

Remediation of smoke-affected wine by dilution



Background

When grapes are exposed to smoke, they can absorb volatile phenols, which bind to sugars in the grapes, forming non-volatile phenolic glycosides. In wine, both volatile phenols and their glycosides can cause unpleasant 'ashy' and 'smoky' sensory properties and a lingering aftertaste, commonly described as 'smoke taint'.

Dilution studies on smoke-affected wine

Blending with an unaffected wine is one option for managing a smoke-affected wine, with the goal of diminishing or eliminating smoke-related sensory characters. This option was evaluated in a trial using a smoke-affected 2019 Pinot Noir rosé wine. The smoke-affected wine was blended with an unaffected Pinot Noir wine of a similar style sourced from the same vintage, to produce a series of six samples: 100% smoke-affected wine, 50%, 25%, 12.5%, 6.25% and 0% (equivalent to 100% unaffected wine). Wines were assessed by the AWRI smoke panel for 'smoke' aroma and flavour and also 'overall fruit' aroma and flavour (Table 1).

As expected, the 100% smoke-affected wine was scored much higher ($P < 0.05$) in 'smoke' aroma and flavour than the unaffected wine and had the lowest rating for 'overall fruit' aroma and flavour. Dilutions of the affected wine with 87.5% or more unaffected wine resulted in low 'smoke' aroma and flavour scores which were not significantly different from the unaffected wine. The decline in 'smoke' aroma and flavour with increased dilution followed a linear pattern (Figure 1).

Table 1. Attribute mean scores for each wine blend (n=11 judges x 2 replicates). The intensity of each attribute was rated using a line scale (0 to 10).

Blend	Smoke aroma	Smoke flavour	Fruit aroma	Fruit flavour
100% smoke-affected wine	6.7*	7.0*	2.2*	1.8*
50% smoke-affected wine	4.5*	4.9*	2.7*	2.4*
25% smoke-affected wine	2.4*	2.3*	3.6*	3.4*
12.5% smoke-affected wine	1.2	1.4	3.7	4.0
6.25% smoke-affected	0.5	0.7	4.3	4.2
100% unaffected wine	1.0	0.9	4.2	4.0

*Significantly different attribute score to the unaffected control wine ($P < 0.05$).

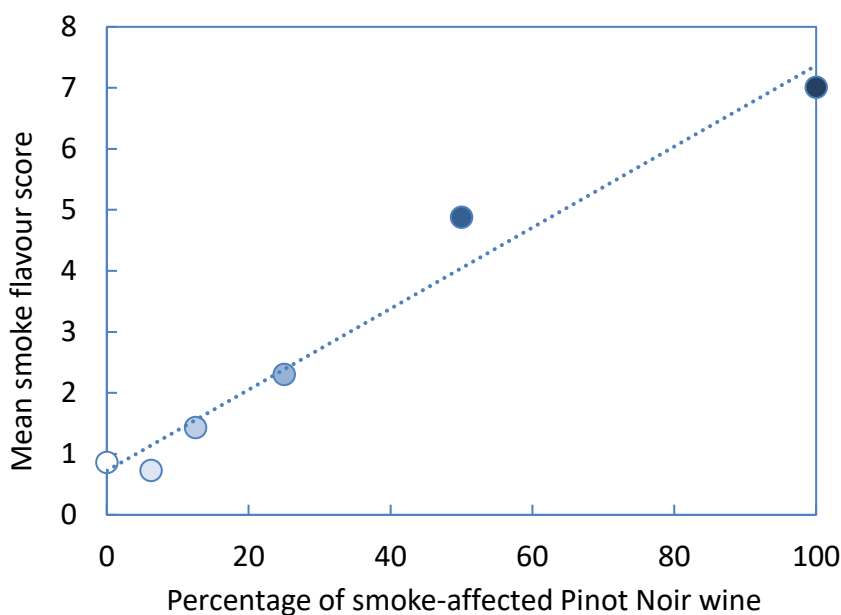


Figure 1. The relationship between the percentage of smoke-affected wine in the blend and the mean score for smoke flavour (linear regression $R^2=0.97$).

Comparison of smoke compounds in diluted wine to background levels

The AWRI maintains a database of the background levels of volatile phenols and phenolic glycosides that occur naturally in grapes that have not been exposed to smoke (and wines made from those grapes). This background data can be compared to analytical results from potentially smoke-affected fruit and wine to determine the likelihood of the fruit or wine being affected by smoke (assuming no oak contact for wine).

The concentrations of volatile phenols and phenolic glycosides in the wines in this dilution study (100%, 50%, 25%, 12.5% and 6.25% smoke-affected wine) were compared against those in the background database (Figures 2 and 3, respectively). The grey bars in Figure 2 and Figure 3 represent the 99th percentile values (i.e. 99% of the data collected for non-smoke-exposed samples are at or below this concentration). For the volatile phenols in this particular wine, 25% or less of the affected Pinot Noir rosé wine in a blend resulted in concentrations within or just above the background levels. A similar result was observed for the phenolic glycosides. If smoke compounds are diluted in an affected wine to concentrations equivalent to those in the background database for that particular variety, then it is likely that the perception of smoke characters will be greatly decreased and more desirable 'fruit' aroma and flavours may be enhanced.

