Wine Grape

Wednesday afternoon 2:00 pm

Where: Grand Gallery (lower level) Room D
Recertification credits: 1 (1C, PRIV CORE)
CCA Credits: CM(2.0)
Moderator: Mark Longstroth, SW Michigan District Fruit Educator, MSU Extension

2:00 p.m. Wine Grape Cultivars of Interest

- Paolo Sabbatini, Horticulture Dept., MSU
- Tom Zabadal, SWMREC, MSU Extension

2:20 p.m. Precision Viticulture; The Role of Remote Sensing and Mechanization

- Russell Smithyman, Ste. Michelle Wine Estates, Woodinville, WA

3:00 p.m. Managing Grapes to Reduce Losses to Winter Injury

- Tom Zabadal, SWMREC, MSU Extension
A wine grape grower’s selection of a cultivar (variety) to plant is an all-important decision, which may be so critical as to determine the outright survival of vines at the specific vineyard site. More often, however, the importance of one’s choice of a wine grape cultivar is more complicated, because it interacts with several factors. In fact, it becomes expressed in terms of 1) the extent of winter injury experienced by vines, 2) the productivity of mature vines, 3) the quality of grapes and wines and 4) the market demand and pricing for the grapes and wine.

Growers often choose cultivars based on industry trends, conversations and literature. Unfortunately, the choice of a cultivar is often speculative and the existence of cultivar trials with either public or private results can increase the chances of picking a “winner”. Certainly cultivar trials can not provide comprehensive information for a specific grower’s situation. Nevertheless, they can give a good indication of whether or not most of the vines of a cultivar will be damaged or survive in a particular viticultural region, whether those vines will be productive and if the fundamentals of fruit quality can be achieved. The impact of variations in both vine management and vinification of a cultivar will be only partially answered by cultivar trials, and so the full potential of a cultivar in a particular viticultural region will be realized only after there has been commercial experience with it. Nevertheless, cultivar trials can reduce the instances of poor or even disastrous choices of cultivars.

A new initiative in wine grape cultivar evaluation will begin in Michigan in 2008 as a part of a broad regional program in 17 states. Vines of 26 and 20 cultivars will be planted at the MSU Southwest Michigan Research and Extension Center and the Northwest Research Station, respectively. These cultivars are often commercially important in cool climate viticultural regions, similar to Michigan, in several countries including France, Germany, Switzerland, Italy and Spain. Information to be recorded for these cultivars include vine survival, phenological development (time of bud break, flowering, fruit maturity), vine size, vine productivity, basic fruit and wine quality will also be evaluated.

Because there are no results to share on this project before it has begun, we present here the characteristics of a few of the cultivars that are not currently part of the Michigan wine industry but will be part of this new cultivar trial.
**Gruner Veltliner**

Gruner Veltliner, which is also occasionally called Green Veltliner, has been cultivated for centuries. It is predominantly associated with Austria but it is also grown in several other Eastern European countries. It has been grown mostly as a bulk producer. However, in recent times has been grown at lower yields with encouraging results in terms of grape and wine quality. The wine has been described with adjectives of spicy, citrus and grapefruit. It is a crisp, dry, white wine that is said to complement food very well. It is not widely grown in the United States but there are some plantings in California, Oregon and Virginia.

**Zweigelt**

Zweigelt is a cross between Lemberger and another obscure cultivar. Zweigelt was created in 1922 in Austria by Dr. Fritz Zweigelt, hence the name. It is a very hardy vinifera. It is the principal red wine grape in Austria. Zweigelt has a late bud break and is early ripening, so it may be a good fit in many cool climate viticultural regions. It is grown in Ontario, Canada; British Columbia, Canada, Hungary, Belgium, Novia Scotia and Vermont. Zweigelt produces excellent, full bodied red wines.

**Marsanne**

Marsanne is an old cultivar from the Rhone Valley of France. It is a cultivar that is highly productive, produces fruit that tends to produce high alcohol levels and low acids. It has classically been blended with another Rhone Valley cultivar, Roussanne, as that cultivar has higher levels of acid. Today it is grown in areas outside of France including Australia and California. There is one known planting of this in Michigan near Baroda at Domaine Berrien, where it has been growing for several years. It seems reasonably hardy and productive there and it is blended with Roussanne there to make a very pleasant varietal wine. It is reported to be sensitive to powdery mildew.

