Whole Cluster Inclusion in Petit Verdot Fermentations (2017)

Early Mountain Vineyards
Submitted by Ben Jordan and Maya Hood-White

Summary

This study examines the impact of whole cluster fermentation versus more traditional fermentation techniques in Petit Verdot winemaking. Petit Verdot grapes were harvested and processed into two T Bins. One treatment was completely destemmed, whereas the other treatment was 100% whole cluster inclusion. The 0% inclusion treatment was punched down, whereas the whole cluster treatment was stomped for punchdowns. When the 0% treatment reached approximately 8 Brix, the fermenting wine was delestaged and the pomace was stomped, and the wine was then racked back into the stomped pomace. Wine was pressed 16 days after processing. Juice and wine chemistry were very similar between treatments, except TA was slightly lower in the whole cluster treatment. Color was slightly increased, and many phenolic compounds were increased by whole cluster inclusion. Although anthocyanin was lower from whole cluster treatment, polymeric anthocyanins were increased. Overall, these wines were not found to be significantly different. There may have been a slight preference for the whole cluster wine. The whole cluster wine tended to score higher in Bitterness, Astringency, and Fruit Intensity. The whole cluster inclusion treatment had the clusters stomped during T Bin filling, which may have reduced some of the more estery characteristics often seen in whole cluster winemaking. Thus, these results may be more in line with what would be expected with a stem inclusion wine, rather than a purely whole cluster wine. This study suggests that whole cluster inclusion may be a useful method for creating a Petit Verdot which could serve as a valuable blending component, but more studies on whole cluster Petit Verdot are needed to determine whether any strong trends can be seen between treatments over time.

Introduction

The role of whole cluster and stem inclusion in winemaking is very controversial. Whole cluster fermentation is often used in Burgundian Pinot noir and is thought to add complexity to the wine (Weston 2000). Whole clusters are thought to round out and complement the low tannin in Pinot noir, and the flavors of Syrah can be complemented by stems (Meisner 2016). However, whole cluster inclusion also results in stems being added to the wine. Stems can enhance structure and wine quality sometimes, but also can add vegetal aromas (Ribèreau-Gayon et al. 2006). In certain cases, these vegetal aromas can also be perceived as spicy, and may act as a counterbalance to overly fruity qualities. Vegetal aromas and tannin additions may also balance out some carbonic maceration character which is found in whole cluster inclusion, which enhances ester aromatics, extends fermentation after pressing, and reduces the contribution of seed tannin. Stem inclusion is less common for Bordeaux varieties because of their already high levels of pyrazine (Meisner 2016). The reticence to use stems due to pyrazine characteristics in certain varieties is likely unfounded, due to cultural practices and climatic conditions which can greatly lower pyrazine character. Stems tend to lower alcohol content, decrease titratable acidity, and increase pH (due to high potassium levels). Stems can contribute a large amount of tannin to wine. Additionally, stems tend to decrease color intensity by adsorbing anthocyanins (Ribèreau-Gayon et al. 2006; Reshef et al. 2016). Finally, wines made with stem inclusion tend to have higher color stability over time (Ribèreau-Gayon et al. 2006). These results vary, however (Ribèreau-Gayon et al. 2006), and are dependent on many other factors, such as extraction kinetics, maceration practices, the level of crushing in the grapes, grape variety, and possibly stem maturity. Whole cluster and stem inclusion require much more thorough study before any hard conclusions can be drawn. This study examines the impact of whole cluster inclusion on Petit Verdot wine.

Results and Discussion

Juice and wine chemistry were very similar between treatments, except TA was slightly lower in the whole cluster treatment. Color was slightly increased, and many phenolic compounds were increased by whole cluster inclusion. Although anthocyanin was lower from whole cluster treatment, polymeric anthocyanins were increased.

Juice Chemistry					
	Brix	pH	TA (g/L)	Malic Acid (g/L)	YAN (mg N/L)
Control	27.2	3.49	8.62	2.58	113
Whole Cluster	27.8	3.43	8.51	2.44	116
% Change	2%	-2%	-1%	-5%	3%

In House Data

Wine Chemistry												
	Ethanol (%vol/vol)	Residual Sugar (g/L)	pH	TA (g/L)	Volatile Acidity (g/L)	Tartaric Acid (g/L)	Malic Acid (g/L)	Lactic Acid (g/L)	Potassium (mg/L)	Total SO2 (ppm)	Free SO2 (ppm)	Molecular SO2 (ppm)
Control	14.51	<1	4.06	4.65	0.96	0.7	<0.15	2.53	1600	42	25	0.23
Whole Cluster	14.47	<1	4.09	4.37	0.91	0.7	<0.15	2.57	1650	43	25	0.21
% Change	0%		1%	-6%	-5%	0%		2%	3%	2%	0%	-9%

