Comparison of wine quality from two clones of Merlot

Walsh Family Wine
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Summary

Side by side studies comparing different clones of Merlot in other regions have shown differences in vegetative growth, yield, berries per cluster, berry weight, and cluster weights among clones, as well as differences in pH and potassium of resulting juice. The purpose of this study was to examine performance of two clones of Merlot, 348 and 181, in Virginia. Clone 181 produced heavier clusters with slightly higher Brix at harvest. Finished wine parameters were very much the same between clones and there were no significant differences in sensory scores for aromatic intensity, color, fruit intensity, or astringency/structure.

Introduction

Merlot first appeared as a named variety in French literature at the end of the 18th century, and was imported to the US in the 19th century[1]. The variety gained wide popularity in France in the 1970's, and by 2006 it was the top planted black grape in France. Though it was initially used primarily for blending in California, its popularity in France was mirrored on the West Coast of the US with heavy planting in California, Washington State, and Oregon. East Coast viticulture also adopted the variety with plantings in New York and Virginia[1]. Merlot now makes up 10% of the Vitis vinifera planted in the world[1].

In Virginia, Merlot makes up 15% of reported Vinifera tonnage and 14% of bearing acres, the second highest red variety after Cabernet Franc[2]. Merlot is often the first red to ripen, and is used for blending, as a varietal wine, and for Rose. It is sensitive to cold injury, susceptible to nonspecific bunch rots, and can have poor fruit set if weather is cool during bloom[3]. When managed well in the vineyard, it has the potential to produce high quality red wine.

Within the variety, there are several known clones of Merlot. UC Davis's Foundation plant services website, which catalogues varieties and clones that have been cultivated and certified through grapevine breeding program, list 33 different clones for Cab Franc[4] and there are 12 clones characterized on the ENTAV website[5]. A clone (also known as a cultivar) is a single genetic expression, created by propagation from a single mother vine that was carefully selected for specific traits such as cold hardiness, disease resistance, or quality of juice [6]. In modern times, cuttings from a single vine are grafted to rootstock, which may further impact the genetic expression of the clone.

Side by side studies comparing different clones of Merlot[7,8] have shown differences in vegetative growth, yield, berries per cluster, berry weight, and cluster weights among clones, as well as differences in pH and potassium of resulting juice. One study conducted in Serbia

compared several clones, 348 and 181 among them. They found that clone 181 had higher yield, grapes per vine, and larger berries, but some of these differences were not significant[8]. Vintage differences also play a significant role in these metrics[8,9].

Though clones are usually characterized at their place of origin, they may behave differently in different climates and when grafted to different rootstocks. The purpose of this study was to examine performance of two clones of Merlot, 348 and 181, in Virginia. Characteristics of each clone from the ENTAV database are listed in Table 1.

Table 1: Comparison of Clones 181 and 348[10]

Clone	181	348
Origin	Gironde	Gironde
Year Approved	1973	1975
Growing Surface area (France)	69.67 ha	36.41 ha
Agronomic references	Bordelais, Languedoc, Provence	Bordelais, Languedoc, Provence
Fertility	medium to high	medium
Weight of grape clusters	low	medium to high
Size of berries	low to medium	
Production level	medium	medium.
Vigor	medium to high	
Sugar content	medium to high	medium
Total acidity	medium	medium
Potential color	medium.	medium
Tannic structure	medium to high	medium
Oenological aptitudes	wines appreciated in wine tastings	wines appreciated in wine tastings

Methods

The experiment was conducted at Walsh Family Vineyard, near Leesburg, Virginia, in a 1.64 acre block of Merlot. The vineyard block was established in 2016. The Merlot was planted to clones 181 and 348 on 101-14 rootstock. The vineyard design is 7.5 ft by 3.75 ft spacing on a VSP trellis, and the vines are trained to a unilateral cordon. The site is situated at 570 to 640-ft above sea level, on a 10-15° slope oriented east, northeast. The Merlot is mapped by geovine.com as the Myersville-Catoctin complex.

Grapes from each clone were harvested separately on the same day and wine was made with identical winemaking according to the standard protocols of the winery. Fruit was

destemmed with the addition of 30 ppm SO_2. A 17% bleed by weight was conducted prior to cold soak. Fruit was cold soaked for 24 hours, covered with dry ice. Bins were warmed, then fermentation was inoculated with 20 g/hL BDX yeast. Tartaric acid (1 g/hL) was added at the end of cold soak. Fermentation was monitored daily for Brix and temperature with a target temperature around 80°F. Bins were pumped over twice daily during cold soak and for the first three days of fermentation, after which they received two punchdowns daily. Fermaid K (12 g/hL) was added at the end of lag phase.

Malolactic fermentation was inoculated at 5°Brix using 1 g/hL MBR31. Bins were drained/pressed on the same day after extended maceration of 10 days. The cap fell after 7 days. Bins were punched down until the cap fell, then gassed and sealed until pressing**.** Both bins received the same number of days total from picking to pressing. Wine was monitored for malic acid depletion using paper chromatography. Sulfur dioxide (50 ppm) was added at the completion of ML. An additional 50 ppm was added after 30 days.

