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OKLAHOMA & ARKANSAS HORTICULTURE INDUSTRIES SHOW

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Growing and Vinting Cynthiana/Norton Grapes

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Cynthiana, also called Norton, grapes Vitis aestivalis have unusual features that make it difficult to grow and turn into premium wine. Growing and making wine from this grape in the same manner as V. vinifera grapes will seldom result in a premium wine (Main and Morris 2002). In this presentation, the focus will be on the differences between Cynthiana and other (V. vinifera and interspecific hybrid) grapes.

At first glance, Cynthiana would not seem a likely candidate for wine production. It is high in titratable acidity (up to 15 g/L), malate (up to 6 g/L), and potassium (up to 6 g/L) and has a high pH (> 3.5). It has poor color in warm years, aggressive seed tannin, small clusters, small berry size, and low juice yield. Despite these features, and with proper management, an excellent wine can be made from Cynthiana grapes.

Key differences between Cynthiana and other wine grapes. Cynthiana grapes have three-times as much malic acid and two-times as much potassium as most other wine grapes. Cynthiana grapes can have up to 20% non sugar solids as compared to 5% in other grapes (Table 1). Note that the soluble solid readings are on hot-pressed juice. It is imperative that a Cynthiana must sample be heated before analysis. An increase in titratable acidity of up to 40% is seen with heating. Heating to extract skin components for testing is not necessary with other grapes but is necessary to get a true picture of Cynthiana juice parameters. Heat the must sample to 165°F, press through cheesecloth, and allow to cool to 70°F before analysis.

Table 1. Composition of soluble solids in hot-pressed Cynthiana juice at different sampling times.

Refractometer soluble solids (%)		Fermentable sugars (%)		Non sugar soluble solids (%)		Expected alcohol (% v/v)
18.8	=	80	+	20	produces	8.3
22.6	=	85	+	15	produces	10.6
24.3	=	90	+	10	produces	12.0

Viticulture. The primary focus of Cynthiana viticulture is to pick the fruit at 24% soluble solids, maintain a green canopy, and do everything possible to reduce malate and potassium in the fruit. Cynthiana grapes grown on a drip-irrigated, high wire, bilateral curtain at 6 x 9 spacing should produce the following results: 23 to 25 % soluble solids, pH 3.4 to 3.7, titratable acidity 12 g/L, 120 to 140 clusters per vine, 50 to 60 g clusters, berries weighing about 1 g, 4.5 to 5.5 tons/acre, and dormant prunings of 2.2 lbs/vine. Only factors that limit the success of growing this grape are being pointed out due to time constraints.

It is helpful to establish a HACCP-like, viticultural and enological plan for Cynthiana (Zoecklein 2004). The differences in this grape are significant both viticulturally and enologically. It is easy to make mistakes that are detrimental to the finished wine. Components of a HACCP-like plan are available on the internet (Zoecklein and Wolf 2004).

Site selection is critical, because you need well-drained soils. Cynthiana does not tolerate wet soils. A week of soggy soil will turn the leaves yellow and stunt growth. When establishing a vineyard, do not let water stand around the roots or trunks. Use growth tubes only if you have sandy soils as they can retard growth in a wet year.

The vines do not grow well on a VSP training system, as the spurs do not produce abundant fruit when oriented upward. The recommended training system is a bilateral cordon (BC) or Geneva Double Curtain (GDC). Row spacing on BC should be 6 to 8 ft. x 9 to 10 ft. and on GDC, 6 to 8 ft. x 12 ft. Vines should have two trunks on a GDC system when in-row spacing is greater than 7 feet.

Vine nutrition is not well understood for Cynthiana. The roots are very efficient in removing potassium from the soil, and therefore, potassium fertilizer should not be used unless potassium deficiency is seen in the vine. The addition of potassium fertilizer increases juice pH and potassium in Cynthiana (Morris et al. 1987). Severe magnesium deficiency is often seen in Cynthiana. It is advisable to apply a pre-bloom magnesium foliar spray (6 to 8 lbs magnesium sulfate/100 gallons water) plus two or more additional sprays during the season. It is extremely important to maintain a green canopy throughout the season. Fertigation is an excellent way to apply nitrogen and micronutrients.

