units).

The degree of polymerization influences astringency, spectral color, and color stability of red wines. In one study, we evaluated the impact of canopy side on Cabernet Sauvignon pigments. With north/south-running rows, fruit from the east side of the canopy contained 290 µg SPPs/berry, while fruit from the west side (at the same degrees Brix) contained 220 µg/berry.

This same fruit had a higher concentration of LPPs on the east side (135 µg/berry) vs. the west side (115 µg/berry).

Total (spectral) color was 13.9% higher in fruit from the east vs. west side. Total tannins showed the opposite trend: a higher concentration in west- vs. east-side fruit. Some of these tannins are quercetin-type glycosides which are, in part, responsible for dry, dusty tannins in wines.

The side of the grapevine canopy can have a dramatic influence on fruit chemistry and resulting wine chemistry and quality. Thus, a harvester system that can separate fruit based on maturity level represents a significant advancement.

Bucher Valsin: Dynamic trough press. This system controls and monitors press pressure by evaluation of changes in cake pressure. Such evaluation is thought to possibly allow for a more gentle and controlled press cycle. This may aid in the control of the non-soluble solids and phenols. See *Enology Notes* #151 for a discussion of white wine mouthfeel.

Cenofrance: Yeast protein extract for fining. This yeast extract product has been developed to provide a non-allergenic fining alternative. It is being marketed as a replacement for other protein fining agents, such as egg albumin, gelatin, and isinglass.

Kitozyme: Polysaccharide for the treatment of must and wine. This polysaccharide product is to be used for must and wine settling. It is designed as an alternative to protein-based fining agents.

Both of these addition products are the result of the EC requirement for label declaration when dairy-based fining agents are used in wine production. Such regulations have been imposed as a result of concerns regarding allergenic reactions to animal proteins.

Nomacorc SA: Luminescence-based trace analyzer for bottled wines. This system has the ability to measure headspace and dissolved oxygen in bottled wines non-destructively and non-invasively by using luminescence.

As outlined in *Enology Notes* #97, as wines age in the bottle, the oxidation-reduction potential decreases until it reaches a minimum value, which is dependent on the wine and how well it is sealed, among other things. The nature and intensity of bottle bouquet is, in part, dependent on the redox potential.

Variations in closures and/or closure performance can impact the redox potential and the sensory characteristics of a wine. This can be either good or bad in the case of sulfur-like off odor compounds (see *Enology Notes* #133, 134, 139, and 148).

Desirable reactions taking place in a bottle require little or no oxygen.

The question of how much oxygen is needed for proper aging goes to the core of the original debate regarding screwcap closures.

Thus, oxygen ingress post-bottling is usually very limited, or near zero. The exceptions include synthetic closures. Initially, oxygen transfer with synthetics was thought to be a large problem. It may be. Certainly, being able to measure oxygen in the bottle will allow producers a greater understanding of the impact of specific closure type on wines and wine styles.

An important consideration is how much oxygen is desirable in the wine at the time of bottling. This is different for different wines, and may also be very dependent on the closure selected.

We know that we impart some oxygen in the wine at the time of bottling. How much is desirable, and how much is excessive? More than 1.0 mg/L oxygen at bottling is not desirable for any wine. Lower concentrations are best for aromatic whites. For example, in a study on Rieslings, aromatic freshness was best with no more than 0.2 mg/L; 0.5 mg/L produced citrus to lime notes as dominant characters and, at 1.0 mg/L, the wine was dominated by aged, toast-like tones.

Red wines, due to their higher buffering capacity, can withstand higher oxygen concentrations at bottling, up to about 0.7 mg/L. Naturally, the oxygen concentration at bottling has an influence on the redox potential: the more the oxygen, the higher the potential.

Factors influencing oxygen levels at bottling include wine temperature, bottling equipment, and closure type.

Oxygen in the bottle as a result of cork closure can be highly variable. When the cork is compressed in the neck of the bottle, gas pressure in the cork cells can double, thus releasing oxygen trapped in the lenticels. In a 750-mL bottle, several tenths of a cubic centimeter of oxygen can be released during the first weeks of bottle aging. How much oxygen is released depends on several factors, including the relative moisture content of the cork. The higher the cork moisture, the less oxygen is released.

Variations in oxygen content of the empty glass, vacuum pressure effects of the corker, and slight variations in filler spouts can result in significant bottle variations with regard to dissolved oxygen in the wine.

30 mm of headspace is the international standard for fill height. This gives about 9 mL volume. If this volume is occupied by air, it adds about 2 mg oxygen/L. As such, many choose to reduce this volume, or have this space occupied by inert gas, such as nitrogen or carbon dioxide. In some bottling systems, the variation in oxygen remaining in the bottle after gas purge is significant.

A system which allows for the measurement of both dissolved oxygen and headspace oxygen non-destructively will aid in our understanding of the impact of processing and closure type on wine quality and longevity.

c. The Institute Rhodanein Centre du Rosé. We also visited the Centre du Rosé, which conducts impressive research on a variety of subjects of interest to rosé producers, including color standards and methods to attain those standards, effects of maturity on rosé color and aromatic quality, defining differences between production by pressurage vs. saignée (bleeding), defining optimum conditions for maceration, élevage, sur lie, etc.

