

OREGON WINE



P O R T L A N D

SYMPOSIUM

# Analysis and Remediation Strategies for Smoke Affected Wines

Jasha Karasek, Winemaking Specialist, Vinqury Labs



VINQUIRY  
LABORATORIES  
by enartis

# Overview

- Background on Vinqury smoke taint analysis
- Smoke Taint Markers
- Free vs. Total markers
- Smoke and Sensory
- Interpreting Results



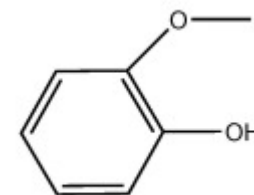
# Brief Background of Smoke Taint Analysis and Vinquiry Labs

- In 2009 industry was not fully aware that smoke compounds were present in grapes as glycosides. Most research was only on free smoke taint compounds
- 2010 Hayasaka et al. determined smoke compounds can be converted into glucosides in the vine
- 2013 Parker et al. determined relative levels of free smoke compounds compared to bound forms in grapes was relatively small
- 2013 cont. Vinquiry labs begins development for bound smoke taint marker analysis
- 2015 Vinquiry Labs begins offering total smoke taint markers analysis

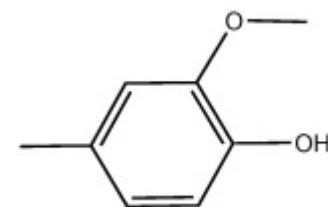
# Smoke Taint Markers

Why Vinquiry utilizes Guaiacol and 4-Methyl Guaiacol smoke markers:

- Both compounds contribute strongly to smoky character in wine (Parker et al. 2012)
- Commonly found smoke compounds among different kinds smoke from different fuels
- Faster and more Cost effective then measuring all total smoke taint compounds



Guaiacol

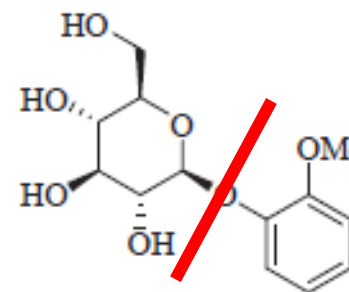


4-Methyl Guaiacol

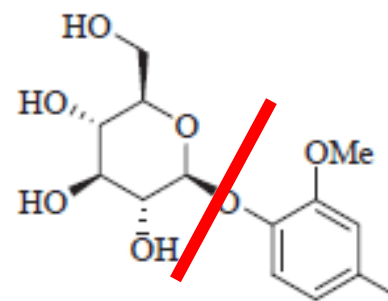
# Total Smoke Taint Markers

Total smoke markers = Free + Bound Guaiacol and 4-Methyl Guaiacol

1. Extraction of slurry (grapes only)
2. Hydrolysis of compounds utilizing acid and heat (grapes and wine)
3. Measurement of headspace (GCMS/ SPME)



Guaiacol  
Glycoside

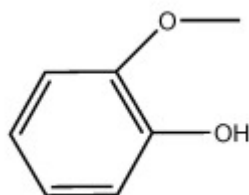


4-Methyl  
Guaiacol  
Glycoside

# Free vs. Bound Smoke Compounds

## Free (volatile)

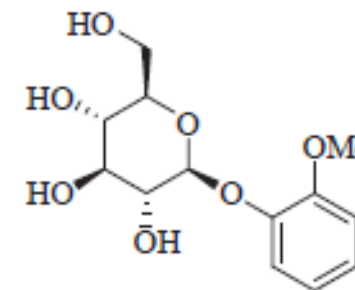
- Often very low in grapes/ young wine
- Varies greatly depending on variety, fermentation parameters, enzyme use, treatments etc.
- Aromatically detectable



Guaiacol

## Bound (Glycosylated)

- Much higher in grapes/ young wine
- Will decrease over time as glycosides release
- Is detected on the palate on the finish, and with retronasal effect (Mayr et. al 2014)



Guaiacol  
Glycoside



# Sensory Impact levels

What are some of the reported sensory impact levels?

## Best Estimate Thresholds

compound	BET ( $\mu\text{g/L}$ )	SE
<i>m</i> -cresol ( $n = 23$ )	20	0.6
guaiacol ( $n = 23$ )	23	0.8
guaiacol (flavor, $n = 22$ )	27	0.6
<i>p</i> -cresol ( $n = 22$ )	64	0.5
<i>o</i> -cresol ( $n = 22$ )	62	0.8

Parker et al. 2012)

# Differences among individuals

Like many other sensory properties, smoke perception varies from one individual to the next

**Table 2. Release of Guaiacol from Guaiacol Monoglucoside Following Incubation with Saliva Obtained from Four Subjects in Vitro<sup>a</sup>**

subject	mean release (standard deviation) %	minimum release (%)	maximum release (%)	number of replicates
A	17 (6)	9.7	25	6
B	31 (13)	21.0	52	9
C	12 (8)	3.8	20	4
D	63 (5)	57.0	68	4

<sup>a</sup>30 min incubation, 37 °C.