Balance pruning is difficult in Cynthiana. Unripened periderm results in low dormant pruning weights. In general, recommended pruning is to 2 to 5 bud-canes with one-bud renewal spurs and 80 to 100 buds retained. The vines can be mechanically pruned with hand follow-up. Shoots should be positioned in a downward orientation two times per year after shoot entanglement to facilitate pruning and harvest. Shoot positioning will also help reduce fruit pH. Allow shoots at the top of the cordon pointing directly up to remain in that orientation. These shoots break easily, have few clusters, and protect against sunscald.

Cynthiana is very disease tolerant, but it can be affected by powdery mildew, downy mildew, phomopsis, anthracnose, zonate leaf spot, fruit rots, crown gall, Eutypa, Pierce’s disease, berry moth, leafhopper nymphs, stink bugs, Japanese beetles, grape root borer and birds. The underlined diseases and pests tend to be the most problematic. It is essential to control berry moth because this will lead to fruit rots and prevent hanging the fruit for the 50 days from first color until harvest. Leafhopper nymphs strike the University of Arkansas AAREC vineyards at mid-veraison and can turn a vine canopy yellow in a few days. The vines do not recover from this, and it becomes almost impossible to get the fruit to 24% soluble solids.

Cynthiana is extremely sensitive to 2,4-D. It is sulfur sensitive and may be sensitive to other commonly used fungicides. Use extreme caution when spraying, and apply as few sprays as possible.

Leaf removal is recommended 20-30 days after berry set. This helps reduce fruit potassium and malic acid in addition to reducing disease pressure (Main and Morris 2004). Remove leaves in an 8 to 12 inch zone below the cordon on either side of a canopy with north south orientation. Remove 40 to 60% of the leaves in this zone.

Making Wine. The primary focus of Cynthiana wine production is to keep pH below 3.6 and improve wine structure. Cynthiana wine can be made in every style. It is best suited to a Burgundian style – light, fresh, fruity. Many factors affect wine style, but Cynthiana has three major production challenges. These are high pH, inadequate structural/textural balance, and extremely high malic acid content. Structural balance may be viewed as:

Perceived Sweetness ↔ acidity + bitterness and astringency (tannin)

Sweetness is comprised of alcohol, glycerol, polysaccharides, and sugar. The high malic acid content of Cynthiana is fixed, so to become structurally balanced, it is necessary to increase the sweetness factor or reduce and/or soften the tannin component. It is not desirable to add sugar to a wine because of the possibility of fermentation in the bottle. The polysaccharide component of sweetness can be increased with selected yeast and malolactic bacteria and through a sur lie process. The tannin component can be reduced by a variety of cap management techniques.

Malic acid levels are up to three times higher in Cynthiana than in other grapes, this poses a problem for winemaking. Malic acid is best reduced by vineyard practices as elaborated earlier. Malic acid is converted to lactic acid by malolactic bacteria, and pH can increase 0.5 pH units. This pH increase is up to three times higher than in other wines, and the malolactic bacteria are almost impossible to stop in Cynthiana. It is extremely important to monitor pH during fermentation and to keep the pH below 3.6 during both the alcoholic and malolactic fermentation. A commercial malolactic strain that produces polysaccharides and low volatile acidity is recommended for Cynthiana. Native malolactic bacteria can produce acetic acid from the 1 g/L citric acid found in Cynthiana. Yeast strains that consume malic acid such as Lalvin 71B have not found favor due to flavors produced. Yeast strains that produce polysaccharides and improve structure should be used with Cynthiana. The Lalvin yeast strains ICV-D254, BM45, and BRL97 all work well for Cynthiana wines by contributing to mouthfeel and flavor.

