Do jacks really matter?: Testing the impact of post-destemmer sorting on Cabernet Franc and Petit Verdot wine quality (2022)

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Summary

Recent advances in destemmer technology have reduced the amount of non-grape material entering fermentation bins. However, stem jacks are usually still present at some level. The winemaking goals at Blenheim are to produce fruit-forward red wines that bottle within 12 months of harvest and are consumed within 1-2 years post bottling. The standard protocol at Blenheim has been to sort out jack stems post destemming to minimize harsh tannins and bitterness entering the wine. However, destemming is labor intensive and time consuming. The purpose of this experiment was to determine if time and effort spent sorting jack stems make a perceptible difference in overall wine quality. Experiments were conducted using both Cabernet Franc and Petit Verdot. For each, one TBin of fruit was fermented from grapes that were sorted post-destemming while a second TBin of fruit was fermented from grapes that were not sorted. There was a slight increase in pH, acetic acid, and tannin but no change in methoxypyrazine in the finished wine when Cabernet Franc grapes were not sorted. The wines were not significantly different in a triangle test. Those that could tell the difference between the wines rated the wine made from sorted fruit as having higher astringency while there were no differences in bitterness ratings. The wine made from unsorted Petit Verdot also had higher pH than the sorted treatment, with no differences in the other chemical measures. The wines were not significantly different in a triangle test. Those that could tell the difference between the wines rated the wine made from sorted fruit as having higher fruit intensity with no other differences in descriptors. In this experiment, sorting fruit came at the cost of considerably slower destemmer speed (2 tons/hour vs. 5 tons/hour) as well as labor (3-5 people at the sorting table). Each winemaker must decide for themself if these differences are worth the cost.

Introduction

The winemaking goal for the red wine program at Blenheim Vineyards is to produce fruit forward, early bottling wines that are usually consumed within 1-2 years of release. To this end, all red grapes are destemmed but not crushed before fermentation to remove the potential for bitterness, harsh astringency, and vegetal character that may be imparted by stems.

In 2021, Blenheim purchased a new destemmer. One of the main criteria for this purchase was to maximize the efficiency of stem removal and minimize the amount of stem jacks entering the fermentation bins. Several characteristics of destemmers are aimed at maximizing wine quality, including material (rubber beaters vs. metal beaters), size of basket perforations,

rotational direction of the beaters vs. the basket (opposite is more efficient but more prone to stem and berry damage), and speed of rotation[1–3]. In a 2021 experiment testing if destemmer speed affected wine quality in Cabernet Franc and Petit Verdot, wines produced by fast destemming could not be distinguished from those produced by slow destemming in a triangle test and there were no significant differences in sensory scores for astringency, bitterness, or fruitiness (link to experiment here).

Discussion of the destemmer trial during the sensory session included a debate surrounding the impact of jacks on wine quality. Specifically, does the amount of jacks produced by normal destemming of relatively healthy fruit make a difference in wine quality? At Blenheim, harsh tannins or bitterness if introduced by jacks at harvest do not have long aging time to soften. Will these attributes decrease the quality of the wine if not sorted out?

The purpose of this experiment was to test if post-destemming sorting of jack stems makes a perceptible difference in wine quality. The experiment included both Cabernet Franc and Petit Verdot because each variety presents unique challenges. A primary concern with Cabernet Franc is its tendency toward "green character". Stems contain hexenal and other C6 compounds that might lead to a "leafy" perception. Stems can also contain methoxypyrazine, which can contribute to the perception of green bell pepper[4]. Petit Verdot tends to have leggier stems that sometimes get tangled in the destemmer and produces more jacks than Cab Franc, with potentially more effect on wine quality. Ripeness may also be an important factor in how many jacks are produced, with riper fruit destemming more easily and producing fewer jacks. A companion trial was run at Fabbioli Cellars (link to companion study).

