Insight into Smoky and Medicinal Flavour Associated With Smoke-Affected Wines

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Introduction

This study is part of a large research project aiming to understand the effect of bushfire smoke on grapes and wines. Our goal is to understand the chemical basis for the undesirable aromas and flavours associated with smoke-affected wines, particularly the undesirable lingering ashy or smoky flavour. Recent work at AWRI has identified a suite of volatile phenols and their glycoconjugates that are present at elevated levels in smoke-affected grapes and wine. A sensory study using three of these glycoconjugates was carried out to investigate their aroma and flavour properties. More detail about the volatile phenols, glycoconjugates and the sensory aspects of smoke-affected wines can be found in four accompanying AWRI posters.

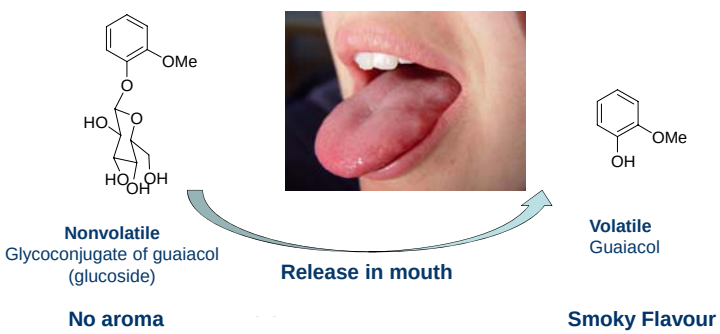

Figure 1. Release of volatile phenols from glycoconjugates in the mouth

Volatile phenols

Recent work at AWRI has shown that numerous volatile phenols are present in bushfire smoke, and can be absorbed by the grape berry and leaves during a smoke event. The volatile phenols, especially guaiacol and *m*-cresol, influence the sensory characteristics of smoke-affected wines. These compounds have low thresholds (23 and 20 µg/L respectively), contributing to smoky and medicinal aromas and flavours. However, on reconstitution of a smoke tainted wine using all the volatile phenols, the lingering unpleasant smoky or ashy flavour was not evident.

Glycoconjugates of volatile phenols

Our research has shown that in the plant, these volatile phenols undergo biotransformation, with each forming up to seven nonvolatile glycoconjugates. These glycoconjugates can be extracted into the wine during winemaking, and persist in the final wine in concentrations up to 10 mg/L in total. Of the glycoconjugates, syringol gentiobioside is usually the most abundant.

Sensory study using pure glycoconjugates

Pure guaiacol glucoside, syringol glucoside, and *m*-cresol glucoside were sythesised and characterised. The compounds were assessed by a sensory panel in model wine (10% food grade ethanol in saturated potassium hydrogen tartrate solution) at 0.5 mg/L. The concentration of the free volatiles was confirmed to be below 1 µg/L. The panel (N=30) rated 'smoky' and 'medicinal' aroma, and 'smoky/ashy' and 'medicinal' flavour, in duplicate, with a forced rest of two minutes between samples.

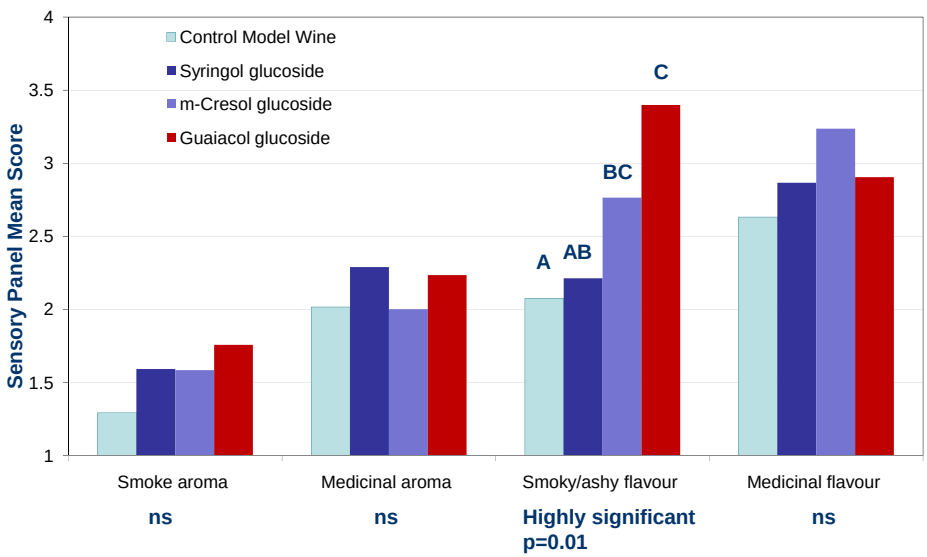

Figure 2. Aromas and flavours associated with the glucosides
Samples with different letters are significantly different, p=0.01

Results

The presence of guaiacol and *m*-cresol glucosides caused significant smoky/ashy flavour compared to the control, despite imparting no significant difference in the aroma compared to model wine. There was no significant effect for the syringol glucoside. While the medicinal flavour was not significant overall, there were nine sensitive people who could detect a significant medicinal flavour due to the *m*-cresol glycoside. Chemical analysis (by GC-MS) of expectorated samples confirmed that free volatiles had been released.

Conclusions

When present at concentrations found in smoke-affected wine, the glycosides had smoky/ashy or medicinal flavours, despite imparting no significant aromas. This implies that the glycosidic bond is hydrolysed in the mouth, perhaps by salivary enzymes or microbes, releasing free volatiles that are perceptible retronasally. The release reaction is fast enough to provide amounts of free phenols that can be perceived retronasally in a time frame that is meaningful. Further work is needed to investigate the flavour activities of the various glycoconjugates present in smoke-affected wines, and to assess the contribution to the smoky and medicinal flavours relative to the free volatiles.

AWRI staff sensory panel is gratefully acknowledged
The AWRI is a member of the Wine Innovation Cluster

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