SURVEYING BACKGROUND LEVELS OF GUAIACOL AND 4-METHYL GUAIACOL IN SAUVIGNON BLANC AND CABERNET SAUVIGNON VINEYARDS IN LAKE COUNTY

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Introduction

In 2018, fruit from many vineyards in Lake County were significantly affected by volatile phenolic compounds and glycocides contained in fresh smoke that originated from numerous wildfires in the region. In an analysis of both fruit and wine from 13 vineyards sampled across a transect in the region, it was determined that vineyards most affected were those that were inundated with smoke that originated closest to actively burning fires. Not all vineyards within the sample set were uniformly affected, but smoke compounds could be found in fruit from almost all vineyards. In many cases, the smoke compounds were at a concentration that did not cause detectable smoke flavors when tasted. Two volatile phenolic compounds, guaiacol and 4-methyl guaiacol, are used as indicators in lab assessments to determine the level of smoke exposure in both fruit and wine. There is a high correlation between the amount found in fruit and the potential for the concentration of these compounds when the fruit is fermented. While lab tests are quantitative, qualitative information can be made by micro-fermentations which allow for actual assessment by tasting of wine made from affected fruit. The wine can then be analyzed for further verification of volatile phenolic compounds in the lab if needed.

It was recommended by research enologists at both UC Davis and the Australian Wine Research Institute (AWRI) to evaluate the same 13 vineyards to determine if there are natural background levels of guaiacol and 4-methyl guaiacol. In Australia, some cultivars show a natural background level of these compounds, even when vines have not been subjected to smoke.

Materials and Methods

In this study conducted in 2019, 60 pounds (lbs) of Cabernet Sauvignon fruit was sampled from 13 Cabernet Sauvignon vineyards in a transect across Lake County (approximately 15 miles long) representing the major growing regions. Twelve (12) Sauvignon Blanc vineyards were also sampled in a similar way. A one-pound berry sub sample from each vineyard was analyzed immediately by a commercial lab for guaiacol and 4-methyl guaiacol. Whole berries were finely ground in presence of an internal standard and extracted by Headspace/SPME. Analysis was performed by GC/MS. Calibration was built using berries not exposed to smoke, spiked with known amounts of guaiacol and 4-methylguaiacol.

With the remainder of the fruit, microvinifications were made using Australian Wine Research Institute protocol to produce sound stable uniform wine samples in 19-liter fermentation vessels, preserved with sulfites and bottled from each vineyard, eight (8) 750-ml bottles total for each vineyard sampled. Sample wine from each wine lot was then analyzed by a commercial lab for guaiacol and 4-methyl guaiacol in California (analysis as previously described).

Results and Discussion

There was no measured guaiacol or 4-methyl guaiacol above the detectable threshold of 1 µgram/kg in any of the Cabernet Sauvignon vineyards (Table 1) or Sauvignon Blanc vineyards (Table 2) in either fruit that we sampled and microvinifications that we made.

Based on this limited sample, we conclude that the guaiacol and 4-methyl guaiacol measurements detected in the Cabernet Sauvignon vineyards in our studies done in 2018 were due to smoke inundation. We have no reason to believe that there is a natural contribution to volatile phenolic compounds in Cabernet Sauvignon vineyards not

exposed to smoke. There is no indication that Sauvignon Blanc vineyards produce background levels of volatile phenolic compounds either.

We recognize that this sample size is quite small and that more sampling and assessment of fruit and microfermented wine would contribute to a more robust data set. Regardless, the data presented represent considerable effort and expense, and the sampling and measurement procedures were conducted with precision.

Table 1: Volatile phenol content of fruit and wine, Cabernet Sauvignon vineyards, Lake County, 2019

Sample Number	***Location***	***Total Guaiacol (µg/L)***	***Total 4-methylguaiacol (µg/L)***
1	Big Valley A	*0.0*	*0.0*
2	Big Valley B	*0.0*	*0.0*
3	Kelsey Bench	*0.0*	*0.0*
4	Red Hills A	*0.0*	*0.0*
5	Red Hills B	*0.0*	*0.0*
6	Red Hills C	*0.0*	*0.0*
7	Lucerne	*0.0*	*0.0*
8	High Valley A	*0.0*	*0.0*
9	High Valley B	*0.0*	*0.0*
10	Middletown	*0.0*	*0.0*
11	Lower Lake	*0.0*	*0.0*
12	Kelseyville	*0.0*	*0.0*
13	Upper Lake	*0.0*	*0.0*

Table 2: Volatile phenol content of fruit and wine, Sauvignon Blanc vineyards, Lake County, 2019

Sample Number	***Location***	***Total Guaiacol (µg/L)***	***Total 4-methylguaiacol (µg/L)***
1	Kelseyville	0.0	0.0
2	Big Valley A	0.0	0.0
3	Red Hills	0.0	0.0
4	Lower Lake	0.0	0.0
5	Big Valley B	0.0	0.0
6	Upper Lake	0.0	0.0
7	Lucerne	0.0	0.0
8	Big Valley C	0.0	0.0
9	Red Hills	0.0	0.0
10	High Valley	0.0	0.0
11	Kelsey Bench	0.0	0.0
12	Big Valley D	0.0	0.0