> *I think this will be the only way that I will be able to sleep soundly at night thinking about all of the jacks that end up in fermentations! (Kirsty Harmon)*

Methods

For each variety, fruit was harvested and processed with the same operations and additions between treatments with the sole exception of post-destemming sorting. Sorting was done after fruit was destemmed, prior to fruit entrance into TBins. All fruit was destemmed onto the sorting table. Control fruit traveled down the sorting table without any MOG removal. For treatment lots, sorting was done by 3 (CF) - 5 (PV) people. The amount of material removed was weighed after sorting was complete.

Cabernet Franc

Fruit was hand harvested on 9/7/23 from the Deer Ridge Vineyard (Monticello AVA), cooled overnight then destemmed but not crushed into TBins with the addition of 50 mg/L SO_2 (added as 35 g KMBS). Fruit in each bin was inoculated for fermentation with 15 g/hL (70 g) EC1118 yeast. Bins were punched down twice daily with no other additions. Bins were pressed

at the completion of alcoholic fermentation on 10/3, then racked off gross lees into barrels on 10/4 and allowed to go through malolactic fermentation. There were two barrels per treatment. Malolactic fermentation was completed on 10/31. On 11/22, an acid trial was completed and 1.25 g/L tartaric acid was added to each barrel along with 100 mg/L SO_2.

Sensory analysis was completed by a panel of 18 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). To account for order effects, there were four 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 fruit intensity, fruit character, herbaceous/green character, bitterness and astringency. Fruit character was defined as a range from bright/fresh/red (low scores) to dark/dried/black (high scores). 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. Lastly, to assess differences in tannin texture, tasters were given 5 different tangible fabrics (in order from softest to roughest; soft suede, suede, velvet, sandpaper and burlap) and were asked to select the fabric that most closely represented the texture of the wine. Fabrics were chosen to include an increasingly rough tactile perception.

Petit Verdot

Fruit was hand harvested on 9/21/23 from the Claim Vineyard (Monticello AVA), cooled overnight then destemmed but not crushed into TBins with the addition of 50 mg/L SO_2 (added as 35 g KMBS). Fruit in each bin was inoculated for fermentation with 15 g/hL (70 g) EC1118 yeast. Bins were punched down twice daily with no other additions. Bins were pressed at the completion of alcoholic fermentation on 10/11, then racked off gross lees into barrels on 10/13 and allowed to go through malolactic fermentation. There were two barrels per treatment. Malolactic fermentation was completed on 11/7. On 11/28, an acid trial was completed, but no acid addition was needed. Wine was treated with 100 mg/L SO_2 on 12/2.

Sensory analysis was completed by a panel of 17 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). To account for order effects, there were four 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 fruit intensity, fruit character, herbaceous/green character, bitterness and astringency. Fruit character was defined as a range from bright/fresh/red (low scores) to dark/dried/black (high scores). 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. Lastly, to assess differences in tannin texture, tasters were given 5 different tangible fabrics (in order from softest to roughest; soft suede, suede, velvet,

sandpaper and burlap) and were asked to select the fabric that most closely represented the texture of the wine. Fabrics were chosen to include an increasingly rough tactile perception.

Results

Additional effort for sorting

Fruit was destemmed at a speed of 2 tons/hour onto the sorting table, which conveyed fruit into TBins for fermentation. When fruit is not sorted, the destemmer is usually set to 5 tons/hour. Regardless of treatment, all fruit was destemmed at the slower speed onto the table but jacks were removed from the "sorted" treatment only. For each of the "sorted" treatments, less than one pound of material was removed by the end of the run. Figure 1 shows a comparison of must from each treatment. Sorting did not remove all imperfections, but there were noticeably more jacks in the TBin containing unsorted fruit than the TBin containing sorted fruit.