Macerating enzymes are advertised to improve color, body, and structure. In a maceration enzyme study at our facility, five different macerating enzymes were tested on Cynthiana (Main and Morris 2003). There was no increase in color or color stability. Maximum color extraction occurred on day three of fermentation and thereafter color was lost. In another experiment, tannin addition helped to stabilize color. It is important to add copigmentation cofactors such as grape skin tannin or oak powder at crush to encourage early pigment polymerization. Cynthiana has many diglucoside pigments, and color stability can become a problem. In the warm climate of Arkansas and Oklahoma where color can be lacking, it is important to retain as much color as possible. Short skin contact time will not only help retain color in Cynthiana it will also promote softer tannins and contribute to structural balance.

Structural balance can be obtained by several procedures that modify tannin extraction. Cold soak is a procedure where the fruit is held at 35 to 55°F for 3 to 10 days to extract phenolic compounds in the absence of ethanol. It promotes fruit character, soft tannins, color stability, mouthfeel, and polymerization of phenolic compounds. Délestage is a process that removes seeds and aerates the wine. It has found favor in Cynthiana wine made in Virginia. A detailed description of the process can be found at http:www.icv.fr/kiosqueuk/Procedur/delestage.htm. The procedure is done in lieu of pumping over and reduces seeds by up to 40% thus reducing astringent and bitter seed tannin.

Another procedure that promotes structural balance is light lees return. Light lees are white wine precipitates that form post fermentation. When added to the wine during malolactic fermentation the yeast cells break down releasing polysaccharides and mannoproteins that add to complexity and mouthfeel through a sur lie effect. Stirring of the lees is important in 1000 gallon and larger tanks to prevent release of sulfur compounds. Frequency of stirring affects the sensory balance, and tasting should be done frequently.

Tartaric acid is used to keep the pH below 3.6. The lower the pH of the grapes on entering the winery, the less tartaric acid required. This is an expensive treatment and may cost up to $0.60/gallon. However, it is a necessary procedure as off flavors can form, and color will be lost if the wine is fermented at high pH. Even though you may add up to 2% tartaric acid, it will all fall out of solution as potassium bitartrate upon cold stabilization. This can be seen in the wine shown in Table 2 where the initial juice had 11.8 g/L + 19 g/L added = 30.8 g/L (3.08%) total tartaric acid, yet the finished wine only had 2.1 g/L (0.21%) tartaric acid. Even at a titratable acidity of almost 1%, this wine had good structural balance and gave the perception of a wine of much lower acidity. Ion exchange can also be used for pH reduction in Cynthiana wine (Walker 2002, 2003).

In a cool year like 2004, the color of Cynthiana will be so intense that it can turn teeth blue. It is therefore necessary to use a neutral, low acid, good body wine as a blending agent to reduce the color. The blended wine should be tested for stability in a series of blending trials before large scale additions are made.

Table 2. Must and wine composition of a 2004 Cynthiana wine.

	Soluble Solids (%)	Fermentable Sugars (%)	pH	Titratable Acidity tartaric (g/L)	Citric acid (g/L)	Tartaric acid (g/L)	Malic acid (g/L)	Lactic acid (g/L)
Must	24.7	21.6	3.78	12.6	1.2	11.8	5.3	-
Wine	-	-	3.56	9.8	0.2	2.1	0.3	2.7

A total of 19 g/L tartaric acid was added to adjust pH. Yeast used was Lalvin BRL97. Wine alcohol and Glycerol were 12.2% and 9 g/L.

The use of French oak is preferred over American oak to help add complexity and smoothness to the wine. Cynthiana wine is not known for long aging potential. Sulfur dioxide should be generally avoided until bottling to allow for polymerization and precipitation of phenolics. Much of the rest of the winemaking process is the same as for other grapes.

Obviously, many of the techniques presented cannot be used at the same time. The techniques mentioned, produce good Cynthiana wine. It is up to the winemaker to understand and refine these techniques to produce a premium wine.

References and useful web sites.

Many of the references cited in this paper are available at the University of Arkansas, Grape and Wine Program Web site: http://www.uark.edu/depts/ifse/major8.html.

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