

Impact of Activated Carbon and Polyvinylpyrrolidone Treatments for Amelioration of Smoke Tainted Cabernet Sauvignon Wine

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Introduction

- The wine industry is faced with a growing problem of wildfire smoke causing grapes to be possibly unsuitable for fermentation. The volatile phenols present in wildfire smoke impart unpleasant sensory notes to the wine. This issue impacts wine producing regions on an international scale, and therefore methods for effective removal of these VPs with minimal impact on wine quality are necessary.
- The goal of this project was to investigate the effect of activated carbon and polyvinylpyrrolidone (PVPP) treatments on smoke phenols (guaiacol, o-cresol, m-cresol, p-cresol, phenol, syringol, and 4-methylsyringol) as well as wine structure in a smoke-tainted Cabernet Sauvignon wine.

Materials and Methods

- Smoke-impacted Cabernet Sauvignon berries were harvested from Napa Valley and processed using conventional wine production methods. The wine was then treated (in triplicate) with two amelioration regimens: activated carbon, and activated carbon in conjunction with polyvinylpyrrolidone (PVPP). Both treatments were used at manufacturer's recommended dosage, as well as a second treatment at a double concentration with an extended contact time.
- Gas-chromatography mass-spectrometry was used to determine which treatment was more effective. A sensory panel is planned pending approval.



Wildfire smoke in a Vineyard in St. Helena, CA, harvest 2020

Materials and Methods (Continued)

- Experimental design and trial concentrations are as follows:

Treatment ID	Carbon (g/hL)	PVPP (lb/1000gal)
Control	0	0
Carbon low	50	0
Carbon-PVPP low	50	2
Carbon high	100	0
Carbon-PVPP high	100	4

Table 1 Experimental Dosages

Results

ID	Guaiacol ug/L	o-cresol ug/L	m-cresol ug/L	p-cresol ug/L
CONTROL	35.7	21.2	21.9	15.3
CARBON Low	34.6	18.6	20.1	13.6
CBN+PVPP Low	33.9	18.3	19.6	13.5
CARBON High	28.4	13.3	15.3	10.5
CBN+PVPP High	28.7	14.4	15.5	10.6

Table 2a Phenolic Levels in Wine Treatments

ID	cresols (sum) ug/L	phenol ug/L	syringol ug/L	4-methylsyringol ug/L
CONTROL	58.2	96.5	18.7	6.9
CARBON Low	52.4	98.8	23.6	8.5
CBN+PVPP Low	51.4	99.1	23.4	8.5
CARBON High	40.1	85.9	20.2	7
CBN+PVPP High	40.5	86.5	20.4	7.2

Table 2b Phenolic Levels in Wine Treatments

Results (Continued)