Cabernet Franc

Cabernet Franc was harvested with balanced chemistry, indicating good ripeness with little difference in fruit between treatment and control (Table 1). There was also very similar general chemistry in the finished wines (Table 2). The fermentation with unsorted fruit completed with slightly higher acetic acid and alcohol levels, however these are small differences, based on a single fermentation only, that may have been caused by factors other than sorting. Notably, there was no difference in methoxypyrazine (IBMP) between treatments. The threshold of detection for IBMP in wine is estimated to be 6-15 ng/L, so these values were all likely below threshold. There were no consistent differences in anthocyanins between fermentations with sorted and unsorted fruit (Table 4, Figure 2). The fermentation with sorted fruit produced wine with a lower concentration of tannin than the fermentation with unsorted fruit. This effect may have been due to slightly higher alcohol bin with unsorted fruit extracting slightly more tannin.

In a triangle test of Cabernet Franc with and without jack inclusions, 8 out of 18 respondents were able to distinguish which wine was different, indicating the wines were not significantly different ($Z= 0.75$, $p= 0.23$). There were no significant differences in scores for fruit intensity, fruit character, herbaceous/green character, or bitterness (Table 5). The mean scores for astringency were nearly significantly higher for the wine made from sorted fruit vs. unsorted fruit. When asked to compare the astringency of wine to 5 different tactile fabrics, responses were dispersed between fabrics. The highest number (3 tasters) selected sandpaper to describe the astringency of the unsorted fruit, and suede to describe the astringency of wine made from sorted fruit (Figure 3). Overall, wine made from sorted fruit was rated as having slightly coarser texture.

Petit Verdot

Petit Verdot fruit chemistry was also very similar between treatment and control bins (Table 1), with balanced and ripe chemistry. Finished wine chemistry was also very similar between treatments (Table 3). The fermentation with unsorted fruit had noticeably higher pH than the sorted fruit. Potassium is found in stems, which may lead to higher pH values. A change in potassium as small as 10% can lead to a shift of up to 0.1 pH units[5]. The wine made from sorted fruit had slightly higher concentration of total anthocyanins but there was no difference in tannin concentration between wines (Table 4).

In a triangle test of Petit Verdot with and without jack inclusions, 6 out of 17 respondents were able to distinguish which wine was different, indicating the wines were not significantly different (Z=-0.09, p= >0.50). There were no significant differences in scores for any of the descriptors (Table 6), though scores for fruit intensity of wine from unsorted fruit were nearly significantly higher than those for wine from sorted fruit. When asked to compare the astringency of wine to 5 different tactile fabrics, the overall perception of coarseness was nearly the same though there was higher variation in responses for wine made from sorted fruit (Figure 4).

References

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Figure 1: Comparison of must from sorted and not sorted treatments.

Table 1: Juice chemistry for Cabernet Franc and Petit Verdot with and without sorting (Imbibe Solutions)

		Brix	pH	Titratable Acidity (g/L)	Malic Acid (g/L)	YAN (mg/L)
Cabernet Franc	Sorted	21.4	3.67	3.3	1.47	98
9/18/23	Not Sorted	21.8	3.67	3.4	1.41	95
Petit Verdot	Sorted	23.9	3.34	5.5	3.25	66
9/23/23	Not Sorted	23.9	3.34	5.7	3.25	71

Table 2: Wine Chemistry for Cabernet Franc with and without sorting (ICV Labs, March 2023)

							SO_2 (ppm)		
		Acetic Acid (g/L)	pH	Titratable Acidity (g/L)	IBMP (ng/L)	Ethanol (%)	Total	Free	Molecular
Sorted	1404	0.49	3.61	4.78	5	12.3	78	31	0.69
	1508	0.49	3.62	4.79	5	12.4	76	31	0.67
Not Sorted	1403	0.54	3.64	4.74	6	12.6	86	11	0.23
	1510	0.53	3.64	4.79	5	12.69	75	27	0.57

Table 3: Wine Chemistry for Petit Verdot with and without sorting (ICV Labs, March 2023)

						SO_2 (ppm)		
	Acetic Acid (g/L)	pH	Titratable Acidity (g/L)	IBMP (ng/L)	Ethanol (%)	Total	Free	Molecular
Sorted	0.68	3.62	5.72	3	14.03	109	52	1.21
Not Sorted	0.67	3.72	5.39	3	13.9	89	46	0.86

