Chardonnay Lees Management with Extralyse (ARC)

Chatham Vineyards
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Summary

This study examined the impact of lees stirring and batonnage enzyme addition during Chardonnay aging on the chemical and sensory qualities of wine. Chardonnay juice was fermented partially in tank before being aeratively racked with lees inclusion to finish fermentation in barrels, and afterwards 2 different stirring regimes were imposed: unstirred and stirred with Extralyse (Laffort). Stirring occurred once per week for 8 weeks. No major chemical differences could be observed between treatments, and both wines underwent partial malolactic conversion. Wines tended to become more cold stable and heat stable over time, with stirring and Extralyse potentially making the wine slightly more heat stable than not stirring. Of 10 judges, 9 were able to correctly distinguish the wines from each other, showing that these wines were significantly different ($p<0.001$); however, this may have been because the stirred wine was cloudy. 8 out of 8 people tended to prefer the wine with Extralyse; however, the unstirred wine may have had some oxidized characteristics. Wine produced with Extralyse and Stirring had a strong tendency to be higher in Sweetness and Body, and tended to have slightly higher Yeast Character and Depth of Flavor. However, the stirring regime for this study was relatively short (8 weeks). In the future, more realistic stirring regimes should be implemented to see whether differences tend to increase over time

Introduction

Marchal et al. (2011) provide an excellent brief review of yeast autolysis in their introduction. Lees are mainly composed of yeast, bacteria, tartaric acid, polysaccharides, and protein-tannin complexes (Zoecklein 2013). Heavy lees generally refers to lees which precipitate 24 hours after fermentation (generally grape particles and large complexes of other lees particulates), and can often lead to off-aromas in wine. Light lees precipitate later and are generally beneficial to wine quality, and have less grape particulates and less heavily complexed yeasts and other lees particulates (Zoecklein 2005; Zoecklein 2013). Lees aging can decrease vanilla flavors from oak, and increase toasted flavors (Chatonnet et al. 1992; Tominaga et al. 2000). Others have observed that lees stirring increases yeast character in the wine, decreases fruit and oak character. In some cases, this reduction in oak character can increase the perception of fruit (relative to very oaky control wines) (Zoecklein 2005).

Lees aging also increases the polysaccharide content of wines, particularly mannoproteins, which may enhance wine protein and tartrate stability (Llaubères et al. 1987; Ledoux et al. 1992; Moine-Ledoux et al. 1997; Feuillat 2003; Zoecklein 2005; Zoecklein 2013). Sur lies aging releases mannoproteins and other cell wall polysaccharides which can enhance the colloidal structure, stability, and aromatic quality of red wines while reducing their astringency, making sur lie aging of red wines important (Zoecklein 2005). Although yeast-derived proteins can increase during lees aging, these proteins are not involved in protein instability (Zoecklein 1991).

Lees may also act to preserve fruity and varietal characteristics by preventing oxidation and producing a reducing environment (Marchal et al. 2011; Zoecklein 2013). The release of thiols into the wine from yeast has been attributed to lowering reductive characteristics by being able to oxidize methanethiol and ethanethiol into their non-volatile disulfide forms (Lavigne and Dubourdieu 1996);

however, this greatly depends on other factors in the aging process, and could impart a more reductive character to the wine. Yeast glycoproteins from autolysis may also decrease astringency in wines through interaction with phenolic compounds (Escot et al. 2001). Lees autolysis can also impart sweetness to wine (Zoecklein 2005; Marchal et al. 2001), which may be in part due to sweet peptide fractions released during cell autolysis. One such fraction appears to be derived from heat shock proteins (Hsp12p) (Marchal et al. 2011), which is expressed from high temperature, ethanol, oxidative stress, and glycerol concentrations (Varela et al. 1995). All of these factors are present under winemaking conditions (Marchal et al. 2011). The breakdown of peptides can result in aromatic precursors in wines (Zoecklein 2005), but may also provide more nitrogen for spoilage organisms to consume. Many of these impacts of lees aging can be affected by winemaking practices, such as frequency of stirring, amount of lees present, amount of oxygen ingress, pectinase/glucosidase enzyme additions (such as Extralyse by Laffort), and perhaps even quality of lees. This study examines the impact of one such lees stirring regime on the chemical and sensory qualities of wine.

Results and Discussion

No major chemical differences could be observed between treatments, and both wines underwent partial malolactic conversion. Wines tended to become more cold stable and heat stable over time, with stirring and Extralyse potentially making the wine slightly more heat stable than not stirring. Of 10 judges, 9 were able to correctly distinguish the wines from each other, showing that these wines were significantly different ($p<0.001$); however, this may have been because the stirred wine was cloudy. 8 out of 8 people tended to prefer the wine with Extralyse; however, the unstirred wine may have had some oxidized characteristics. Wine produced with Extralyse and Stirring had a strong tendency to be higher in Sweetness and Body, and tended to have slightly higher Yeast Character and Depth of Flavor.