The Centre du Rosé has developed color standards used to help define the relationships between cultivar, growing conditions, processing, and longevity, on color. It was interesting to note that their preferred recommended rosé color was essentially salmon color, which possesses much less red vibrancy than many US producers would consider desirable. They believe this color helps to provide regional distinction and is consistent with their overall goal of optimizing the aromatic profile.

Much of the applied research conducted at Centre du Rosé is in the following areas:

- Evaluating enzyme formulations for targeted extraction of grape components
- Evaluating cultivar differences that impact extraction
- Evaluating the relationships between yeast strains and enzyme additions to maximize color stability
- Evaluating yeast strains that selectively adsorb phenolic compounds to impact rosé wine mouthfeel

A review of the current research activities of the Centre du Rosé is available at www.Centredurose.fr.

2. Monitoring Sustainability. As discussed in *Enology Notes* #148, winery ecological and environmental sustainability usually includes some of the following practices:

- LEED certification
- Use of eco-friendly building materials
- Earth-sheltered buildings
- Green roofs
- Building orientation/insulation
- Brise soleil (a sun baffle of louvers outside the windows or extending over the entire surface of a building) or solar blocks
- Alternative energy, including geothermal, solar and wind
- Energy/heat capture and recovery
- CO_2 capture
- Natural lighting and venting
- Rainwater collection
- Water recycling
- Materials recycling

As an industry, we need to quantify our ecological and environmental sustainability activities; otherwise, we may be guilty of contributing to the cascade of "green-washing" evident in our society. The advantages of quantification and benchmarking lie in our ability to measure, contrast and chart our true progress. A number of matrices should be reviewed, including those suggested by P. Michael et al., in the article "Benchmarking Winery Production: Developing Benchmarks," published in *Australian and New Zealand Grape Grower and Winemaker* (2009).

- Wine volume per ton of grapes
- Total energy consumed per ton produced
- Water consumed per volume of wine produced
- Personnel hours per ton
- Wastewater COD (chemical oxygen demand) and BOD (biological oxygen demand) per ton

Wineries need to properly compare and contrast their facilities and performance against others in order to create a benchmark. They must understand the importance of scaling. For example, energy and water use should be evaluated within a relative production volume or scale, if we are going to compare different-sized wineries. According to Roger Boulton of UC Davis, who gave a presentation on green production practices at the 2009 Unified Symposium conference, large wineries generally have a smaller surface area per wine volume produced than small wineries. This is highly relevant in benchmarking and comparing the energy and water use within our industry.

Carbon dioxide emissions, on the other hand, can be compared directly, based on tons crushed or fermentation volume. In the absence of energy and water scaling, our industry will not be able to accurately establish benchmarks or evaluate progress in environmental and ecological sustainability.

3. Economic Sustainability. Economic sustainability has several aspects, including sound decision-making, technology and education, and a realistic understanding of product value.

What is technology and education doing for the industry? The following is but a partial list of activities being conducted world-wide to the benefit of all.

- Investigate societal attitudes towards the consumption of wine and determine potential effects on patterns of consumption.
- Develop and demonstrate links between consumers' sensory preferences and measurable wine attributes related to important wine styles, using consumers' language.
- Determine whether and how price points and sales are related to sensory attributes.
- Enhance the preparation and updating of analyses of regulatory and other market access barriers in key markets for the wine industry.
- Develop tools which measure wine attributes of relevance for consumer preferences. Adapt winemaking processes to achieve these attributes.
- Create and adopt new technologies – including those from other industries – that will continuously improve the productivity of the winemaking process and the quality of wine.
- Explore new ways of using yeasts, bacteria and enzymes to better transform valuable grape precursors into the sensory wine attributes of high consumer preference.
- Develop tools which measure grape attributes of relevance for consumer wine preferences. Improve grape harvesting and delivery processes to preserve these attributes.
- Determine opportunities to measure the industry's environmental footprint, and identify opportunities to improve environmental management, for example with respect to biodiversity, water use efficiency, and waste management.
- The link between economic sustainability and environmental sustainability will strengthen only through technology, and the implementation of technology through education.

The forces that motivated the wine industry to be concerned about traditional sustainability (image, popular trepidation about global climate changes and the general need for optimum energy, water, chemical and packaging resource management) have not, and will not, disappear. New technologies may aid in our attempts to become more environmentally efficient. We must acknowledge that it is what we learn, after we know it all, that really counts.

4. *Winery Planning and Design*, Edition 16, Available. This publication, in CD format, is the result of a number of short courses and seminars covering various aspects of winery planning in several wine regions around the country. While not regionally specific, the information provided is from a number of authoritative sources covering such diverse topics as sustainable design, winery equipment, and winery economics. *Winery Planning and Design*, Edition 16, is available through the industry trade journal *Practical Winery and Vineyard* (phone 415-479 5819), email: donpwv@aol.com or tlv100@sonic.net. Additional information is available at www.vtwines.info.

All past *Enology Notes* technical review are posted on the Wine/Enology – Grape Chemistry Group's website at: http://www.vtwines.info.

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