

# Impacts of Smoke on Grapes and Wine in Victoria



## Background

Smoke from bushfires negatively impacts on the quality of grapes and wine by causing undesirable smoky flavours and aromas.

The impact of smoke from wildfires (compared to prescribed burns) is generally greater due to a combination of intensity, duration, topography and proximity to the fire.

## What is known...

- Guaiacol and 4-methylguaiacol are two of the compounds associated with the smoke effect in fruit and wines.
- Fruit from grapevines has shown the highest sensitivity to smoke-effect at seven days after the onset of ripening<sup>1</sup>.
- Repeated and longer exposure to smoke results in increased levels of guaiacol and 4-methylguaiacol through a cumulative effect<sup>1,2</sup>.
- Levels of “smoke” compounds can increase in wine over time due to these compounds becoming released from bound forms.
- Some techniques can reduce the “smoke effect”. They include hand harvesting of fruit (to reduce contamination from leaves), chilling grapes after harvest, altering strength and duration of grape pressing time and reverse osmosis treatment of the wine<sup>2</sup>.
- No carry over effect from one growing season to another.

## King Valley experience<sup>2</sup>

As a result of the north east Victorian fires in the 2006-07 season, a loss of approximately \$75-90 million worth of wine occurred after many crops were unable to be salvaged.

The level of guaiacol and 4-methylguaiacol reported in fruit harvested from the King Valley region during 2007 was variable. Guaiacol ranged from 183µg/kg to very low and 4-methylguaiacol ranged from 29µg/kg to almost non-existent over sixteen sites and five varieties tested.

The variability can be partly explained by site-specific wind patterns (speed and direction) and also location of vineyards and prevailing wind direction in relation to the fire.

The level of guaiacol and 4-methylguaiacol in wine is not necessarily a reflection of what was present in the grapes. The ratio of extraction from grapes to wine can vary from 0.5 to 8.3. However, both the wine and juice aroma assessments correlated well with the measurements of guaiacol and 4-methylguaiacol.

Susceptibility of grapes to “smoke effect” varies between varieties with observations so far indicating Sangiovese > Cabernet Sauvignon > Chardonnay > Shiraz > Merlot\*.

\* Please note that these observations are based on only one season of data.

## Currently unknown...

A large collaborative approach is currently being undertaken across Australia to solve the issue of smoke effect on grapes and wine.

This includes research on controlled experiments in field, glasshouse and laboratory as well as samples of grapes taken from vineyards affected by prescribed burns and wildfire situations.

Specifically, research focuses on:

- Investigation of compounds contributing to smoke effect – Department of Agriculture and Food WA (DAFWA) and University of Adelaide.
- Identification of guaiacol glycosides and other precursors or smoke compounds in grapes and wine, and their expression in the wine - University of Adelaide.
- Extractability of smoke compounds into wine in relation to management processes (such as hand harvesting, duration of skin contact and pressing of grapes after fermentation) - AWRI.
- Location of smoke compounds in grapes and vines and their mode of smoke entry into grapevines and fruit – DPI Victoria.
- Effect of stage of development and variety on susceptibility of grapevines to smoke taint – DAFWA, Curtin University of Technology, the University of Adelaide and DPI Victoria.

Information gathered from current research will assist the development of an impact assessment tool for growers and land managers to use in setting and achieving controlled burning objectives.

## Summary

As we move into a hotter drier climate, smoke from bushfires and prescribed burns will become more prevalent. The combined efforts of research agencies, land managers and the grape and wine industry across Australia are essential to enable the future management of smoke taint by the grape and wine industry in Australia and overseas.



## Acknowledgements

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Photos: Courtesy of Stephen Lowe (King Valley Vignerons).

## References

1. Kennison K.R., Wilkinson K.L., Williams H.J., Smith J.H. and Gibberd M.R. Smoke-derived taint in wine: Effect of postharvest smoke exposure of grapes on the chemical composition and sensory characteristics of wine. *J. Agric. Food Chem.* 2007, 55, 10897-10901.
2. Krstic M.P. and Whiting J. Understanding the sensitivity to timing and management options to mitigate the negative impacts of bush fire smoke on grape and wine quality – Scoping study. Victorian Department of Primary Industries, 2007.