Results from ICV in Late March, Except Tartaric acid and Potassium from ETS

Color Profile					
	A420	A520	A620	Hue (420/520)	Intensity (420 + 520 + 620)
Control	0.630	0.856	0.278	0.736	1.764
Whole Cluster	0.669	0.906	0.302	0.738	1.877
% Change	6%	6%	9%	0%	6%

Results from ICV in Late March

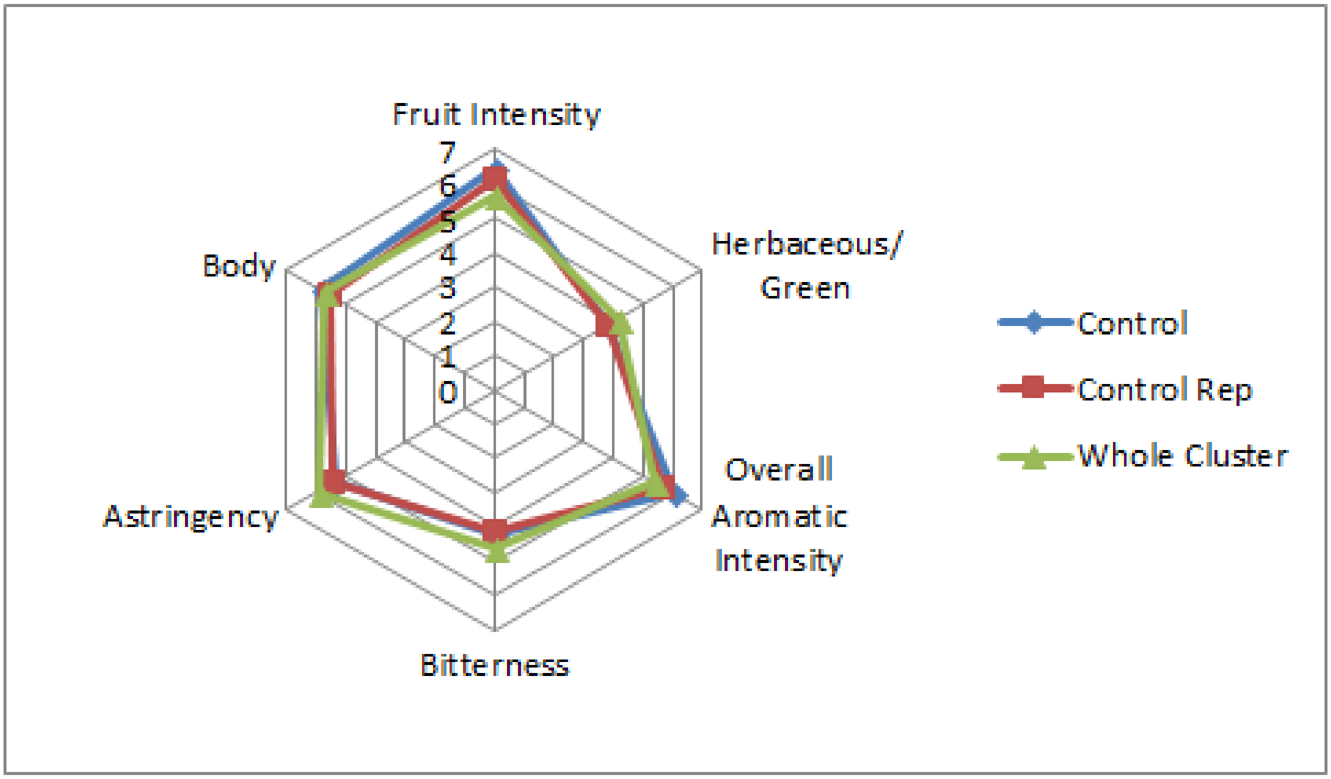
Phenolic Profile					
	Caffeic Acid (mg/L)	Caftaric Acid (mg/L)	Catechin (mg/L)	Epicatechin (mg/L)	Gallic Acid (mg/L)
Control	5	32	51	47	37
Whole Cluster	6	48	73	58	44
% Change	20%	50%	43%	23%	19%

