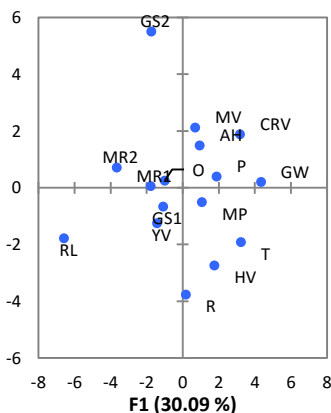




# Insights into flavour and aroma compounds in Chardonnay



Leigh Francis

Dimitra Capone, Tracey Siebert, Sheridan Barker, Alice Barker and  
Patricia Williamson

# Chardonnay flavour profiles



The Australian Wine  
Research Institute

Saliba et. al. Wine & Viticulture Journal, May/June 2013



**cut grass,  
vegetal  
citrus, straw**



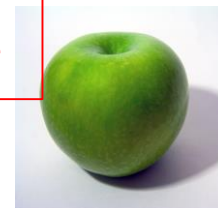
**apricot  
peach  
banana  
melon  
tropical fruit**



**caramel,  
butter, honey  
oak/woody,  
struck flint**



**tropical fruit,  
melon,  
green apple**



# Polyfunctional thiols



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Thiol	Perception threshold	Aroma
4-MMP	3 ng/L	box tree passionfruit
3-MH	60 ng/L	grapefruit passionfruit
3-MHA	4 ng/L	passion-fruit box tree sweaty

- ❖ Cysteine, glutathione precursors, released by yeast metabolism



# Survey of commercial Australian Chardonnay wine



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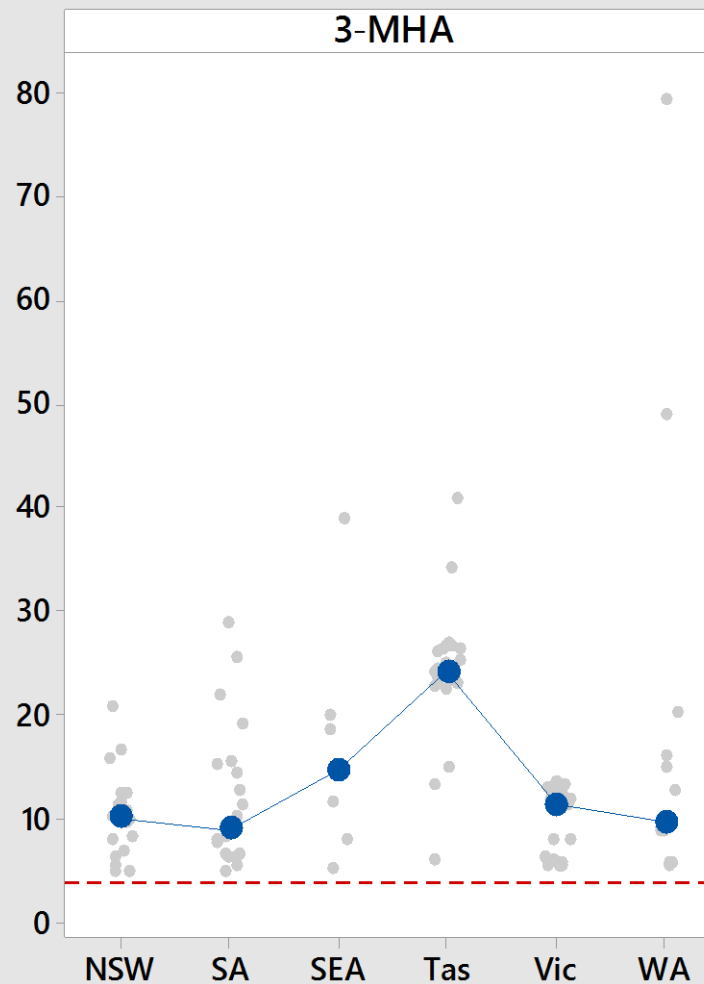
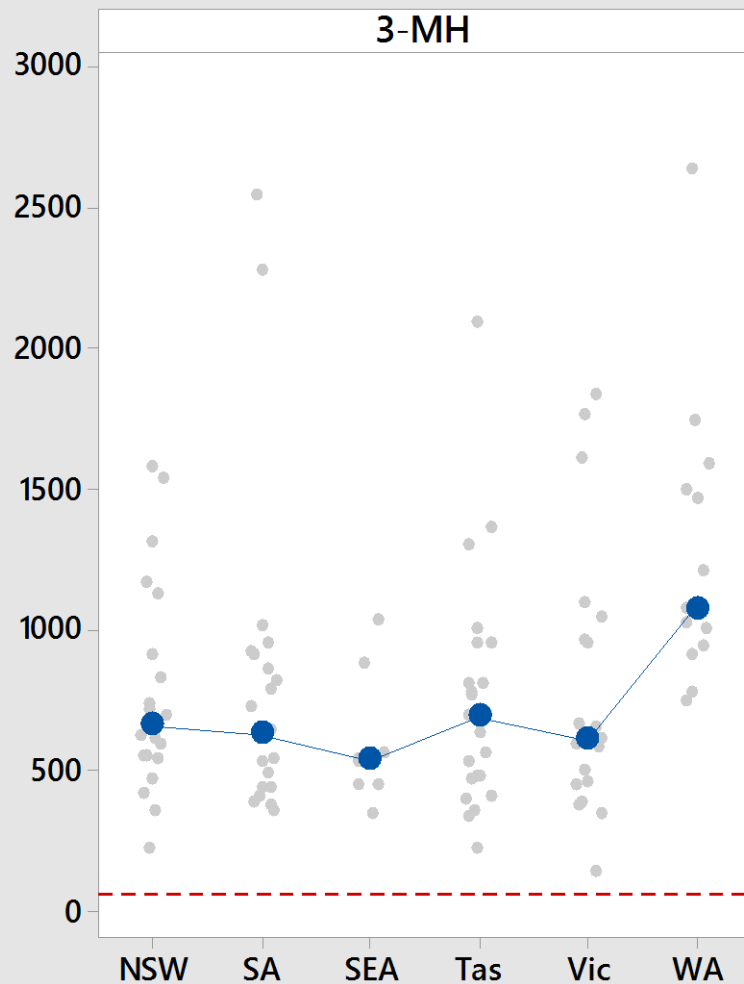
- ❖ 106 wines
- ❖ Nielsen sales data – including top selling Chardonnay wines sold across Australia
- ❖ Vintages ranging from 2003 to 2013 (median 2012)
- ❖ Price ranged from \$3 to \$120 (median \$19)

