Hyperoxidation Fining Trials of Petit Manseng

Early Mountain Vineyards
Submitted by Ben Jordan

Summary

This study examines the effect of adding fining agents to hyperoxidized Petit Manseng juice on the sensory and phenolic characteristics of Petit Manseng. After reducing the temperature to 10-12°C, Petit Manseng juice was hyperoxidized by pumping four volumes of juice over a sump screen, taking about 10 minutes. After this process, juice was very brown and then sulfur dioxide was added at 50ppm. Juice was then split into two vessels, one of which was fined with casein, PVPP, and bentonite to remove solids and phenolic compounds. All other treatments between juices and wines were identical. Overall, no major chemical, color, or phenolic differences were observed between the wines, suggesting that fining juice after hyperoxidation does not do much to alter the color and phenolic properties of the wine. Triangle testing suggests that the wines were significantly different from each other ($p<0.001$), likely due to a difference in turbidity. No preferences could be seen for one wine over the other. The fined wine had a slight tendency for lower Tropical Fruit and increased Bitterness/Astringency.

Introduction

Skin contact in Petit Manseng wines may pose a viable solution to reducing the acidity found in these grapes. Apart from some benefits such as potential for enhanced aromatic quality, skin contact in white wines can result in wines which are more bitter and phenolic. One option that has been explored to reduce the negative impacts of skin contact is hyperoxidation of juice prior to any form of sulfite or yeast addition. This hyperoxidation is meant to oxidize phenolic compounds in juice so that oxidized phenolic compounds are pulled out of solution during solids precipitation in fermentation. However, the efficacy of hyperoxidation is importantly determined by the initial phenolic content and polyphenol oxidase concentration of the juice, which can vary widely among varieties. Although hyperoxidation is thought to result in lower quality in wine (Singleton et al. 1980; Boulton et al. 1996), others have found that hyperoxidation may have no effect or even positive effects on wine quality (Müller-Späth 1977; Valouyko and Papyakan, 1984; Nagel and Graber 1988; Cheynier et al. 1989). In this study, the effect of hyperoxidation compared to hyperoxidation with juice fining afterwards is compared.

Results and Discussion

Overall, no major chemical, color, or phenolic differences were observed between the wines, suggesting that fining juice after hyperoxidation does not do much to alter the color and phenolic properties of the wine. For the triangle test, of 31 people who answered, 25 people chose the correct wine (81%), showing a statistically significant difference between wines ($p<0.001$). This was likely due to the difference in turbidity between wines. These wines were voted to have an average degree difference of 4.7 (out of 10), suggesting that the wines were moderately different. In general, there was no preference for one kind of wine over the other. No strong trends could be seen for the wines with the descriptors used in this study. The fined wine had a slight tendency for lower Tropical Fruit and increased Bitterness/Astringency.

Juice Chemistry

	Brix	Density (g/mL)	pH	TA (g/L)	Malic Acid (g/L)	Ammonia (mg/L)	NOPA (mg N/L)	YAN (mg N/L)
Hyperoxidized	26.0	1.101	3.48	6.98	5.56	62.23	107	169
Hyperoxidized and Fined	25.6	1.106	3.49	6.90	4.27	62.23	107	169

Chemistry after Primary Fermentation

	Ethanol (%vol/vol)	Residual Sugar (g/L)	pH	TA (g/L)	Volatile Acidity (g/L)	Malic Acid (g/L)
Hyperoxidized	14.9	0.55	3.40	7.50	0.65	2.96
Hyperoxidized and Fined	14.7	0.59	3.42	7.95	0.65	3.07

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)
Hyperoxidized	15.2	0.7	3.45	7.5	0.78	2.8	0.2	96.0	23.2
Hyperoxidized and Fined	14.9	0.9	3.49	7.3	0.81	2.8	0.1	121.2	20.9

Lab Results from Enology Analytics in Late January, 2017, except for pH and VA (from ETS)

Color Profile

	A420	A520	A620	Hue (420/520)	Intensity (420 + 520)	Intensity (420 + 520 + 620)
Hyperoxidized	0.167	0.030	0.010	5.650	0.196	0.206
Hyperoxidized and Fined	0.154	0.027	0.010	5.786	0.181	0.191