**Roussane**

Roussane originated in the Rhone Valley of France and it is still the predominant place where it is grown. It is also grown to some extent in Northern Italy. There are currently about 200 acres in California and some production in Washington. There is a small planting near Baroda, Michigan. Roussane has many negative aspects. It tends to be very irregular in its yields, it ripens late and it is highly susceptible to powdery mildew. These negative characteristics are counter balanced by two redeeming features. It has a very unique aroma and a very pronounced acidity. For those reasons it is often used in blending. In the Rhone Valley it is blended with the other late grape grown there, Marsanne. It is used elsewhere in blending because of the unique aroma and acidity characteristics. There are occasional varietal wines made from Roussane. Some varietals from the state of Washington tend to be very crisp and floral, as opposed to fruity. It is a grape that is currently enjoying a renewed interest, presumably because of some improved clones of this cultivar.

**Valvin Muscat**

Valvin Muscat is a new cultivar that was introduced by Cornell University in 2006 (Reisch et al., 2006a). It is a cross between two former Muscat cultivars including Muscat Ottonel and Muscat du Moulin. It has moderate vigor on its own roots. Vines have been long-lived on phylloxera-infested soils but it may develop a small vine size. Grafting to rootstocks 5C or Couderec 3309 have improved the vine size and productivity of this cultivar. It is considered moderately hardy and a mid-to-late season ripening cultivar. The fruit is considered to be very spicy. Valvin Muscat produces relatively small clusters, averaging 0.15 to 0.2 of a pound. Yields of 4 to 6 tons per acre are the result of numerous clusters per vine. The wines from Valvin Muscat are spicy, floral in aroma with no objectionable bitterness. The wines are used either
as a varietal or in blends to enhance the fruitiness of blended white wines. The leaf area of Valvin Muscat exhibits a necrotic spotting called rupestris speckle or Muscat spot. This is not deleterious to the performance of the cultivar. Valvin Muscat is relatively disease resistant but is susceptible to both downy and powdery mildew. It is resistant to Botrytis bunch rot. It is harvested between late-September and mid-October in the Finger Lakes region of New York.

**Corot noir**

Corot noir is a new cultivar that was released in 2006 by Cornell University (Reisch et al., 2006b). The cross that produced Corot noir was made in 1970 between the cultivars Seyve Villard 18-307 and Steuben, a native cultivar. It is very vigorous with a root system that is highly resistant to phylloxeration. It is a mid-to-late ripening cultivar and highly productive. The wines from Corot noir are said to have a broad range of tannin structure and deep color that make them comparable to many vinifera red cultivars. Bud break takes place later than many cultivars. Corot noir is moderately winter hardy and relatively resistant to diseases with the exception of downy mildew to which it is moderately susceptible. One aspect of this cultivar is its propensity to produce clusters on secondary and tertiary shoots so that this can complicate the crop level on vines and results in uneven ripening of clusters produced on primary, secondary and tertiary shoots.

A new database of wine grape cultivars is in preparation. It will be available in the spring of 2008. This publication discusses the factors to be considered when selecting a wine grape cultivar for planting. More than 100 wine grape cultivars are described with regard to their origin and viticultural characteristics. For relatively minor cultivars, their experience in Michigan is also mentioned. Lastly, this publication contains a current listing of grapevine nurseries from which grapevines may be obtained.

**References:**


Precision Viticulture:
The Role of Remote Sensing and Mechanization

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Ste. Michelle Wine Estates is dedicated to producing premium wines while utilizing the most sustainable practices available. Many precision viticulture practices are now implemented to improve management decisions, increase efficiency, and enhance wine quality. The use of multi-spectral imagery to identify vegetative variability within vineyard blocks has become an important tool for precise application of practices to improve vineyard uniformity. However, fruit can also be differentially harvested based upon the multi-spectral imagery to create additional blending options for wine production. The ability to differentially harvest not only improves fruit uniformity of individual lots, but also enables the selection of premium fruit for production of higher tier wines.

