



RED WINE PRODUCTION CONSIDERATIONS

Section 2.

Maceration During Red Winemaking

In the last century, winemakers left almost every aspect of fermentation to chance. Today, both vineyardists and winemakers use modern technological tools to produce clean, drinkable wines and increase the possibility of producing great wines.

There is particular interest in designing wines in the vineyard, by understanding the qualitative and quantitative differences in grape phenols and flavor as a function of viticultural management. Grape growers and vintners are working more carefully together to gain further insight into “viticultural winemaking.”

This is done by separately fermenting lots of red wine which may differ in basic components affecting grape phenols and flavor, e.g., soil, rootstock, clone, climate (macro-, meso- and microclimate, particularly light exposure to the fruit), age of the vine, fruit maturity ($^{\circ}$ Brix, berry softness, etc.), berry size, moisture stress, and fruit-to-leaf balance.

Grape Maturity

Until relatively recently, red wine producers were primarily concerned only with elevated pH. Grapes were harvested to avoid this evil. The results were frequently hard, tannic youthful wines as that were not approachable for some time. The concepts of maturity are evolving (See above). What is now sought is suppleness, a wine which is palatable upon release, and the avoidance of herbaceous aromas. Most producers are harvesting primarily based on taste, looking for mature, “ripe” tannins. As grape maturity proceeds, there is a decrease in astringency which, along with the drop in acidity, corresponds to increased suppleness in the fruit (Ribéreau-Gayon and Glories, 1986).

Polymerized tannins which have a large molecular weight (> 3000) are said to be smoother on the palate than smaller tannins, which are considered to be “hard” and astringent. We know from the work of Ribéreau-Gayon and Glories (1986) and others that the total phenolic concentration may show a two-fold change from one season to the next.

Many are following the recommendation of Somers (1986) and measuring mean berry weight of field samples for comparative purposes as an index of “enologically active” phenols. The quantitative and qualitative differences in grape phenols is of great interest to red wine producers and is a principal factor influencing decisions regarding maceration. Good fruit and ripe tannins provide winemakers with complete flexibility, that is, they can make wine for drinking or wine for keeping.

Changes in attitude regarding fruit maturity parallel changes regarding balance. It's not uncommon to find reds with titratable acidities of 5.5 g/L and pHs 3.7 or higher. Wines rich in tannin cannot support a lot of acidity without being harsh and astringent. Elevated pHs also add to suppleness.

In Virginia, uncertainty remains about how to maximize red wine palatability and attain stylistic goals. Questions influencing maceration and grape phenols include the following:

- What are the proper pH and acid levels in finished reds, and how are they best achieved?
- When is the optimum time to add SO₂, and at what levels?
- What is the appropriate tannin level for the type and style of wine being produced, and how does this relate to aging?
- How does varying the amounts of whole berries and/or stems affect the wine?
- Should open or closed fermentors be utilized?
- What is the best size and shape of the fermentor?
- How is skin contact best achieved, and for what schedule and duration?

Many questions remain regarding yeast and malolactic fermentation:

- What is the desirable fermentation temperature?
- What is the desirable maceration period?
- What is the desirable degree of aeration during and following skin contact?

The following is a review of important red wine production considerations.

Crushing/Destemming

Vigorous crushing favors the extraction of the most astringent and bitter tannins (Ribéreau-Gayon and Glories, 1986). Therefore, most producers avoid excessive crushing or any other handling operation which might increase the nonsoluble solids level. The percentage of berries broken and destemmed varies widely

depending on the cultivar and style, although many wineries attempt to maximize flexibility by having a system which can convey uncrushed fruit to the fermentor.

The interest in partial whole cluster, or destemmed berry return, resides from the perceived benefits of prolonging the fermentation, lowering the phenol extraction, and increasing “fruit” character. Winemakers using a large percentage of whole clusters seek the fragrance of intracellular fermentation which, although incomplete, does add “fruit” character.

Partial whole cluster fermentation is frequently utilized with Merlot and Cabernet Franc by producers looking to maximize “fruit” character for blending purposes. Blending wines made with extended maceration with these wines adds flavor layers, lowers tannin, and adds “sleekness” and refinement.

Many Pinot noir producers emulate Burgundian winemaking practices by dumping whole, intact grapes into the fermentor, and crushing by hand punching or with mechanical cap punching devices. Such fermentations can last two weeks or more, and tend to remain cool. Some whole berry fermentation results, but the action of punching down three times per day crushes all but a small percentage of the grapes by the end of the fermentation. By the second week, most of the grapes are broken. In using this method with Pinot noir, and with extended maceration, the final product is much closer to Burgundy than Beaujolais.