Table 4: Phenolic compounds found in Cabernet Franc and Petit Verdot with and without sorting (mg/L) (ETS Labs, March 2023)

		Barrel	Polymeric Anthocyanins	Total Anthocyanins	Catechin	Tannin
Cab Franc	Sorted	1404	25	219	13	284
		1508	24	218	13	285
	Not Sorted	1430	32	202	14	370
		1510	26	225	14	315
Petit Verdot	Sorted		61	518	26	558
	Not Sorted		64	477	23	555

Figure 1: Comparison of anthocyanins and tannins for two treatments of Cabernet Franc (ETS Labs March 2023)

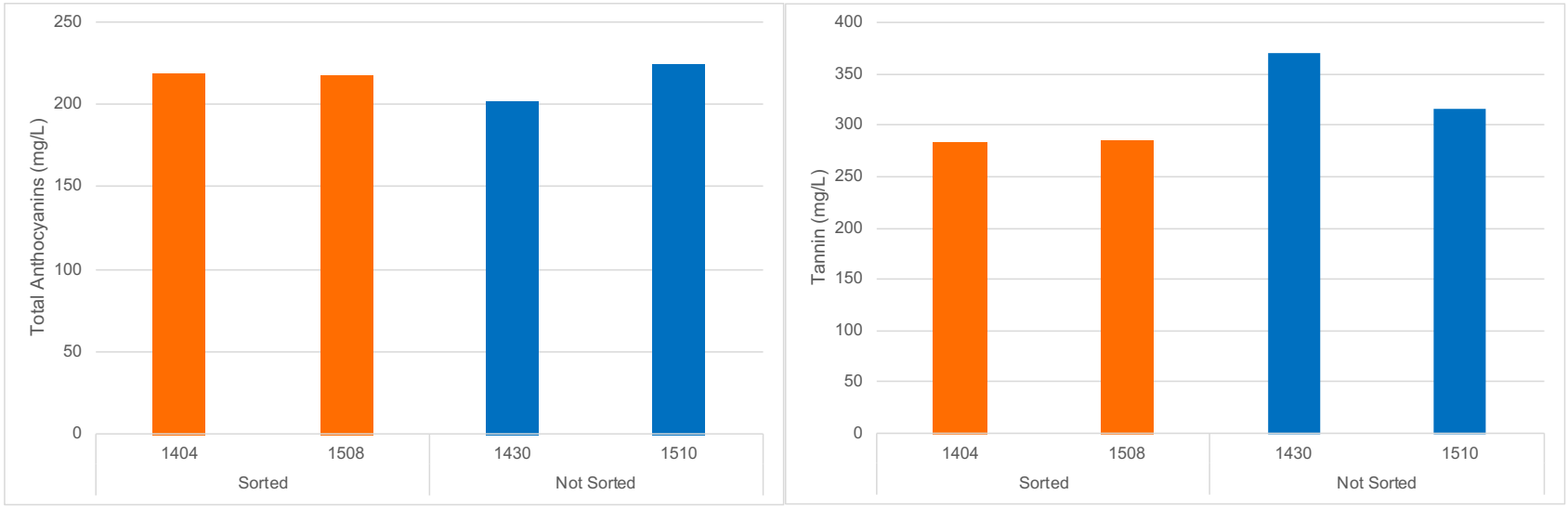

Table 5: Mean descriptive scores for five attributes of sorted vs. not sorted Cabernet Franc

	Sorted		Not Sorted			
Descriptor	Mean	SD	Mean	SD	F	P
Fruit intensity	5.6	2.07	5.4	1.3	0.37	0.55
Fruit character	4.4	2.23	4.6	1.92	0.04	0.85
Herbaceous/green	3.5	2	3.3	1.79	0.05	0.82
Bitterness	4.1	2.1	3.9	1.64	0.18	0.68
Astringency	5.9	1.36	4.5	1.6	4.09	0.06