Ste. Michelle Wine Estates began investigating multi-spectral imagery in 2003 using a digital multi-spectral camera with a small chassis PC and 15” LCD monitor provided by Washington State University to produce an airborne image capture system. Imagery was collected twice during the growing season and corrected for variability in light conditions, surface slope, aspect, and soil reflectance. The red and near infrared bands were used to determine the Normalized Difference Vegetative Index (NDVI). NDVI provided an estimation of the amount of vegetation anywhere in the vineyard and the means to monitor changes in vegetation over time. Reference vines were established in several vineyard blocks to collect information throughout the growing season to compare with the imagery. Combining the imagery with vineyard sampling, separate areas (vigor zones) within blocks were identified by differences in vegetative and fruiting characteristics. Vigor zones were then harvested separately by hand for wine production. Sensory analysis confirmed wines produced from these distinct areas were different, thereby providing additional blending possibilities for wine production. Although differentially harvesting fruit by hand was time consuming and expensive, it was economical in production of higher tier wines. However a means for differentially harvesting larger vineyard areas using a mechanical harvester was desired.

Several harvesting methods to separate fruit based on NDVI mapping were evaluated prior to 2006. Because hand harvesting large vigor zones was too expensive, attempts to mechanically harvest zones began in 2004. Borders of zones were flagged and maps were distributed to machine harvesting crews. This was also inefficient, since harvesting was often done at night and required the harvest personnel to locate flagged zone changes from atop the harvester. iPAQ’s with GPS units were then installed in the cabs of tractors to indicate the different vigor zones. The crew used the screen to determine which zone they were located in. Although this worked, the screens on the iPAQ’s were small and multiple interpretations of exactly when zones were changing created some confusion and frustration. In addition, it often required an additional person available onsite during the harvest to troubleshoot any problems. Another method attempted to move the divisions between the vigor zones in order to harvest full rows. However this diluted the differences between the zones and reduced the accuracy of the zonal harvest. Nevertheless, 4 out of 5 sensory panelists were able to distinguish wines produced from zones differentially harvested in 2005.
A system to more efficiently harvest large vigor zones was developed in 2006. 3,500 acres were imaged and processed using NDVI during the growing season and twenty blocks (400 ac total) with significant variability were divided into vigor zones based on the imagery and field observations. The SMWE harvester signal was developed when nothing appeared commercially available, and consisted of a series of three lights (red, amber, and white) that were controlled by an iPAQ with a GPS card. The NDVI vigor zones were loaded onto an iPAQ running ArcPad and a custom application. The iPAQ, GPS and signal were easily mounted on any harvester and, based on the location of the harvester, would signal the zone that was being picked. The red light signaled a heavy canopy zone, the amber light alerted the crew that a change in zones was approaching, and the white light signaled a light canopy zone. Drivers collecting the fruit from the harvester were assigned a specific light color to follow and thereafter the fruit was kept separately through fermentation and evaluation. The SMWE harvester signal was redesigned for the 2007 season to be more durable and easier to use.

The use of remote sensing to identify vegetative variability and ultimately potential wine variability within vineyard blocks has become an important tool for enhancing wine quality. Differentially harvesting large vineyards creates additional wine blending options produced from more uniform fruit and allows for the selection of premium fruit for the production of higher tier wines. Remote sensing also has the ability to facilitate more sustainable practices by efficient application of product, practices, and labor in the vineyard to improve uniformity. Ste. Michelle Wine Estates continues to develop and utilize precision viticulture practices in order to produce premium wine while implementing the most sustainable methods possible.
Global warming is a reality. Most of us now believe that. Having been born and raised in Buffalo, New York, my personal testimony is that the winters just are not as harsh as they were more than a half-century ago. Therefore, one might wonder if winter injury to grapevines is a topic of any importance anymore. It is true that many cold climate viticultural regions escape severe vine injury problems in the majority of winters. Nevertheless, it is the episodal occurrences of vine winter injury that are very devastating. For example, as recently as January of 2004, winter injury to vines in the Finger Lakes Region of New York caused an estimated loss of $5.7 million in crop and a loss of value-added wine exceeding $41 million (Martinson and White, 2004). It was after that episode that also affected Ontario, Pennsylvania, Virginia and Ohio that it was decided it was time to review and explain the current understanding of winter injury to grapevines. How does it occur and what can be done about it? Therefore, a concentrated two-and-a-half-year effort culminated in the publication of a new Michigan State University Extension bulletin on this topic (Zabadal et al., 2007). The breadth of subject matter covered in this 106-page publication cannot be covered in this presentation. Copies of this publication can be obtained at the following website: http://web2.msue.msu.edu/bulletins/ or by calling the MSU Media Distribution Center at 517-353-6740. The following is a presentation of highlights from this publication.