Results from ETS in Late March

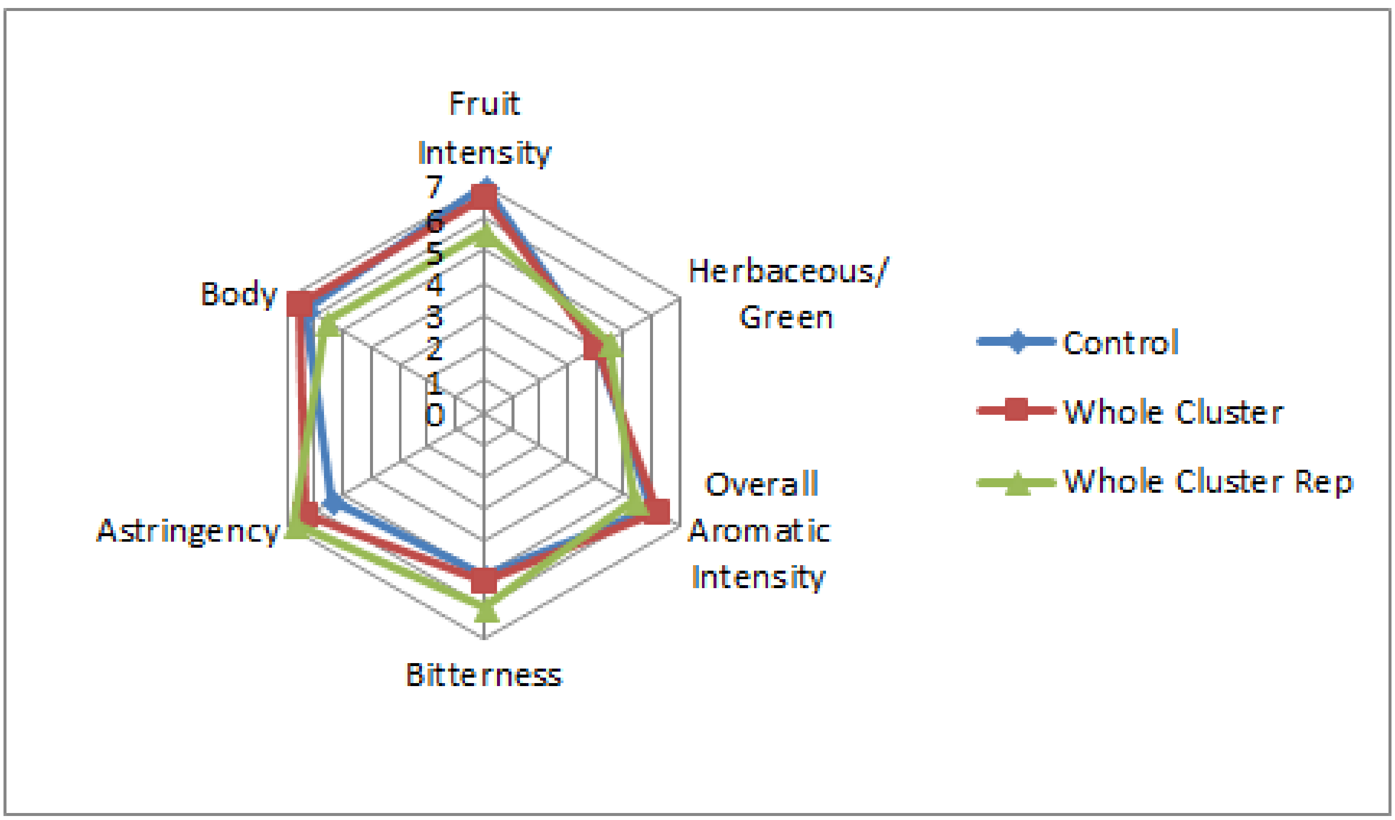
Phenolic Profile								
	Malvidin glucoside (mg/L)	Monomeric Anthocyanins (mg/L)	Polymeric Anthocyanins (mg/L)	Quercetin (mg/L)	Quercetin Glycosides (mg/L)	Tannin (mg/L)	Total Anthocyanins (mg/L)	Resveratrol (cis and trans) (mg/L)
Control	248	457	50	4	9	526	507	0.6
Whole Cluster	207	400	56	4	11	617	456	1.2
% Change	-17%	-12%	12%	0%	22%	17%	-10%	100%

Results from ETS in Late March

For the triangle test on May 2, of 24 people who answered, 11 people chose the correct wine (46%), suggesting that the wines were not significantly different. In general, people who answered correctly slightly preferred the whole cluster treatment to the control (4 judges preferred the control, 7 preferred the whole cluster). For the descriptive analysis, there was a somewhat strong trend for the control wine to have lower Bitterness (LSD=0.39). There was a slight tendency for the whole cluster wine to have lower Fruit Intensity and Overall Aromatic Intensity, and higher Herbaceous/Green character and Astringency.



