Viticulture and Enology Program
Washington State University

Jackson Family Wines

Comparison of Nano- and Microscale Fermentations for Evaluation of Risks Associated with Smoke Exposure

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Introduction

Micro- or bucket-scale fermentations have been used as a tool to evaluate the impact of vineyard smoke exposures prior to harvest. While chemical analysis or sensory evaluation of the resulting wines can be used to identify affected blocks, a key limitation for their usefulness is the amount of time required to complete fermentation, along with lack of temperature control and the amount of space required. This study set out to determine if nano-scale fermentations could be used to assess risk more quickly and with more control.

Materials and Methods

Microscale (bucket) fermentations were carried out in 5-gallon buckets under ambient conditions. Nano-scale fermentations were completed using 16-22 oz glass canning jars placed in an 85°F water bath heated with a sous vide heater (Figure 2). Daily punch downs were completed on all samples. Analysis of smoke marker compounds was completed using HS-SPME-GC-MS/MS.

Results

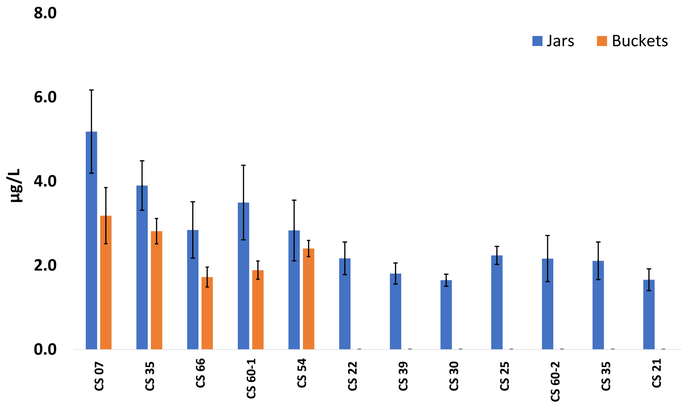

Figure 1: Free guaiacol content (µg/L) in 12 Cabernet Sauvignon wines. Guaiacol content was below the limit of quantification in seven of the bucket-fermented wines. (n=3, except for CS07, CS35 and CS22, where n=9).

Nano-scale fermentations are faster, more controlled, and more predictive than traditional bucket fermentations for evaluating smoke exposure risk pre-harvest.

Figure 2: Nano-scale (A) and bucket (B) fermentation set ups show the decreased space requirement with nano-scale fermentations. Bucket fermentations completed in 7-8 days, while nano-fermentations completed in less than 48 hours.

Results (continued)

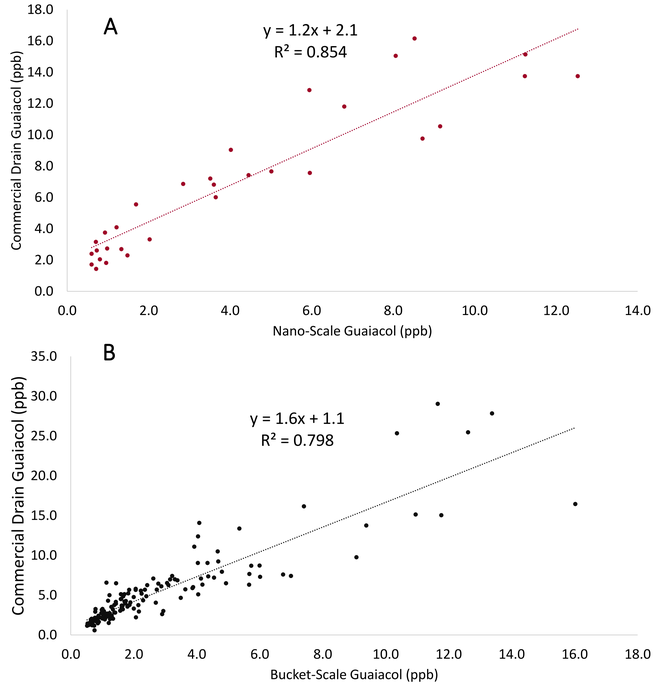

Figure 3: The correlations between nano-scale (A) or bucket-scale (B) fermentations and commercial drain tanks are similar for free guaiacol concentrations but show slightly better predictability in nano-scale fermentations (n=31 nano-scale; n=143 bucket-scale).

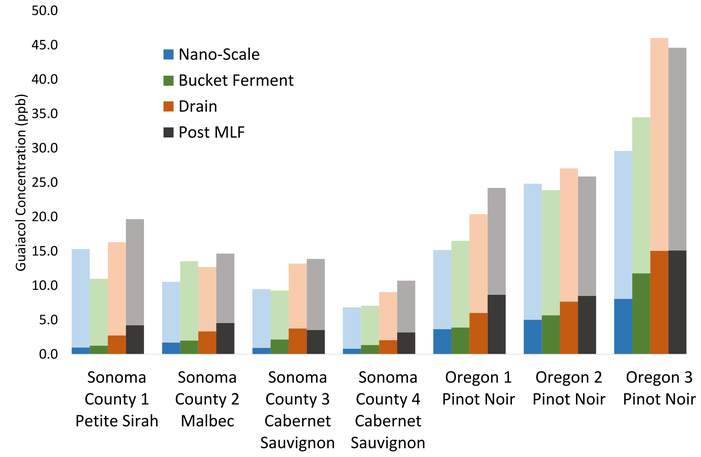

Figure 4: Evolution of free (solid bar) and total (translucent bar) guaiacol from nano- or bucket-scale fermentations to commercial drain and post malolactic samples at seven sites shows a slight increase in guaiacol with fermentation scale and wine age.