

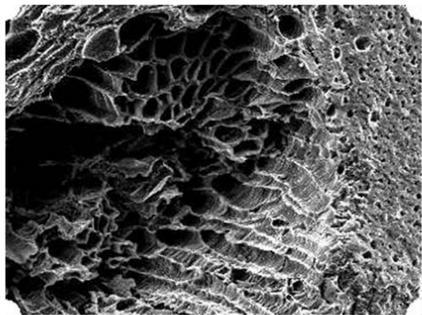
# Evaluating activated carbon products for removal of phenols and their glycoconjugates from smoke-affected juice and wine



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## Introduction

- Exposure of grapes to smoke results in the uptake of volatile phenols (VPs) such as guaiacol, cresol and syringol.
- VPs, once absorbed into the berry, are enzymatically converted into a range of non-volatile glycoconjugates.
- In wine, VPs and their corresponding glycoconjugates can cause an unpleasant 'ashy' and 'smoky' sensory sensations and a lingering negative aftertaste, which is commonly described as smoke taint.
- Treatment with activated carbon (AC) products has been shown to remove taint compounds from drinking water and reduce the perception of smoke taint in wine.

## Aims

- To evaluate a range of AC products for their ability to remove volatile phenols and their corresponding glycoconjugates from smoke-affected juice and wine.
- To determine whether the efficacy of AC products in removing VPs predicts their ability to remove glycoconjugates.

## Materials and methods

- Fourteen commercially available AC products were evaluated
- Grape varieties evaluated: Merlot, Cabernet Sauvignon, Pinot Noir, Mataro, Sauvignon Blanc, Riesling, Chardonnay
- Dose rate: 0.5-2.0 g/L; contact times: 2-24 hours; juice or wine, 50 mL.
- Samples were analysed post-treatment for VPs by GCMS and for phenolic glycoconjugates by HPLC-MSMS.



## Results and discussion

- Removal of glycoconjugates depended on carbon type and dose rate (Figure 1).
- Higher removal of glycoconjugates was observed in white wine compared to red wine (Figure 2).
- Generally, AC products were less effective at removing smoke taint molecules from wine than juice (compare Figure 1 to 2 and see Figure 3).
- Some AC products removed more glycoconjugates (Figures 1, 2, 4); others were better at removing VPs (Figure 3).
- Some AC products exhibited good removal of both VPs and glycoconjugates.
- Contact time of 2 vs 24 hours made little difference in removal efficiency (data not shown).

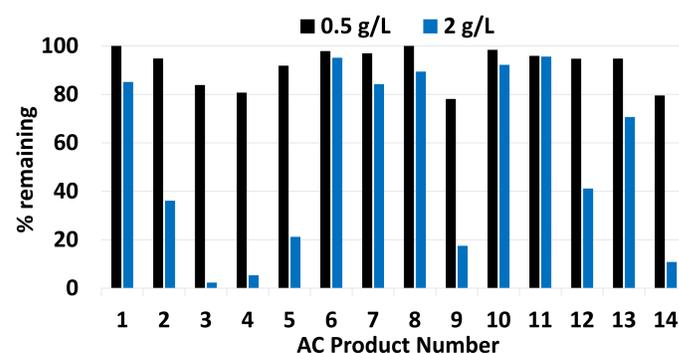


Figure 1. Total smoke glycoconjugates remaining in 2018 smoke affected Orange Sauvignon Blanc juice after treatment with AC products at two dose rates (0.5 and 2 g/L) for 24 hrs

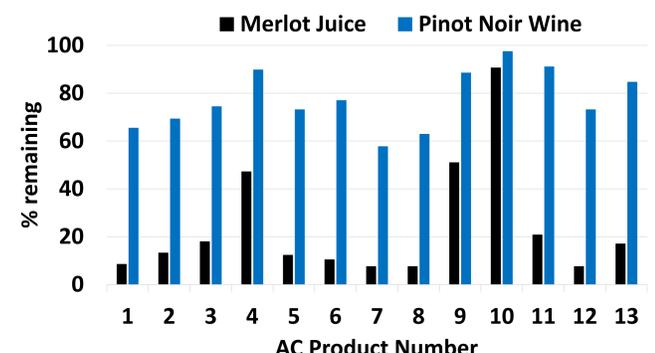


Figure 3. Total VPs remaining in VP-dosed 2016 artificially smoked Merlot juice and naturally smoke-affected Pinot Noir wine after treatment with AC products at 0.5 g/L for 24 hrs

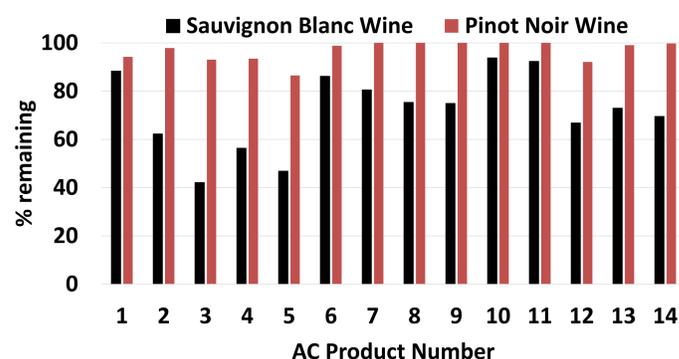


Figure 2. Total smoke glycoconjugates remaining in 2018 smoke-affected Orange Sauvignon Blanc and Pinot Noir wines after treatment with AC products at 2 g/L for 24 hrs

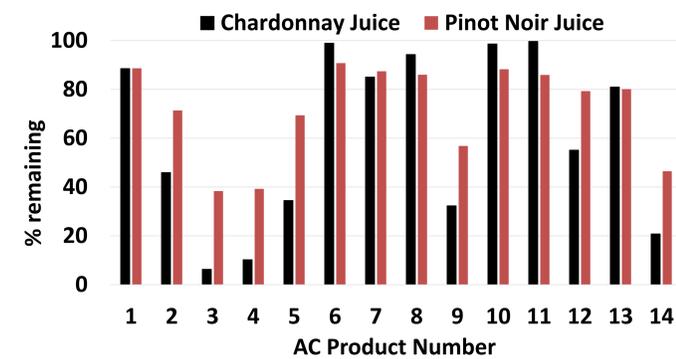


Figure 4. Total smoke glycoconjugates remaining in 2019 smoke-affected Tasmanian Chardonnay and Pinot Noir juice after treatment with AC products at 2 g/L for 24 hrs

## Conclusions

- Benchtop evaluation allows quick screening of activated carbon products for their ability to remove smoke taint molecules in juice and wine.
- Activated carbon products are not equal, with some exhibiting higher affinity for smoke glycoconjugates or volatile phenols compared to others.
- Activated carbon products #3 and #14 were selected for small-scale (50 litre) winemaking trials, using smoke-affected Chardonnay and Pinot Noir juice from Tasmania (2019) treated prior to fermentation. Fermentations are complete with wines awaiting bottling and sensory evaluation.