For the triangle test on May 9, of 7 people who answered, 3 people chose the correct wine (43%), suggesting that the wines were not significantly different. No preference trends were discernible. For the descriptive analysis, there were no strong trends for the descriptors used in this study. The whole cluster wine had a slight tendency to score higher in Bitterness and Astringency, and lower in Fruit Intensity.



Overall, these wines were not found to be significantly different. There may have been a slight preference for the whole cluster wine. The whole cluster wine tended to score higher in Bitterness, Astringency, and Fruit Intensity. The whole cluster inclusion treatment had the clusters stomped during T Bin filling, which may have reduced some of the more estery characteristics often seen in whole cluster winemaking. Thus, these results may be more in line with what would be expected with a stem inclusion wine, rather than a purely whole cluster wine. This study suggests that whole cluster inclusion may be a useful method for creating a Petit Verdot which could serve as a valuable blending component, but more studies on whole cluster Petit Verdot are needed to determine whether any strong trends can be seen between treatments over time.

Methods

Petit Verdot grapes were harvested and processed on October 2. One treatment was only destemmed with delestage and stomping occurring at 8 Brix, and one was left as 100% whole cluster (which was stomped "extractively" instead of punched down). The T Bin for this treatment was stomped during filling in an attempt to crush the whole cluster grapes effectively. Grapes were processed into T Bin with sulfur dioxide. The next day the must was inoculated with 0.15g/L 43 yeast and 0.2g/L Go Ferm. 0.30g/L Superfood was added over two days, from October 9-10. The fermentations stuck, and on October 16, the must was re-inoculated with 43 yeast at 0.4g/L with 0.45g/L Go Ferm.

The fermenting wine was pressed into barrel in October 18, with an addition of 0.2g/L Lysozym and 0.4g/L SIY Cell Hulls (these were added on October 19 for the whole cluster treatment). On October 22, 0.08g/L Fermaid A, 0.1g/L SIY Cell Hulls, 0.4g/L 43 Restart, 0.53g/L Go Ferm, and then another 0.03 g/L Fermaid A were added to the wine to attempt to further dry it out. On November 7, 0.0025g/L Omega Enoferm was added to the wine. Stab Micro was added to the wine at 0.05g/L on December 6, along with sulfur dioxide. On December 7, 0.75g/L tartaric acid was added.

These wines were tasted on May 2 and May 9. For the triangle test, descriptive analysis, and preference analysis for the May 2 tasting, anybody who did not answer the form were removed from consideration for both triangle, degree of difference, and preference. Additionally, anybody who answered the triangle test incorrectly were removed from consideration for degree of difference and preference. Additionally, any data points for preference which did not make sense (such as a person ranking a wine and its replicate at most and least preferred, when they correctly guessed the odd wine) were removed.

In order to balance the data set to perform statistical analysis for descriptive analysis on the May 2 tasting, any judge who had not fully completed the descriptive analysis ratings were removed. In order to then make the number of judges between groups equivalent, one judge from groups 1 and 2 was eliminated. This resulted in a final data set of 3 groups, each with 7 judges (considered as replications within groups, and groups were considered as assessors). Data was analyzed using Panel Check V1.4.2. Because this is not a truly statistical set-up, any results which are found to be statistically significant ($p<0.05$) will be denoted as a "strong trend" or a "strong tendency," as opposed to general trends or tendencies. The statistical significance here will ignore any other significant effects or interactions which may confound the results (such as a statistically significant interaction of Judge x Wine confounding a significant result from Wine alone). The descriptors used in this study were Fruit Intensity, Herbaceous/Green, Overall Aromatic Intensity, Bitterness, Astringency, and Body.

Due to the very small number of judges (5) at the May 9 tasting, only slight trends will be discussed for the sensory information.

References

Meisner, M. 2016. Fermentation 101: The case for whole clusters. Last Bottle. http://blog.lastbottlewines.com/education/whole-clusters/. Accessed 2/10/2017.

Reshef, N., Morata, A., and Suárez-Lepe, J.A. 2016. Towards the use of grapevine by-products for reducing the alcohol content of wines. Biointerface Research in applied Chemistry. 6:1531- 1537.

Ribèreau-Gayon, P., Dubourdieu, D., Donèche, B., and Lonvaud, A. 2006. *Handbook of Enology, Volume 1: The Microbiology of Wine and Vinifications* 2nd Edition. John Wiley & Sons. Chichester, West Sussex, England.

Weston, L.A. 2000. Grape and wine tannins and phenolics – their roles in flavor, quality and human health. 29th Annual New York Wine Industry Workshop. https://ecommons.cornell.edu/handle/1813/39812. Accessed 2/7/2017.