Whole Cluster vs Stem Inclusion in Chambourcin (2017)

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Summary

This study examines the impact that fermenting with whole clusters or with stem inclusion has on Chambourcin wines. Chambourcin grapes were harvested from the same block on the same day and separated into 3 T Bins. One T Bin received 100% destemmed and crushed fruit (control). The second T Bin received 30% whole clusters at the bottom, and then was filled with 70% destemmed and crushed fruit (by weight). The third T Bin received 30% of the stems by weight from the control at the bottom of the T bin, and then were filled with the same weight of destemmed and crushed grapes as the control and treatment. All other treatments between musts and wines were identical. pH was slightly increased by whole cluster and stem inclusion, and TA and tartaric acid was slightly decreased. Pyrazine was slightly increased by the treatments. Color intensity was not much affected by the treatments. Catechin, epicatechin, and quercetin were slightly increased by the treatments. Tannin was increased by the treatments, and anthocyanins were decreased by the treatments. Overall, stem inclusion seemed to result in lower Bitterness, and may have lowered Astringency and Herbaceous/Green character. The whole cluster and the control treatments tended to be higher in Herbaceous/Green character. The intensity for the descriptors for whole cluster inclusion seemed to change over time, perhaps due to ester qualities decreasing over time in bottle. Preference trends were hard to determine, although whole cluster and stem inclusion wines tended to be more preferred over the control.

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 and stem inclusion on Chambourcin wine.

Results and Discussion

pH was slightly increased by whole cluster and stem inclusion, and TA and tartaric acid was slightly decreased. Pyrazine was slightly increased by the treatments. Color intensity was not much affected by the treatments. Catechin, epicatechin, and quercetin were slightly increased by the treatments. Tannin was increased by the treatments, and anthocyanins were decreased by the treatments. These results tend to be what is often seen in these kinds of studies.

Juice Chemistry		
	Brix	pH
Juice Chemistry	22.1	3.4

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)	IBMP (ng/L)
Control	12.84	1.5	3.47	6.18	0.51	1.8	<0.15	2.56	1250	50	23	0.71	<1.0
Whole Cluster	12.59	1.3	3.52	5.91	0.61	1.6	<0.15	2.49	1250	40	10	0.27	1.4
Stems	12.69	1.6	3.54	5.95	0.69	1.7	<0.15	2.64	1300	38	17	0.45	1.2
% Change Whole Cluster	-2%	-13%	1%	-4%	20%	-11%		-3%	0%	-20%	-57%	-62%	
% Change Stems	-1%	7%	2%	-4%	35%	-6%		3%	4%	-24%	-26%	-37%	

Results from ICV in Mid February, Except Tartaric Acid, Potassium, and IBMP from ETS

Color Profile					
	A420	A520	A620	Hue (420/520)	Intensity (420 + 520 + 620)
Control	0.266	0.411	0.094	0.647	0.771
Whole Cluster	0.265	0.418	0.091	0.634	0.774
Stems	0.263	0.401	0.087	0.656	0.751
% Change Whole Cluster	0%	2%	-3%	-2%	0%
% Change Stems	-1%	-2%	-7%	1%	-3%

Results from ICV in Mid February

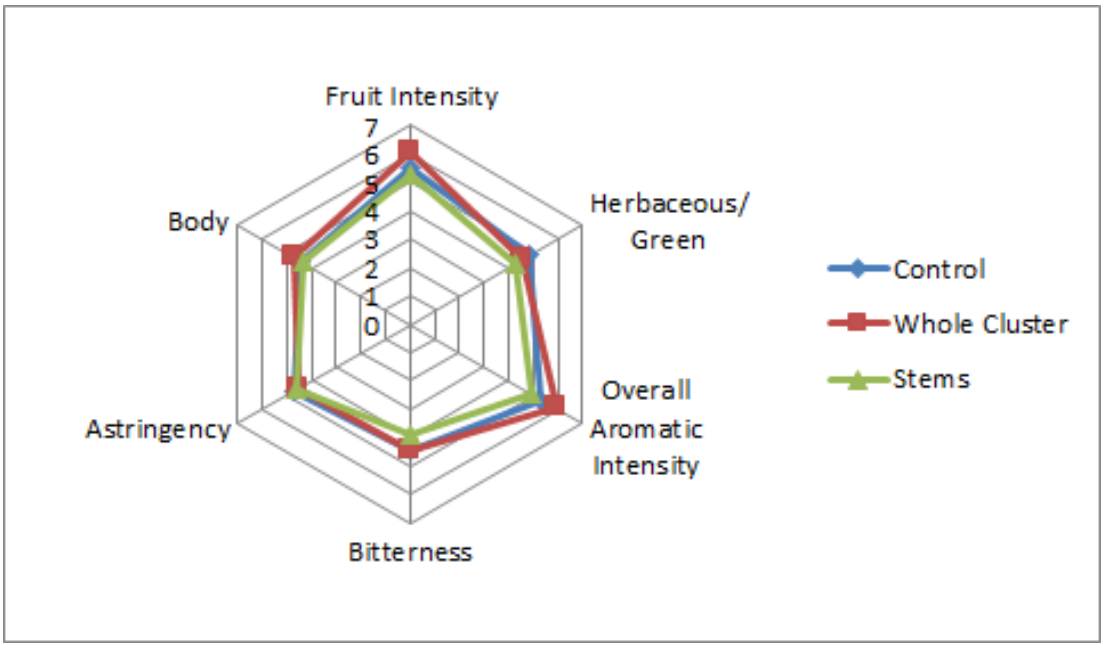
Phenolic Profile							
	Caffeic Acid (mg/L)	Caftaric Acid (mg/L)	Catechin (mg/L)	Epicatechin (mg/L)	Catechin: Epicatechin Ratio	Catechin: Tannin Ratio	Gallic Acid (mg/L)
Control	6	17	11	6	1.83	0.06	20
Whole Cluster	7	19	14	9	1.56	0.06	19
Stems	6	18	14	9	1.56	0.06	21
% Change Whole Cluster	17%	12%	27%	50%	-15%	0%	-5%
% Change Stems	0%	6%	27%	50%	-15%	0%	5%