(Mayr et al 2014)



# Other factors affecting smoke taint perception

- Sugar level

*(3 g/L) reduced release of VPs by salivary enzymes  
(Mayr 2014)*

- Ethanol

*Increasing levels decreased release of VPs by  
salivary enzymes (Mayr 2014)*

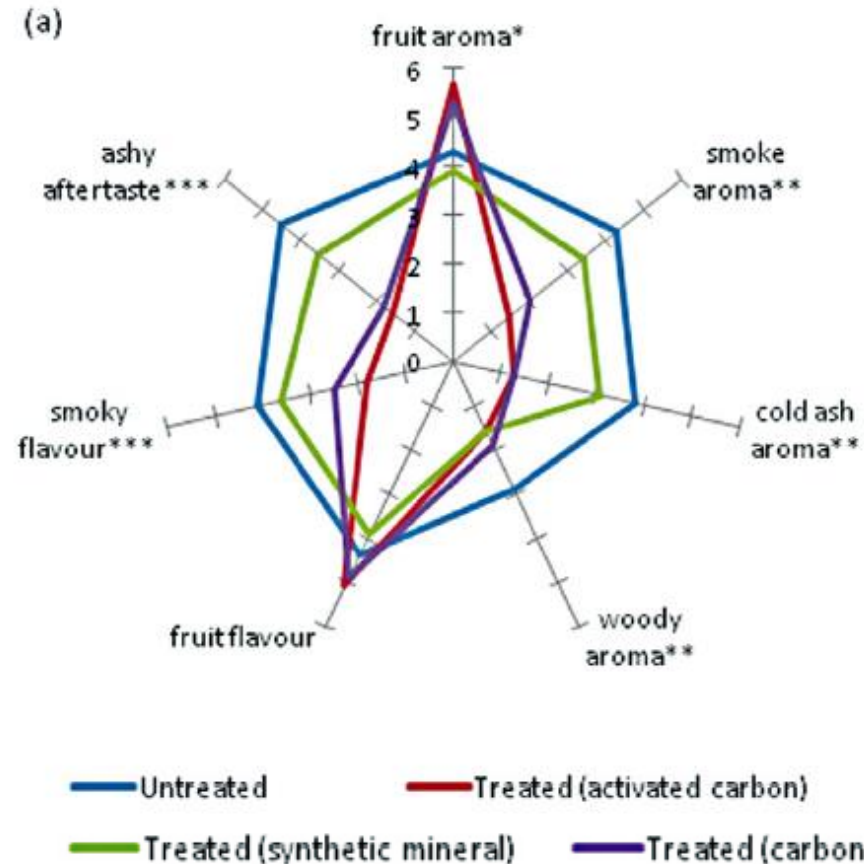
- Other fruity compounds

*Fruity fermentation aromas mask smoke perception  
(Wilkinson 2011)*

# Remediation Strategies - Fining

## Fining Agents:

- Activated Carbon
- Chitosan



Fudge et. al 2012

# Interpreting Results

*What do the numbers mean? Can we put a number on the amount smoke which will be a problem?*

**It's all about risk levels and comparatives at this point**

- Refer to reported sensory thresholds for reference
- Regional off-fire year background levels for different varieties are recommended (ex. Merlot and Syrah)
- ND levels indicate low smoke risk, high Total levels (>30 ug/L) indicate there is greater risk of smoke issue



# Recommendations for When to Analyze

- 2 – 3 weeks before harvest: total smoke markers
- After fermentation and settling: free and total smoke markers
- Mid way aging: free and total smoke markers
- Prior to fining/bottling: free and total smoke markers

# Partnering with the AWRI

## Why the partnership?

- Service for clients which want to have additional smoke markers data
- All classes of free compounds with additional specific glucosides
- Facilitate and expedite analysis with AWRI
- Off season advantage



# Thank You For Your Attention!

For more questions email me: [Jasha.Karasek@Enartis.com](mailto:Jasha.Karasek@Enartis.com)

- **A.L. FUDGE, M. SCHIETTECATTE, R. RISTIC, Y. HAYASAKA and K.L. WILKINSON** Amelioration of Smoke Taint in Wine by Treatment with Commercial Fining Agents, *Australian Journal of Grape and Wine Research* **18**, 302–307, 2012
- Hayasaka, Yoji, Gayle A. Baldock, Mango Parker, Kevin H. Pardon, Cory A. Black, Markus J. Herderich, and David W. Jeffery **Glycosylation of Smoke-Derived Volatile Phenols in Grapes as a Consequence of Grapevine Exposure to Bushfire Smoke.** *Journal of Agricultural and Food Chemistry* **2010** 58 (20), 10989-10998 DOI: 10.1021/jf103045t
- Christine M. Mayr, Mango Parker, Gayle A. Baldock, Cory A. Black, Kevin H. Pardon, Patricia O. Williamson, Markus J. Herderich, and I. Leigh Francis **Determination of the Importance of In-Mouth Release of Volatile Phenol Glycoconjugates to the Flavor of Smoke-Tainted Wines.** *Journal of Agricultural and Food Chemistry* **2014** 62 (11), 2327-2336 DOI: 10.1021/jf405327s
- Patricia O. Williamson,† Markus J. Herderich,† and I. Leigh Francis†,\*Parker et al. **Contribution of Several Volatile Phenols and Their Glycoconjugates to Smoke-Related Sensory Properties of Red Wine** *Journal of Agricultural and Food Chemistry* **2012** 60 (10), 2629-2637 DOI: 10.1021/jf2040548
- Parker, M., Baldock, G., Hayasaka, Y., Mayr, C., Williamson, P., Francis, I. L. and Johnson, D. 2013. **Seeing through smoke.** *Wine Vitic. J.* 28: 42–46.