Impact of Yeast Derivative Treatments on Smoke-Tainted Cabernet Sauvignon Wine

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Introduction

With the risk of wildfires in wine-growing regions increasing every year, the wine industry needs to address the challenge of removing or masking the unpleasant volatile phenolic compounds present in smoke-tainted juice/wine. The ability of yeast derivatives to mask or balance these undesirable wildfire volatile phenols (4-methylguaiacol, o-cresol, syringol, and 4-methylsyringol), especially on the retronasal mid-palate were explored. These volatile phenols often give many negative sensory notes to the wine, both aromatically and on the palate. The primary goals of this study were to either:

1) Mask the smoke sensory characteristics with the yeast derivatives, or
2) Remove the smoke phenolics from the wine with yeast derivatives.

Materials and Methods

Winemaking: Smoke-impacted Cabernet Sauvignon grapes were harvested from the Napa Valley AVA for 2020 harvest and processed using standard winemaking regimens at the University of California Davis Teaching and Research Winery. 10 gallons of the affected wine were then obtained for this research purpose.

Experimental Design: Two experimental yeast derivative treatments were compared at incremental concentrations to establish sensory masking effects or removal of phenolic compounds. Being that the experiment was conducted in triplicate, the wine was divided into 30, 750mL bottles. Yeast derivatives provided by Laffort USA were labeled Yeast Derivative #1 & Yeast Derivative #2. For each derivative, 50g/hL, 100g/hL , 250g/hL, and 500g/hL dosage rates were employed. A 10% solution was prepared via supplier's instructions and used for each dosage rate. A regular battonage was employed weekly to ensure full contact with the yeast derivative products for approximately six weeks. Upon completion, the wines were filtered and volatile phenol panel conducted via gas-chromatography mass-spectrophotometry.

- Dosages:

Derivative #1: 50 g/hL, 100g/hL, 250g/hL, 500g/hL
Derivative #2: 50 g/hL, 100g/hL, 250g/hL, 500g/hL

Materials and Methods (Continued)

Table 1 Experimental Design

SAMPLE VOLUME	ADDITION RATE	STOCK VOLUME (10%)
A) 750 mL	0 g/hL	0 mL
B) 750 mL	50 g/hL	3.75 mL
C) 750 mL	100 g/hL	7.5 mL
D) 750 mL	250 g/hL	18.75 mL
E) 750 mL	500 g/hL	37.5 mL

Fig. 1 Wildfire smoke in a Vineyard, St Helena 2020

Name	N [%]	C [%]	H [%]	S [%]	C/N ratio	C/H ratio	Prot. [%]
YD #1	4.26	48.14	8.23	0.16	11.3	5.85	26.62
YD #2	6.76	44.96	7.53	0.33	6.65	5.97	42.23

Table 2 Yeast Derivative Composition Ratios

Results

ID	4-methylguaiacol ug/L	o-cresol ug/L	syringol ug/L	4-methylsyringol ug/L
CONTROL	6.7	21.2	18.7	6.9
D1 50g/hL	6.6	22.1	18.4	6.9
D1 500g/hL	5.6	31.2	15.7	6.8
D2 50g/hL	7.5	24	20.3	8.8
D2 500g/hL	7.1	30.2	19.5	8.2

Table 3 VP levels in wine treatments

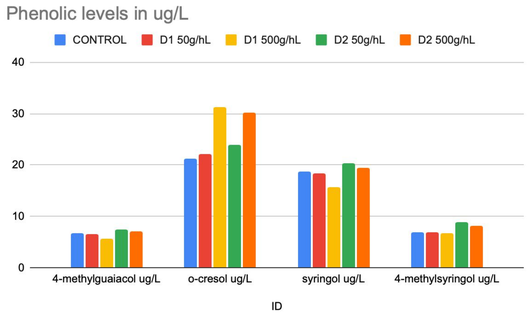

Fig. 2 VP levels in wine treatments

Conclusions

- Of the nine volatile phenols evaluated via GC-MS, only four were determined to be significantly different as identified above.
- GCMS data shows that the yeast derivatives were both ineffective at removing the phenolic smoke compounds from the wine. However, the derivatives were designed as a means to mask the smoke effects and as such a solid conclusion can only be reached after also conducting a sensory panel on the trial wines. This panel is pending approval from Fresno State admin to establish sensory effects of the treatments, and their intended masking properties.

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