Results from ETS in Mid February

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	131	629	17	17	37	195	646	2.2
Whole Cluster	119	562	17	17	44	223	579	2.9
Stems	126	601	18	15	43	220	619	1.9
% Change Whole Cluster	-9%	-11%	0%	0%	19%	14%	-10%	32%
% Change Stems	-4%	-4%	6%	-12%	16%	13%	-4%	-14%

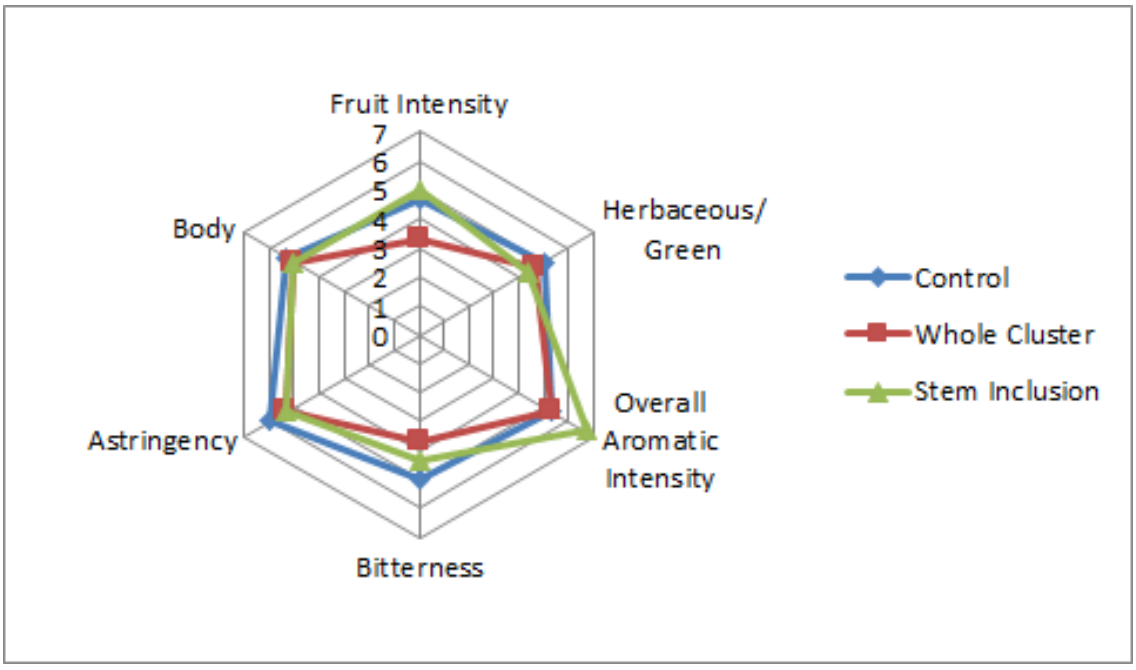
Results from ETS in Mid February

For the descriptive analysis on February 28, there was a strong trend for Bitterness to be lower in the wine with stems relative to the other wines (LSD=0.32). There was a slight tendency for the whole cluster treatment to have greater Fruit Intensity and Overall Aromatic Intensity, with stem inclusion having the lowest scores for these qualities. Herbaceous/Green character was slightly higher in the control and was lowest in the stem inclusion treatment. In general, the whole cluster wine was most preferred, and the stems were less preferred, but some mentioned that they preferred the body and mouthfeel in the wine with stems.