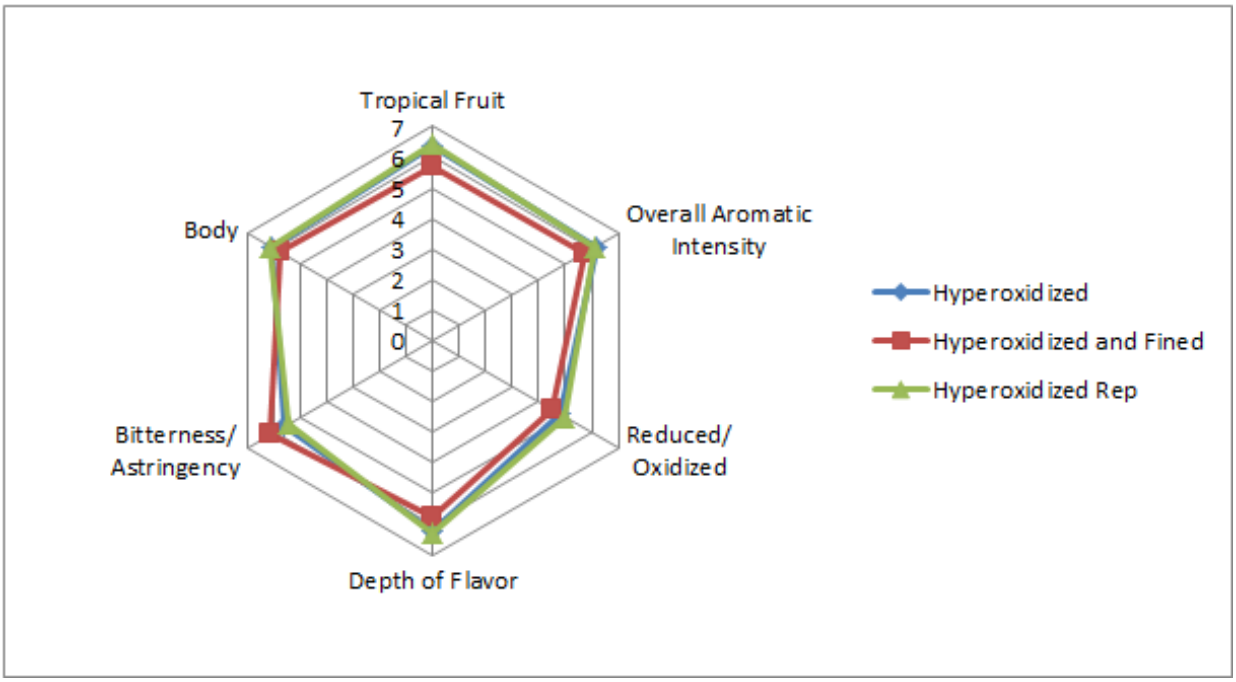
Lab Results from ETS in Late January, 2017

Phenolic Profile

	Caffeic Acid (mg/L)	Caftaric Acid (mg/L)	Catechin (mg/L)	Gallic Acid (mg/L)	Quercetin Glycosides (mg/L)	Tannin (mg/L)	Astilbin (mg/L)	Grape Reaction Product (mg/L)	Quercetin Aglycone (mg/L)
Hyperoxidized	0.6	9.3	<0.2	<0.2	<0.2	12.7	0.6	1.3	<0.2
Hyperoxidized and Fined	0.7	9.8	<0.2	<0.2	<0.2	12.2	0.6	1.4	<0.2

Lab Results from ETS in Late January, 2017

	Hyperoxidized	Hyperoxidized and Fined	Total
Preferred	54%	46%	24



Methods

Note: Hyperoxidation protocol adapted from Enartis (attached below for reference).

One block (4.033 tons) of Petit Manseng grapes were harvested on 9/13, stored overnight, and then destemmed, slightly crushed, and pressed on 9/14 into 2 separate but identical fermentation vessels. 52g of Lafazyme Extract were added at pressing, but no sulfur dioxide was added until hyperoxidation was completed. 2100L were pressed, and 450L were taken for the experiment.

The juice temperature was dropped to 10-12°C. The juice was then hyperoxidized by pumping 4 volumes of juice over a sump screen (achieved approximately 30% saturation of dissolved oxygen). The pumpover process took 10 minutes, with a starting dissolved oxygen content of 0.16mg/L, halfway through a content of 1.75mg/L, and at the end a content of 3.45g/mL. At this stage, the juice was very brown, and 50ppm sulfur dioxide was added to the juice which was subsequently split equally into two vessels. One of the two vessels was fined to remove solids and pigment on 9/15 (a mixture of 0.1 g/L casein, 0.15 g/L PVPP, and 0.35 g/L bentonite) whereas the other remained with solids (was unfined). Each lot was then allowed to settle until 9/16, upon which they were both racked to identical barrels.

The juices were then inoculated on 9/17 with Lalvin QA23 yeast (0.25g/L) which was rehydrated with 0.3g/L Go Ferm. On 9/21 Superfood and DAP was added at a rate of 0.15g/L and 0.8g/L, respectively. These were added again on 9/22, with double the amount of DAP. On 10/6 fermentation was stopped with 50ppm sulfur dioxide, and on 12/15 sulfur dioxide was added again.