Sensory analysis was completed by a panel of 26 wine producers. Wines were presented blind in randomly numbered glasses. Tasters were presented with three wines, two of one type and one of another, and asked to identify which wine was different (a triangle test). There were three tasting groups with the unique wine in the triangle test balanced between groups. Tasters were then asked to score each wine on a scale of 0 to 10 for aromatic intensity, color, fruit intensity, and structure (astringency). They were also given open ended questions to describe the wines. Results for the triangle test were analyzed using a one-tailed Z test. Descriptive scores were analyzed using repeated measures ANOVA.

Results

Clone 348 produced notably heavier clusters (Table 2). Fruit from Clone 181 was harvested with higher Brix than Clone 348, but with similar pH and TA (Table 3). Fermentation was robust for fruit from both clones (Figure 1). Both clones produced wine with very similar general chemistry (Table 4). Clone 181 produced wine with higher color intensity, with no difference in hue (Table 5). Anthocyanins were also not notably different between clones (Table 6), nor was there a perceptible difference in color (Table 8). Color is complex, with influences from anthocyanins as well as wine pH and cofactors. Phenolic measurements were very similar between wines, though Clone 181 had somewhat higher tannin (Table 7). The two wines did not have differences in perceived structure (astringency)(Table 8). In a triangle test of wines made from two different clones of Merlot, 13 out of 26 respondents were able to distinguish which wine was different, indicating the wines were nearly significantly different ($Z= 1.595$, $p= 0.055$). However, there were no significant differences in scores for aromatic intensity, color, fruit intensity, and structure (astringency) (Table 8). Several tasters noted in open ended comments that the wines were very similar.

Figure 1: Fermentation kinetics of two clones of Merlot (in-house data)

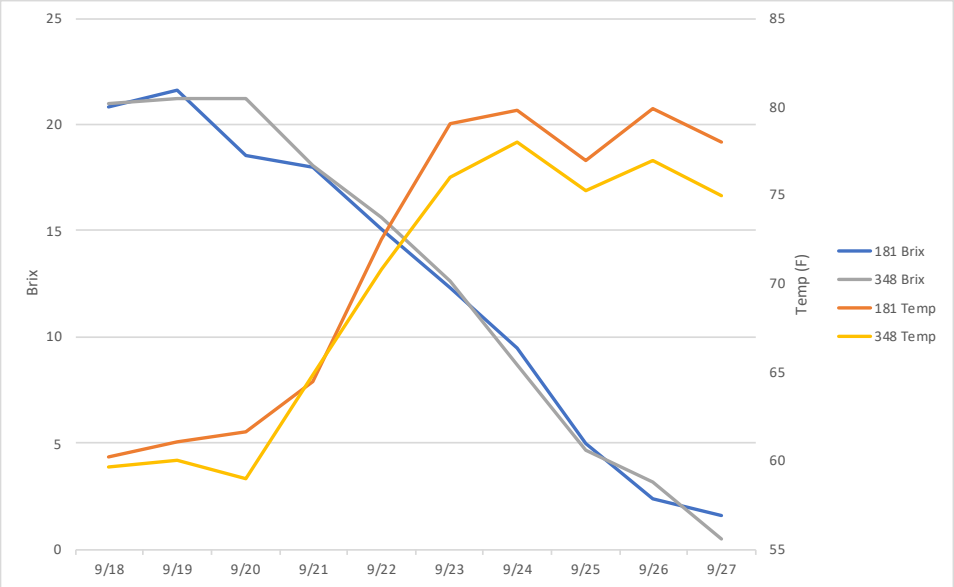

Table 2: Fruit metrics for two clones of Merlot (in-house data)

Clone	Berry Weight (grams)	Cluster Weight (grams)
181	1.5	142
348	1.5	175

Table 3: Juice chemistry for two clones of Merlot (in-house data)

Clone	Brix	pH	Titratable Acidity (g/L)
181	23.4	3.61	6.45
348	22.9	3.65	6.6

Table 4: Wine chemistry for two clones of Merlot (ICV Labs)

Clone	pH	TA (g/L)	Lactic Acid (g/L)	Alcohol (%)	VA (g/L)
181	3.76	4.81	1.66	13.48	0.67
348	3.72	4.91	1.6	13.54	0.71

Table 5: Color metrics for two clones of Merlot (ICV Labs)

Clone	A420 (AU)	A520 (AU)	A620 (AU)	Intensity	Hue
181	3.77	5.46	1.40	10.6	0.7
348	3.33	4.81	1.20	9.3	0.7

Table 6: Anthocyanins for two clones of Merlot (mg/L)(ETS Labs)

Clone	Malvidin Glucoside	Monomeric	Polymeric	Total
181	166	333	40	373
348	175	323	37	360

Table 7: Phenolics for two clones of Merlot (mg/L)(ETS Labs)

	Pulp		Seed			Skin		
Clone	Caffeic Acid	Caftaric Acid	Catechin	Epicatechin	Gallic Acid	Quercetin	Quercetin Glycosides	Tannin
181	8	18	13	24	22	7	37	635
348	8	15	11	23	23	6	36	577

Table 8: Descriptive scores for two clones of Merlot (WRE)

	181		348		Rep Meas ANOVA	
Descriptor	Mean	SD	Mean	SD	F	P
Aromatic Intensity	6.269	1.201	6.077	1.427	0.238	0.630
Color	6.154	0.801	5.885	1.121	0.653	0.427
Fruit Intensity	5.654	1.819	5.231	2.195	0.811	0.377
Astringency/Structure	5.875	1.003	5.667	1.467	0.276	0.604

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