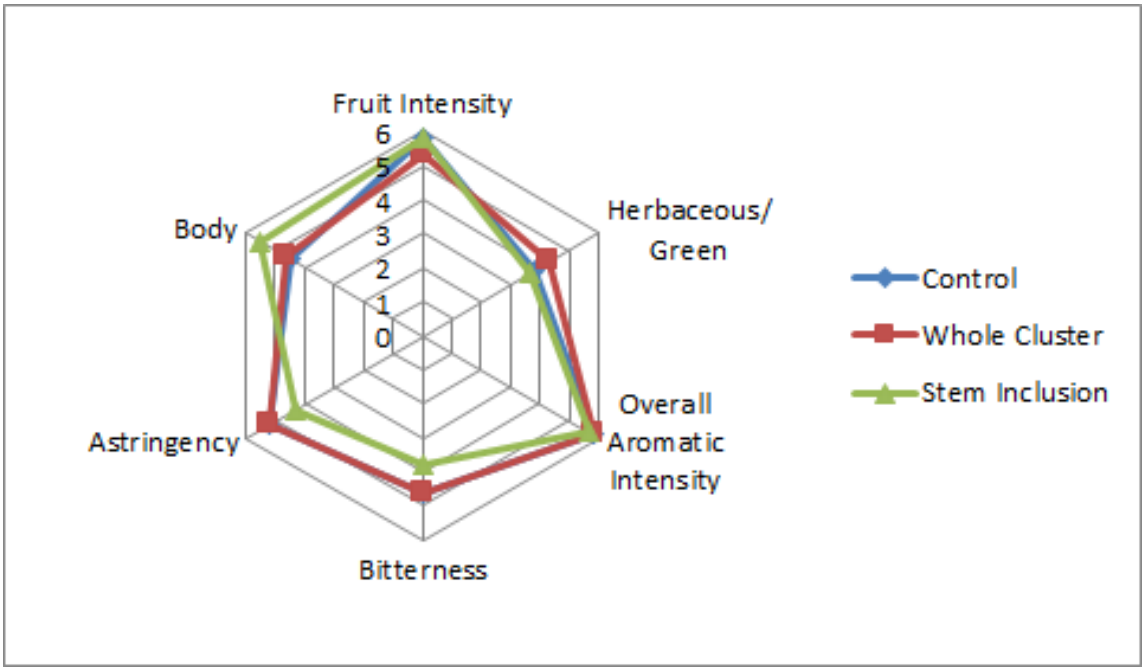


	Control	Whole Cluster	Stems	Total Votes
Most Preferred	31%	50%	19%	26
Second Most Preferred	39%	22%	39%	23
Least Preferred	32%	32%	36%	25

For the March 14 Tasting, the whole cluster treatment had a slight tendency to be lower in most attributes. Preference trends were hard to determine.



For the descriptive analysis on April 4, there were no strong trends for the descriptors used in this study. There was a slight tendency for stem inclusion to increase Body, and to lower Astringency and Bitterness. There was a slight tendency for Herbaceous/Green character to be higher in the whole cluster wine. In general, people tended to prefer the stem inclusion wine the most, perhaps followed by the whole cluster wine.



	Control	Whole Cluster	Stem Inclusion	Total Votes
Most Preferred	30%	10%	60%	10
Second Most Preferred	22%	56%	22%	9
Least Preferred	44%	33%	22%	9

Overall, stem inclusion seemed to result in lower Bitterness, and may have lowered Astringency and Herbaceous/Green character. The whole cluster and the control treatments tended to be higher in Herbaceous/Green character. The intensity for the descriptors for whole cluster inclusion seemed to change over time, perhaps due to ester qualities decreasing over time in bottle. Preference trends were hard to determine, although whole cluster and stem inclusion wines tended to be more preferred over the control. These descriptive results are somewhat unexpected (especially with regard to stem inclusion), and more work should be performed to more rigorously analyze the sensory qualities of these wines. Additionally, this project should be repeated on different grape varieties, and should be attempted to be repeated with different levels of stem maturity.

Methods

Chambourcin grapes were sourced from the same block (planted in 2015, first harvest from this block) and were hand-picked on September 25 into three separate T Bins as follows:

100% destemmed (control)
30% whole cluster, 70% destemmed
100% destemmed with stems from 30% of the grapes (by grape weight) added back.

Each T Bin had a total of 1 ton of fruit added. The bin with the stems had 30% of the stem weight from the control treatment added to the bottom of the T Bin, and then had 2000 pounds of destemmed and crushed fruit added on top. The 30% whole cluster treatment had 600 pounds of whole clusters added at the bottom of the bin, and the rest of the crushed and destemmed fruit added on top. T Bins were inoculated with RC 212, had 40ppm sulfur dioxide added, and no sugar or acid additions were made. Each treatment received two punchdowns per day.

These wines were tasted on February 28, March 14, and April 4. In order to balance the data set to perform statistical analysis for descriptive analysis on the February 28 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 group 2 was transferred to group 1, and another judge from groups 2 and 3 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 (3) at the March 14 tasting, only slight trends will be discussed for the sensory information.

The same procedures for data analysis were used on the April 4 tasting. For the descriptive analysis in this tasting, two judges were eliminated from group 2 so that each group had two judges, for a total of 6 judges.

References

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