It seems to be a cruel reality indeed that there is a very high inverse correlation between the cold hardiness of wine grape cultivars and their ability to produce quality wine, i.e. the less cold hardy a cultivar, the greater the wine quality. There are many exceptions to that correlation, but in general, those of us in cold climate viticulture often find ourselves compelled to grow the most cold tender cultivars that are capable of being sustained at a particular vineyard site. Because we often ride the viticultural edge of grapevine cold hardiness, it is common in many vineyards to have some loss of vines and productivity from winter injury in many years. At first glance those losses might seem modest. It is fairly common to replant 2 - 3% of vines every year to keep missing vine spaces filled and productive. It is indeed important to fill blank vine spaces. It has been estimated that the loss of just one grafted Vitis vinifera vine can over the 4-year period of reestablishment result in a cost and lost income of $155 per vine (White, 2005). So the first activity to combat winter injury in a cold climate vineyard is to take a count of missing vines and place an order for replacement vines.

There are two basic strategies for minimizing the impact of winter injury on a vineyard. The first is to undertake all things that will allow the vineyard to tolerate the cold weather. The easiest approach is to choose a very cold hardy cultivar to grow. We now have superhardy cultivars that are capable of tolerating very low temperatures without significant winter injury. However, growers often don’t choose this strategy because these very cold hardy cultivars either produce wine quality that is deemed inferior to more cold tender cultivars or because the wine from such cultivars does not have a developed market.
identity. So the majority of growers opt to gamble on the more cold tender cultivars in a cold climate viticultural region. The issue then becomes how can these vines managed to maximize their tolerance to low winter temperatures? Numerous vine management cultural practices are reviewed in our new publication to address that question. There were some surprises in that review. For example, it is a common belief that nitrogen fertilization will decrease grapevine cold hardiness. There are two aspects to look at regarding nitrogen fertilization. It has indeed been repeatedly demonstrated that individual shoot vigor has a profound effect on the cold hardiness of tissues. The more rapidly a shoot grows the larger it becomes both in diameter and in length and this results in reduced cold hardiness. Therefore, to the extent that nitrogen fertilization contributes to high shoot vigor, it will promote reduced vine cold hardiness. However, under conditions of moderate shoot vigor, there is as much evidence to suggest increased nitrogen concentration in vines will increase vine cold hardiness as there is evidence for the reverse relationship (Wample et al., 1991).

A second major strategy for dealing with winter injury to grapevines is avoidance. That is, to undertake cultural practices that insulate vine tissues so they avoid experiencing the very low winter temperatures. A common example of such a strategy is the hilling of soil around the base of grafted grapevine so that the graft union and scion tissues immediately above the graft union avoid experiencing low ambient air temperatures. Other, more intensive temperature avoidance strategies include burying more parts of the vine than just the graft union with soil or mulch to keep vine tissue temperatures higher than ambient air temperatures.

Our new publication also discusses the evaluation of winter injury to grapevines after it has occurred and strategies for revitalizing a winter-injured vineyard. Methods for evaluating bud mortality are explained in detail. Injury to tissues below the bark of canes, arms and trunks is an interesting story. After a vine experiences low winter temperatures, tissues just below the bark, which in a healthy condition are bright green or cream colored, will appear brown to almost black. I have observed over many years, that these darkened tissues below the bark can miraculously regenerate and become healthy again. Dr. Martin Goffinet explains in our new publication that the tissues below the bark of a grapevine that are most cold tender are those in the phloem. They may appear darkened while the tissues of the cambium, which are responsible for regeneration of new growth, can survive and regenerate new tissues. The practical importance of this for the grape grower is that he should not give up on a trunk or arm of a vine and prune it out if it is needed to keep balance in the vine. A grower should not hastily remove parts of the vine after severe winter injury because that may serve only to further imbalance the vine and its growth. Such an imbalance promotes the recurrence of winter injury.

Lastly, there is hope for technology of the future. We are currently finding ways to eliminate the dreaded crown gall disease from grapevine tissues. This may reduce the impact of winter injury on the recovery of grapevines. High tech heating devices or insulation schemes may allow us to carry grapevine tissues through the winter more successfully than in the past. Genetically-modified vines have already been produced that will combine high fruit quality and high cold hardiness.
References:

