

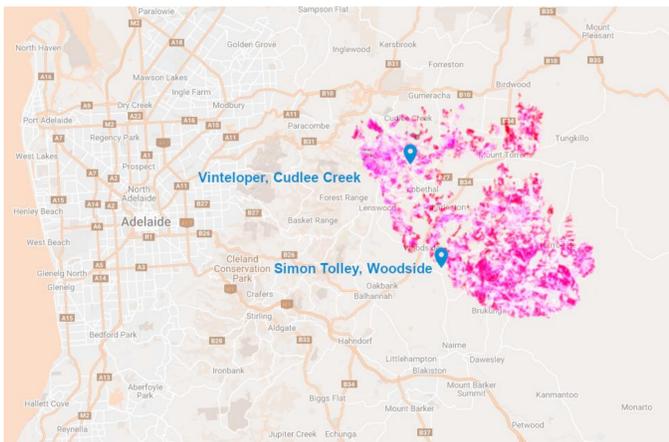
INTRODUCTION & AIMS

As climate change exacerbates the risk of wildfires near Australian vineyards, novel techniques to mitigate the impacts of smoke taint (associated with volatile phenol (VP) compounds such as guaiacol, phenol..etc) on grapes and wines are increasingly relevant. Considering the long history of consumer acceptance of VP compounds in distilled beverages (e.g., malt whisky), it was hypothesised that wine distillation and spirit maturation may provide an option to turn smoke damaged products into a profitable beverage. In this way, there could be control of the volatile phenol content in the spirit or perhaps the different matrix would afford a flavour profile that was accepted by consumers.

The study aimed to evaluate:

- The feasibility and consumer acceptability of distillates and brandies produced from smoke tainted fruit.
- Assess the behaviour of volatile phenol flavour compounds over the course of the brandy production process.

MATERIALS & METHODS



<https://www.adelaidenow.com.au/bushfiresupport/satellite-images-reveal-damage-caused-by-fires-in-adelaide-hills-and-on-kangaroo-island/news-story/4d92b9495801b4737826117034b0fda>

Fig. 1 Vegetation Destruction Measured By European Space Agency SA Sentinel 2 Satellite, 2020 Cudlee Creek Bushfires

- Experimental distillates for maturation were produced from two vineyards (Fig 1.) affected by the 2020 Cudlee Creek Fires. These were double pot distilled using cuts taken from traditional Cognac production [1].
- 2 Tonnes of smoke tainted Shiraz, Pinot Noir and Sauvignon Blanc were sourced from Woodside and 1 Tonne of Pinot Gris was sourced from Cudlee Creek
- Time series (monthly) sampling of maturing brandies for chemical analysis. Sensory analysis of matured stocks at 1-2 years of age.

 GC-MS: quantitation of volatile phenol compounds

 Sensory: Perception of volatile phenols and consumer acceptance in mature brandies using Rate All That Apply (RATA).

RESULTS

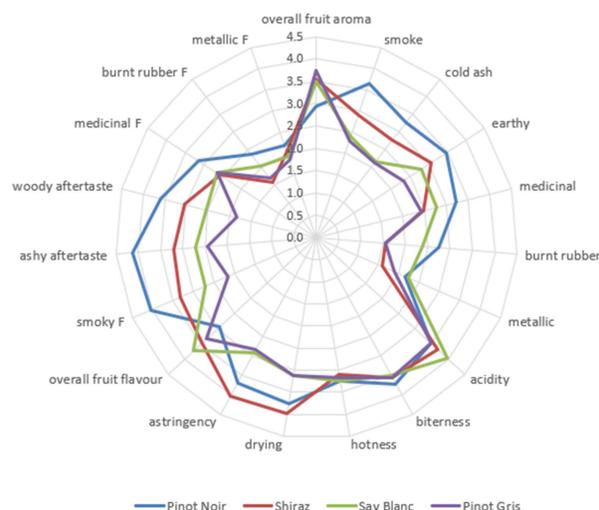


Fig. 2 Sensory Perception of Smoke Tainted Base Wines Using RATA n= 54, all Sig 0.05