Figure 3: Fabric selected by respondents to represent astringency of each Cab Franc treatment

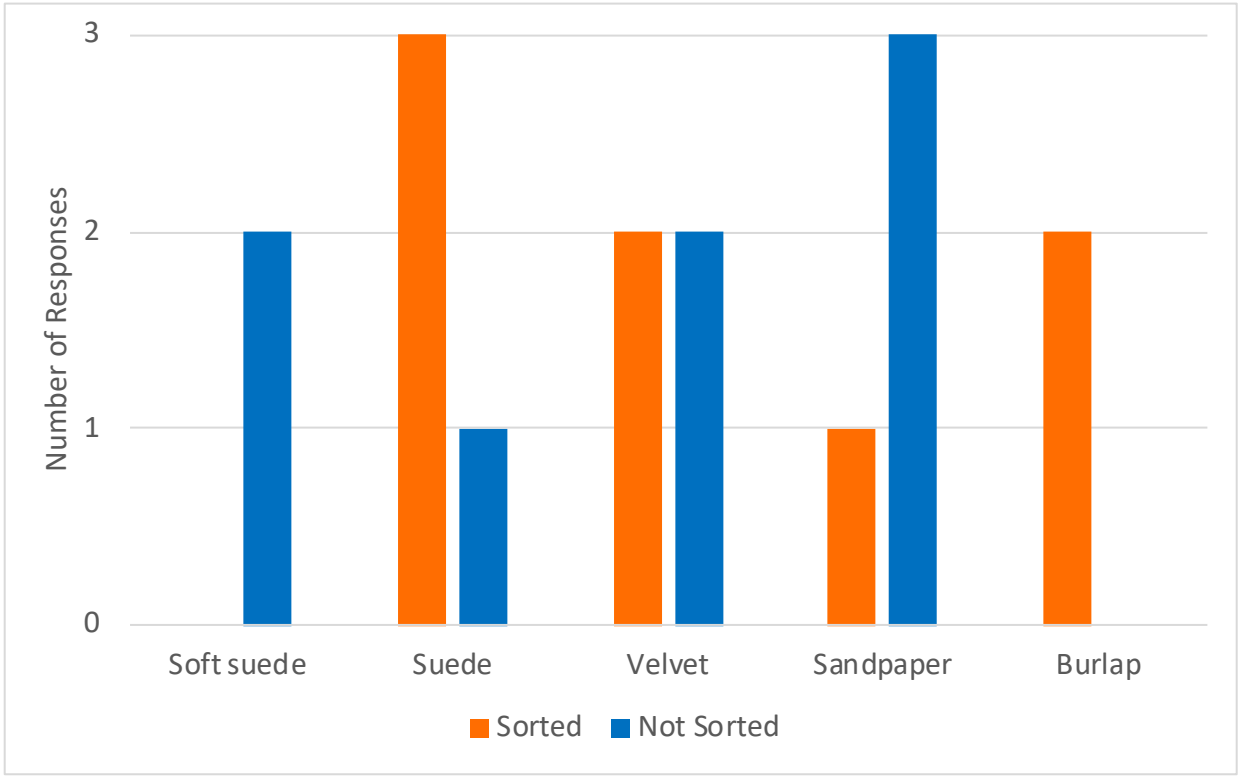

Table 6: Mean descriptive scores for five attributes of sorted vs. not sorted Petit Verdot

	Sorted		Not Sorted			
Descriptor	Mean	SD	Mean	SD	F	P
Fruit intensity	5.3	1.21	6.3	1.63	3.75	0.08
Fruit character	6.8	0.75	6.5	1.38	0.22	0.65
Herbaceous/green	5	2.45	4.2	1.47	1.4	0.26
Bitterness	4.8	2.4	4.3	1.75	0.48	0.5
Astringency	7	1.27	6.7	1.51	0.19	0.67

Figure 4: Fabric selected by respondents to represent astringency of each Petit Verdot treatment