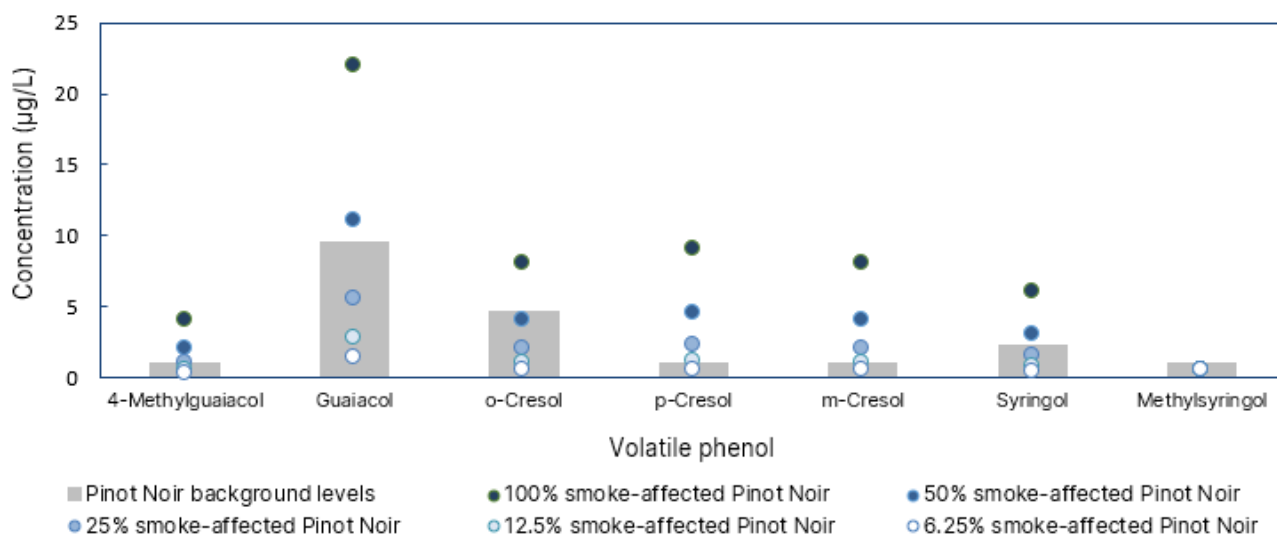


Figure 2. Smoke volatile phenol concentrations for the diluted rosé wines (circle symbols) compared to the 99th percentile values for Pinot Noir red wine (grey bars) from the AWRI's background levels database.

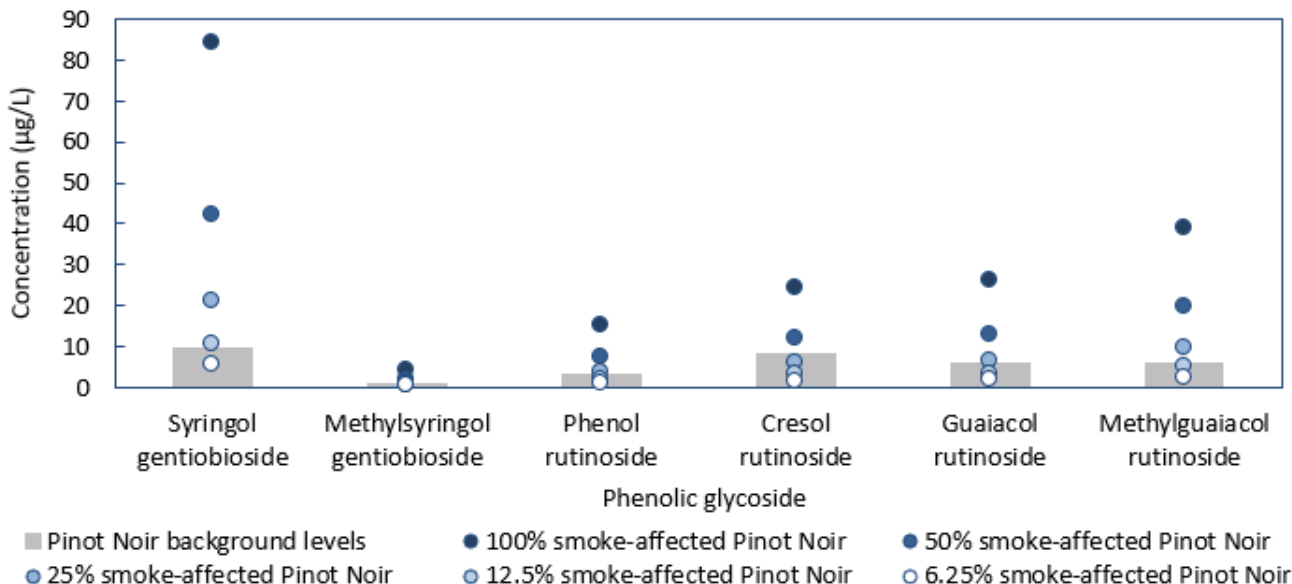


Figure 3. Smoke phenolic glycoside concentrations for the diluted rosé wines (circle symbols) compared to the 99th percentile values for Pinot Noir red wine (grey bars) obtained from the AWRI’s background levels database.

Recommendations and conclusions

Blending can be an effective option for remediation of smoke-affected wine. In this study, dilution with 87.5% or more of an unaffected Pinot Noir rosé wine of a similar style was needed to lower the smoke taint intensity to levels not significantly different from the unaffected wine. Similar results were obtained for a smoke-affected 2016 full-bodied Pinot Noir wine, where 75% or more was sufficient (data not shown). However, further sample sets should be investigated to assess whether this result is applicable more broadly.

The level of dilution required to dilute smoke characters sufficiently will depend on the level of smoke compounds in the wine and the sensory properties of the unaffected wine used as the blending wine. It is therefore recommended that blending trials are conducted on small volumes of wine to determine a final wine blend with suitable sensory characteristics.

As with all remediation treatments for smoke-affected grapes and wines, producers should consider the costs and benefits of this approach and their own individual circumstances and wine characteristics.

Acknowledgement

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