Juice Chemistry

	Brix	pH	TA (g/L)	YAN (mg N/L)
Juice Chemistry	21.7	3.34	7.8	225

Wine Chemistry

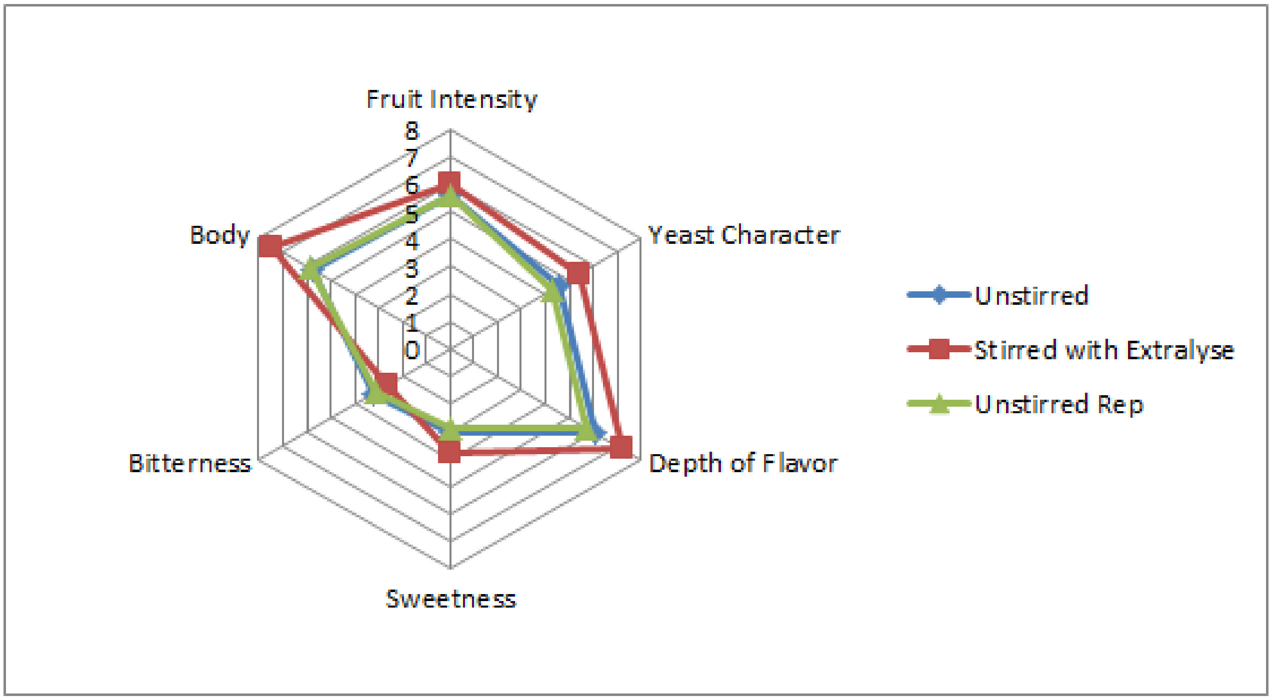
	Ethanol (%vol/vol)	Residual Sugar (g/L)	pH	TA (g/L)	Volatile Acidity (g/L)	Malic Acid (g/L)	Lactic Acid (g/L)	Total SO2 (ppm)	Free SO2 (ppm)
Unstirred	12.6	0	3.68	5.7	0.41	1.3	1.1	104.8	22.4
Stirred + Extralyse	12.7	0	3.71	5.8	0.37	1.3	1.1	116.3	26.7

Lab Results from Enology Analytics from Late January, 2017

Stability before and After Stirring Regimes

	Cold Stability - DIT	Heat Stability - Bentonite Fining (pounds per 1000 gallons)
Before Stirring Regime	17.60%	6
Unstirred	12.10%	3
Stirred + Extralyse	12.50%	2

Lab Results from ETS from Late January, 2017



Methods

5.423 tons of identically sourced Chardonnay Clone 4 grapes were hand harvested on 9/8/2016, chilled overnight and then whole cluster pressed. The fruit was in good condition with brown seeds, classic apple and pear tones typical of Chardonnay Clone 4. These were pressed at 34 degrees out of a refrigerated trailer from 30 pound yellow lugs. 2200L were received from 3 press loads on program #4 (Euromachines). The juice received 30ppm sulfur dioxide and 30mls/ton Color Pro enzyme, and 800 gallons of juice were then transferred to a 1500 gallon tank to settle at 40 degrees overnight. The juice was then racked and warmed up to 62 degrees. The juice was inoculated on 9/12 with 2 bricks of YSEO Cross Evolution rehydrated with 2 pounds Go Ferm. 2 pounds of Opti White were added at this stage as well.

Fermentation temperature was set at 65 degrees. On 9/14, the fermentation was chaptalized with 75 pounds of sugar and 2 pounds of Fermaid, at which point the temperature was reduced to 60 degrees. The juice was aeratively racked with lees inclusion into French Oak barrels to undergo 4 to 5 weeks of barrel fermentation. The barrels used were a mixture of D&J, Cadus, Billon, 30% new, 2nd year, and 3rd year wood.

After fermentation was complete, on November 16 Extralyse was added to the Extralyse barrel and a stirring regime was commenced in the following manner:

1. Unstirred barrel, no Extralyse
2. Stirred barrel, 6g/hL Extralyse added

Barrels were stirred once per week with 6 to 8 strokes. Wine was stabilized with 20 grams of KMBS per barrel, and samples were shipped to the WRE on January 2017.

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