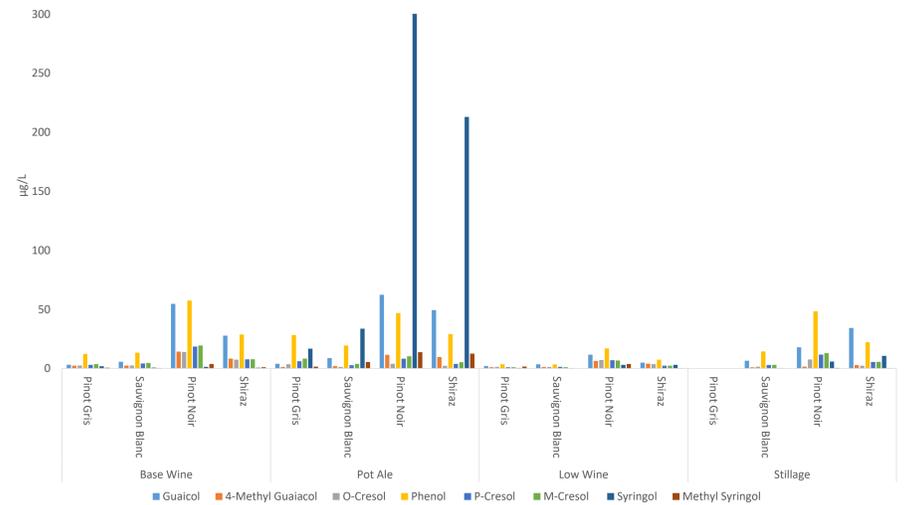


Fig. 3 Concentrations ($\mu\text{g/L}$) of Volatile Phenols in Distillation Charges and Waste Streams, normalised to 10% ABV

Volatile Phenol Content of Distillate Fractions

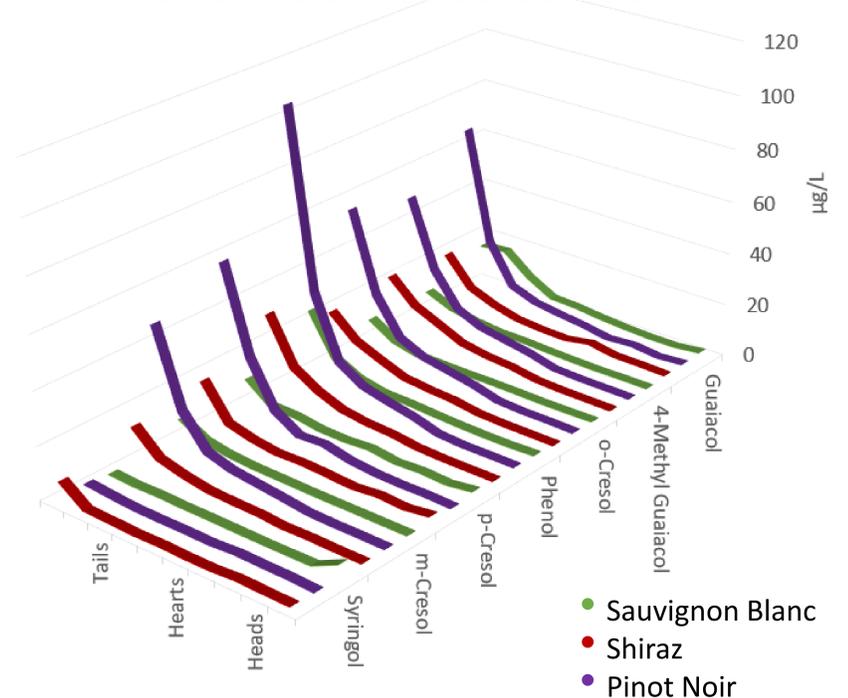


Fig. 4 Concentrations ($\mu\text{g/L}$) of Volatile Phenols in Smoke Tainted Distillate Fractions, normalised to 10% ABV

- All base wines collected from the 2020 Cudlee Creek fires were found to be recognisably “smoky” by a sensory panel (Fig. 2) with the white varieties averaging a “very-low / low” rating and the reds a “low / medium” rating.
- Significant syringol was released in the distillation of the red varieties (Shiraz and Pinot Noir), and was retained in the pot ale (1st distillation) and stillage (2nd distillation) (Fig. 3) minimising its impact on the secondary distillates.
- Due to the high boiling point and low volatility of VP compounds, the majority of the VPs were concentrated in the pot ale and stillage (Fig. 3).
- VP compounds generally accumulated in the latter (mostly tails) fractions of the distillations (Fig. 4).

CONCLUSIONS

- Preliminary results indicate that volatile phenol compounds are significantly reduced in distillation products in the natural fractionation processes.
- Tuning of this process by adjusting cut points and reflux may allow for further control of the presence of volatile phenolic compounds in brandy products.
- Further chemical and sensory analysis of the aged barrel replicates will be necessary to understand whether any residual smoky flavours are present in the brandies, and whether these have impacts on consumer preference for such a spirit.
- The outlook is promising however, that smoke tainted wine grapes can be diverted to brandy production in future extreme fire events. While the market price for distillation fruit is typically much lower than for table wine production, diverting tainted fruit to distillation may prove to be a preferably option to discarding otherwise unsalvageable grapes.