Does the application of horticultural products to grapes form a protective barrier against smoke taint?

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Introduction

- After wine-grapes are exposed to smoke in the vineyard, the grapes may become 'smoke-tainted' via absorption of volatile phenols such as guaiacol.
- Once within the berry, the 'free' phenols bind enzymatically with sugars to form non-volatile glycosides ('bound' phenols).
- 'Free' and 'bound' phenols, if present in high enough concentrations, are detrimental to grape and wine quality.
- Wine made from smoke-exposed grapes may have an excessively drying back-palate and retro-nasal 'ash' character, making the wine unpleasant to consume.

Aim

To evaluate the effectiveness of 12 commercially available horticultural products at preventing the uptake of volatile phenols by grapes and assess the potential to mitigate smoke taint through targeted viticulture management practices.

Figure 1. Coated (a) Shiraz or (b) Muscat Gordo grapes (n=36) plus non-treated controls (n=3) placed inside a glass vessel containing volatile phenols.

Materials and methods

- Triplicate bunches (150-250 g) of Muscat Gordo or Shiraz grapes (Barossa, SA) were coated (via dipping) with each of 12 horticultural products.
- Coated grape bunches (n=36), along with three non-treated controls, were placed randomly in a glass rectangular vessel (91 cm x 38 cm x 45 cm) (Figure 1).
- Grapes were exposed to gaseous volatile phenols (via evaporation from aqueous solutions containing guaiacol, syringol, *o*-cresol, *m*-cresol and phenol) for approximately 60 hours.
- Experiments were performed outdoors under ambient conditions but with some shade to avoid excessive heat and sunburn.

Results and discussion

- Generally, most treatments did not provide much, if any, protection (Tables 1 and 2).
- Most materials tested resulted in higher levels of free phenols and their glycosides.
- Highest uptake of volatile phenols was observed for the more oily/hydrophobic materials.
- These results suggest that many horticulture products (or their carriers and wetting agents) can have a negative impact on the protective properties of grape skins.

Table 1. Total volatile phenols (n=5) in treated grapes as a percentage of total volatile phenols observed in the control

Grape variety	Treatment											
	PCP-1	SP-2 + Carbon	SP-1	PCP-2	AT-1	Drying oil	CS-1	PCP-3	SP-2	Silicone oil	SP-3	SP-2 + TiO_2
Muscat Gordo (Exp1)	+++		+	++		+++	++	+		+	+	
Muscat Gordo (Exp2)	+++	+		+	-	+++	+++	+	+	+++		
Shiraz	+++	N/A		++	+	+++	+++	+++	++	+	+	+++

	% relative to the control
-	50-89
	90-109
+	110-149
++	150-200
+++	>200

Table 2. Total phenolic glycosides (n=22) in treated grapes as a percentage of total phenolic glycosides observed in the control

Grape variety	Treatment											
	PCP-1	SP-2 + Carbon	SP-1	PCP-2	AT-1	Drying oil	CS-1	PCP-3	SP-2	Silicone oil	SP-3	SP-2 + TiO_2
Muscat Gordo (Exp1)	+++		+	++		+++	++	+		+	+	
Muscat Gordo (Exp2)	+++	+		+	-	+++	+++	+	+	+++		
Shiraz	+++	N/A		++	+	+++	+++	+++	++	+	+	+++

PCP = Pest control product
SP = Sunscreen protectant
AT = Anti-transpirant
CS = Cuticle supplement
Exp1 = Experiment 1
Exp2 = Experiment 2

Conclusions

None of the coatings tested effectively prevented the uptake of volatile phenols by grapes. These results suggest that smoke taint mitigation efforts may be better focused in the winery.

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