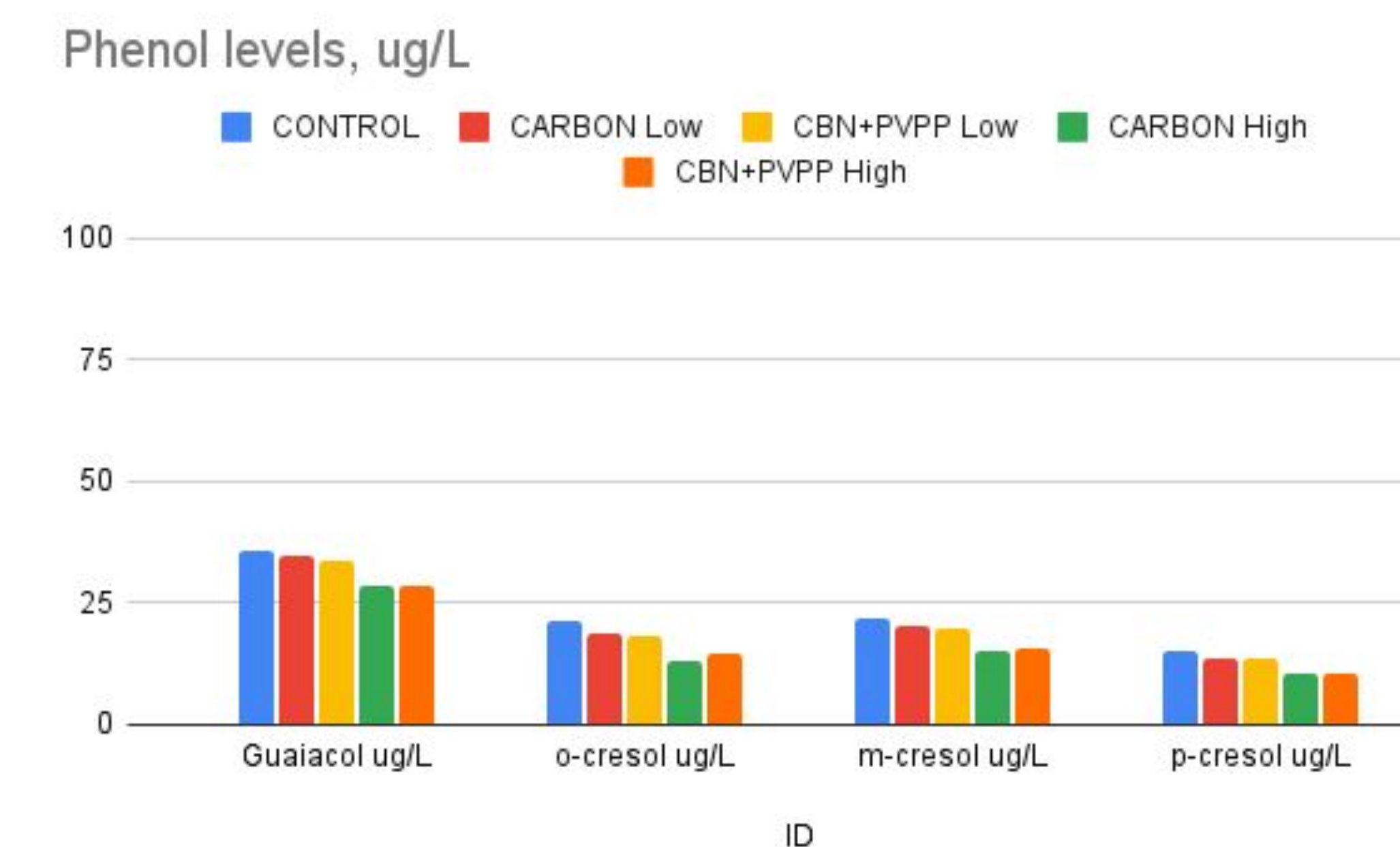


Fig 1: Phenol Levels in wine treatments

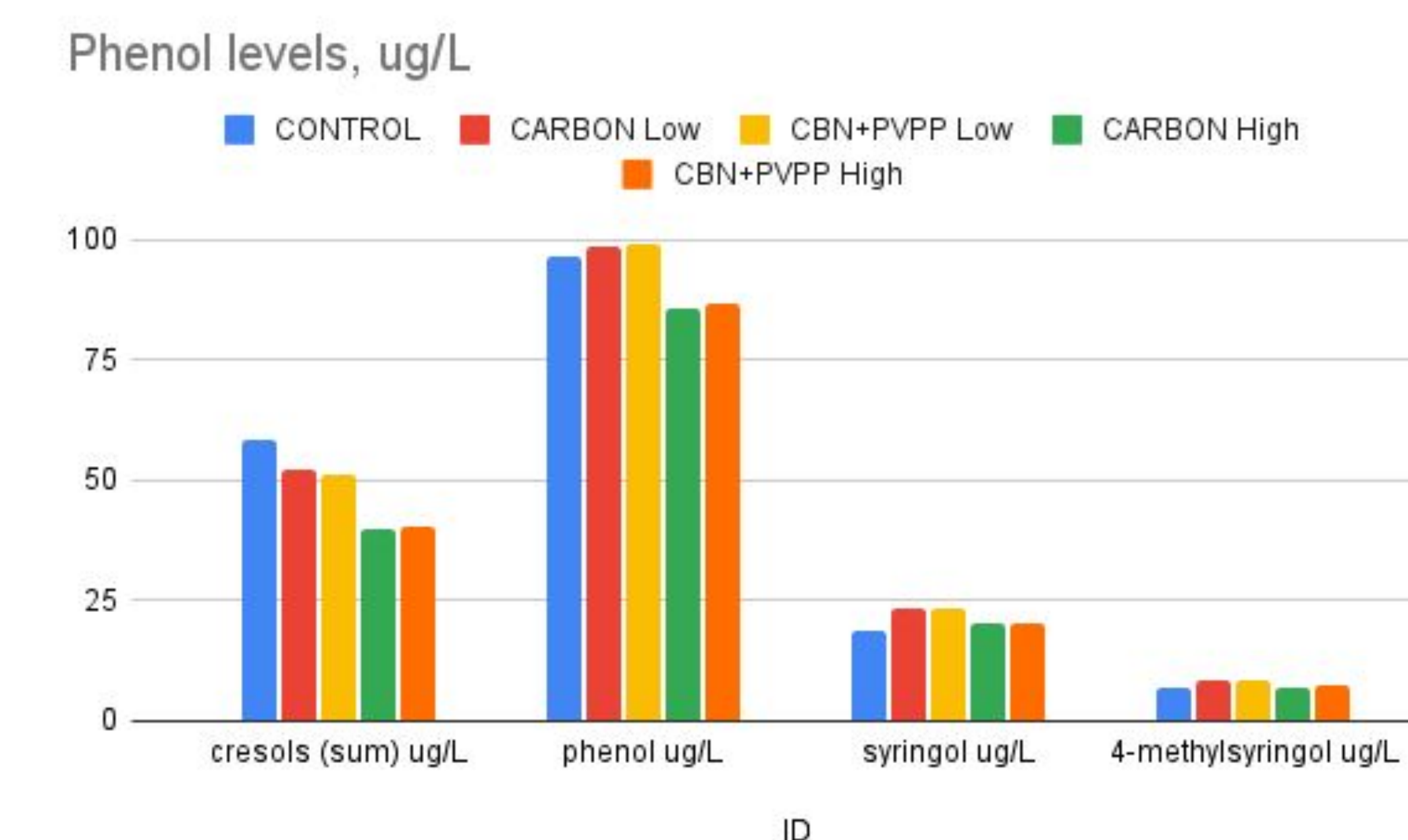


Fig 2: Phenol Levels in wine treatments

Conclusions

From a chemical standpoint, all four treatments were successful in lowering the amount of phenolics present in the wine. The high dosages proved much more effective at this, as expected. The differences in removal between the carbon and carbon-pvpp treatments were minimal. As for the preservation of positive wine character by pvpp, a sensory panel is pending approval from Fresno State admin to establish sensory effects of this treatment.

Acknowledgements

- Fresno State for funding
- Dr. Qun Sun for funding and advising
- Fresno State Winery for providing materials
- UC Davis for providing materials