AWRI Australian Wine Research Institute

Fact Sheet
WINEMAKING

Treating smoke-affected wine with untoasted oak chips

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 juice and wine, both volatile phenols and their glycosides can cause unpleasant 'ashy' and 'smoky' sensory sensations and a lingering aftertaste, commonly described as 'smoke taint'.

Can untoasted oak chips mitigate smoke taint?

Toasted oak (barrels, chips, staves) is commonly used during wine fermentation or maturation to impart toasty and smoky sensory characteristics on wine. These changes are attributable to compounds being transferred from the surface of the oak into the wine, with several of those compounds being identical to those volatile phenols implicated in smoke taint. In small quantities these compounds can impart desirable characteristics to the wine and contribute complexity.

It has been postulated that untoasted oak might absorb compounds from wine into the wood, including smoke taint molecules, and therefore be a possible remediation strategy for smoke-affected wines. Trials were undertaken to test this hypothesis.

Updated November 2022

Assessing performance

Summary of trials performed

Smoke-affected 2020 Pinot Noir, Shiraz and Durif wines were treated with untoasted oak chips at commercial wineries under the conditions outlined in Table 1. The effectiveness of untoasted oak in remediating smoke-affected wine was evaluated by chemical and sensory analysis (both formal sensory analysis by the AWRI's sensory panel and informal sensory assessments by the winemakers undertaking the trials).

Table 1. *Summary of trials performed on smoke-affected wine using untoasted oak chips*

Wine	Brand of untoasted oak*	Dose rate (g/L)	Wine volume treated	Temp (°C)	Contact time (weeks)
Pinot Noir	BF Boise	3	30 L	18	3
Durif	Oenofirst ROO	3	30 L	16-18	4
	Oenofirst ROO	4	30 L	16-18	4
Shiraz 1	BF Boise	3	30 L	12	4
Shiraz 2	BF Boise	3	30 L	18	3

Two commercially available untoasted oak chips were selected for the trials: Oenofirst ROO supplied by Seguin Moreau and BF Boise supplied by Grapeworks. It is important to note that neither product is marketed to reduce smoke taint.

Impact on smoke taint compounds and wine sensory characteristics

The sum of the volatile phenols (n=7) and sum of the phenolic glycosides (n=6) for each of the control and oak treated wines, along with the mean ratings for smoke aroma and smoke flavour are provided in Table 2.

The results show that the addition of untoasted oak chips to smoke-affected wine did not reduce the concentrations of the smoke taint compounds compared to the control wines, and in some instances, the concentrations of volatile phenols increased. Similarly, the oak treatment did not lower the perception of smoke characters, and in some cases it significantly increased it (i.e. for the Durif and Shiraz 1 wine). Despite these observations from the AWRI's sensory panel, winemakers who assessed the wines thought the oak masked bitterness and increased the perception of fruit sweetness and freshness, although the wines still finished with a 'smoky' aftertaste. Dose rate had a significant impact, with the higher dose rate of 4 g/L for the Durif wine being perceived as too aggressive and imparting a dryness that exacerbated the 'smoky' aftertaste in the wine. In addition, variety was important with oak treatment having more influence on the sensory properties of the lighter Pinot Noir wine than the Durif and Shiraz wines.

Table 2. *Sum of the volatile phenols, phenolic glycosides and mean ratings for smoke aroma and smoke flavour for each of the control and oak-treated wines*

Treatment	Sum of volatile phenols	Sum of phenolic glycosides	Smoke aroma	Smoke flavour	Significantly different from the control*?
Pinot Noir					
Control	40	54	2.10	3.64	-
Untoasted oak chips 3 g/L	41	57	1.80	2.86	No
Durif					
Control	24	395	0.15	0.75	-
Untoasted oak chips 3 g/L	34	402	1.15	1.63	Yes, aroma only
Untoasted oak chips 4 g/L	38	397	1.32	1.41	Yes, aroma and flavour
Shiraz 1					
Control	56	110	1.66	2.67	-
Untoasted oak chips 3 g/L	61	104	3.02	2.99	Yes, aroma only
Shiraz 2					
Control	56	161	0.42	1.19	-
Untoasted oak chips 3 g/L	54	173	0.71	1.17	No

*Based on sensory analysis ratings for smoke aroma and smoke flavour; Sum of volatile phenols = additive concentrations (in µg/L) of 4-methylguaiacol, guaiacol, *o*-cresol, *p*-cresol, *m*-cresol, syringol and 4-methylsyringol; sum of phenolic glycosides = additive concentrations (in µg/L SyGG equivalents) of syringol gentiobioside (SyGG), methylsyringol gentiobioside (MSyGG), phenol rutinoside (PhRG), cresol rutinoside (CrRG), guaiacol rutinoside (GuRG) and 4-methylguaiacol rutinoside (MGuRG).

Conclusions/recommendations

In this series of trials with commercial wine producers, treatment of smoke-affected wine with untoasted oak chips did not reduce or eliminate smoke compounds and in some instances the concentrations of volatile phenols increased. The use of untoasted oak chips to remediate smoke-affected wine could be explored on a case-by-case basis to determine its potential for masking the perception of smoke taint. It is recommended to undertake pilot-scale trials to see if the desired sensory outcomes can be achieved before treating larger volumes.

Acknowledgements

This work was supported through funding from the Wine Victoria Bushfire Technical Response Program which aims to deliver a suite of technical support activities for Victorian grape and wine producers affected by the 2020 bushfires. Wine Victoria has received funding from the Victorian Government to facilitate winemaking remediation trials. Wine Network Consulting is thanked for collaboration on this project.

The AWRI's communications are supported by Australian grapegrowers and winemakers through their investment body, Wine Australia, with matching funding from the Australian Government. The AWRI is a member of the Wine Innovation Cluster.

WINE VICTORIA
AUSTRALIA

wine Network Consulting

Contact

For further information, please contact: AWRI helpdesk

Phone 08 8313 6600 **Fax** 08 8313 6601 **Email** helpdesk@awri.com.au

Website https://www.awri.com.au/industry_support/winemaking_resources/smoke-taint/

Address Wine Innovation Central Building, Corner of Hartley Grove & Paratoo Rd, Urrbrae (Adelaide), SA 5064