Stems

The addition of stems to the fermentor is relatively uncommon in the New World, but is occasionally utilized with Pinot noir. Stem addition has both a practical and stylistic effect on wine components. Attributes believed to be influenced by the presence of stems in the fermentor are listed in Table 1.

Table 1. Generalizations Regarding Stem Return

Lower color
Increased phenols
Increased color stability
Increased “spicy” or “stemmy” character
Possibly increased bitterness
Increased pH
Can affect efficiency of cap management
Can aid pressing

Color is decreased, while the phenolic content increases. This increase in phenols helps to stabilize the color, which may be particularly useful with Pinot noir. A high percentage of stems adds a “spicy” character. The tannins of the stems are different from those of the skins. They are rougher and more astringent (Ribéreau-Gayon and Glories, 1986).

Generally stems are added as whole clusters or non-destemmed grapes. It is believed that adding back stems to the fermentor, which have been torn up during crushing and destemming, increases bitterness and stemmy aroma notes. Stem return is occasionally used in years where excessive fruit rot reduces quality. In such cases, grapes are dejuiced soon after the beginning of fermentation. About 20% stem return helps to make up the tannin deficiency resulting from early pressing. The use of refined enological tannins is much more common than stem return.

Tank Type and Size

Fermentor tank size frequently depends upon vineyard plot size, speed of picking and filling, cooling capacity, cap management system, and pressing capacity.

Fermentation and phenolic extraction vary with different tanks and cap management techniques. Tanks as small as 500 gallons (1890 L) waste heat necessary for extraction, while tanks larger than 1500 gallons (5670 L) cannot be managed easily by hand.

Most producers use stainless steel red fermentors with relatively small height-to-diameter ratios of 1.0 to 1.3. It is believed that such dimensions produce a cap which is relatively easy to manage using gentle cap management schemes. High profile tanks are considered to be less suitable for Pinot noir than more colored varieties, such as Cabernet Sauvignon.

In recent years, wooden fermentors have become more popular. These include both large tanks and fermentation in 60-L barrels with the head removed. Such practices represent stylistic tools that affect the juice-to-cap ratio, oxygenation level, and barrel phenolic extraction.

There are two types of wood fermentation used in red wine production, the Australian Red method, and fermentation with cubes, staves, or in barrels and tanks. The Australian Red approach, so named due to its origin, involves several steps. Crushed and destemmed fruit is cold soaked with maceration enzymes for 24 to 48 hours. Cold soaking is effective in aiding the extraction of anthocyanins and stabilizing color.

Additionally, co-pigmentation promoters are extracted. Wine is dejuiced at 18-16 °Brix, depending upon the initial maturity, and barrel fermented. The alternative is to add cubes (not chips) to the fermentation.

During wood fermentation, two factors help to influence the structural integration

of the wood. Mannoproteins are released by the yeast, which help to bind phenols. Additionally, yeast adsorb about one-third of the ellagic tannins, lowering the perception of astringency. The process of wood fermentation is used by some to create wines for blending.

For relatively small wineries, T-bins may represent the best alternative of economics and flexibility. Open-topped bins which can contain a ton or more of fruit allow producers to easily separate vineyard blocks and production treatments. Their limited heat exchange capacity is usually not a problem as a result of the relatively-limited volume.

Open versus Closed Tanks

Cap management depends upon such variables as tank size and shape, whether the tank is open or closed, and production philosophy. Many winemakers use closed tanks because of the added flexibility for post-fermentation maceration, white wine production, volume, and floor space considerations.

Some vintners believe that closed systems increase complexity in the finished product. This belief stems from the knowledge that, with open top fermentors, alcohol losses due to entrainment with CO₂ can be as much as 0.5% (v/v). Alcohol loss can be an advantage with some California Cabernets and Pinot noirs, which have a potential for too much alcohol. This is usually not a problem in Virginia.

Gentle cap management is easier with open vessels. The perceived aeration gained in open-top fermentors may be preferable for the development of complexity and enhanced phenolic polymerization. Oxygen exposure before and during fermentation has gained acceptance. This aids the yeast in membrane

lipid production, and also allows for the binding of anthocyanins and tannins – this is very important for textural balance in red wines.

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