For the triangle test and preference analysis for the March 15 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 March 15 tasting, any judge who had not fully completed the descriptive analysis ratings were removed. In order to then make the amount of judges between groups equivalent, one judge from group 1 and group 2 were eliminated. This resulted in a final data set of 3 groups, each with 9 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 Tropical Fruit, Overall Aromatic Intensity, Reduced/Oxidized (as a scale from most reduced to most oxidized), Depth of Flavor, Bitterness/Astringency, and Body.

References

Singleton, V.L., Zaya, J., and Trousdale, E. 1980. White table wine quality and polyphenol composition as affected by must SO_2 content and pomace contact time. Am. J. Enol. Vitic. 31:14-20.

Valouyko, G.G. and Papyakan, A.B. 1984. Perfection de la technologie de production de vins blancs de table à la base de l'étude des proprieétés d'oxydation de moût et de vin. Presented at the 3rd Bulgarian Scientific and Technic Conference on Enology. Sofia, Bulgaria.

Müller-Späth, A. 1977. Connaissances nouvelles sur l'influence de l'oxygène en vinification vue sous l'angle de la pratique. Die Weinmirtschaft. 6:1-12.

Nagel, C.W. and Graber, W.R. 1988. Effect of must oxidation on quality of white wines. Am. J. Enol. Vitic. 39:1-4.

Cheynier, V., Rigaud, J., Souquet, J.M., Barillère, J.M., and Moutounet, M. 1989. Effect of pomace contact and hyperoxidation on the phenolic composition and quality of Grenache and Chardonnay wines. Am. J. Enol. Vitic. 40:36-42.

Boulton, R, Singleton, V, Bisson, L, and Kunkee, R. 1996. Principles and Practices of Winemaking. New York: Chapman Hall; 1996.

Enartis Protocol

Objective:	Reduce the risk of pinking
PRESSING	Reduce press rotations in order to minimize the mechanical action on skins and by consequence the extraction of polyphenolic compounds. Under the press, add 2g/hL of Enartis Zym RS
OVEROXIDATION	· Use only low contaminated healthy grapes. · Do not add SO_2 before overoxidation. · Decrease juice temperature to 10-12°C in order to avoid wild yeast multiplication

	· Add oxygen till when juice turns brown. Quantity of oxygen/air varies in function of juice characteristic. Indicatively, o if it's pure oxygen addition: 50 ppm. o If it's air: 20-30 liter/100 liter of juice. o If it's open pumping over: pump-over the entire volume of juice 2 or 3 times · Add oxygen/air in the cloudy juice: tyrosinase is bound to solids. · Oxygen addition must be completed within 1 hour. · Keep the temperature low in order to avoid the onset of fermentation. · Control the hygiene of the cellar and the equipment in order to minimize the risk of microbial contamination.
SETTLING	Indicatively, add 30 – 40 g/hL of Claril SP (PVPP, K caseinate, bentonite and silica) to accelerate the clarification, compact the lees and clean the juice. Rack off quickly, even though the juice is not perfectly clean, in order to keep under control wild yeast growth.
CLEAN JUICE	+ 80 ppm WINY (potassium metabisulfite)
PIED DE CUVE (5% of the total volume)	Control the YAN content: wild yeast growth in the SO_2 free period may cause a lack of YAN for the selected yeast. In order to favor selected yeast domination, the preparation of a *pied de cuve* is recommended. · In 5% of juice, eventually filtered and acidified to correct the pH at about 3.3, inoculate the quantity of yeast necessary to inoculate the total volume to be fermented at the rate of 30 g/hL Enartis Ferm Aroma White or ES123 or Top Essence. Do not decrease the inoculation rate below 30 g/hL in order to have more guarantee of selected yeast domination over the wild population. · In the pied de cuve, together with the yeast, add the quantity of Nutriferm Arom (Plus) necessary to treat the entire volume of juice with a rate of 20-30 g/hL. · When the *pied de cuve* has started to ferment vigorously, add it into the entire volume of juice.
FERMENTATION	After 1-2 % alcohol formation, correct YAN content up to 200 ppm by adding DAP Keep the temperature at about 14-16°C At 1/3 sugar depletion, + 200 g/ton Nutriferm Advance, DAP + yeast hulls rich in sterols and surviving factors. It prevents sluggish fermentation and reduction. An open pump-over or the addition of 10-15 mg/L of oxygen will help a complete and regular fermentation.
END OF THE AF	Rack and adjust free SO_2 at about 20-25 ppm