# Survey of 106 commercial Chardonnay wines

\$3-126, \$19 median price



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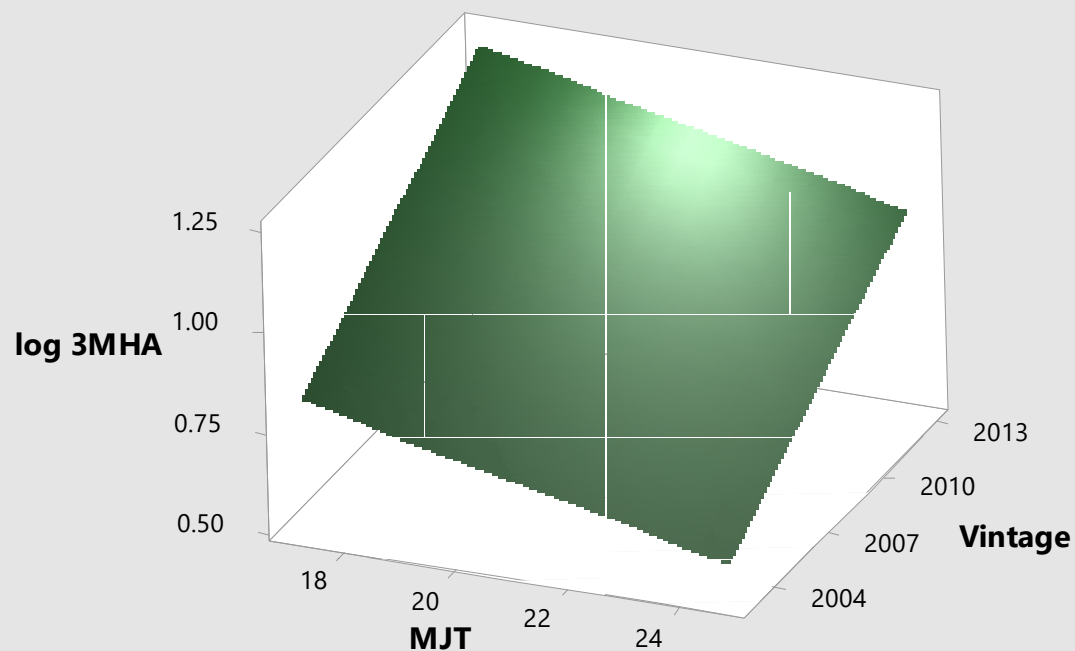


*Aroma  
detection  
threshold*

# Cooler regions, younger wines: higher 3-MHA



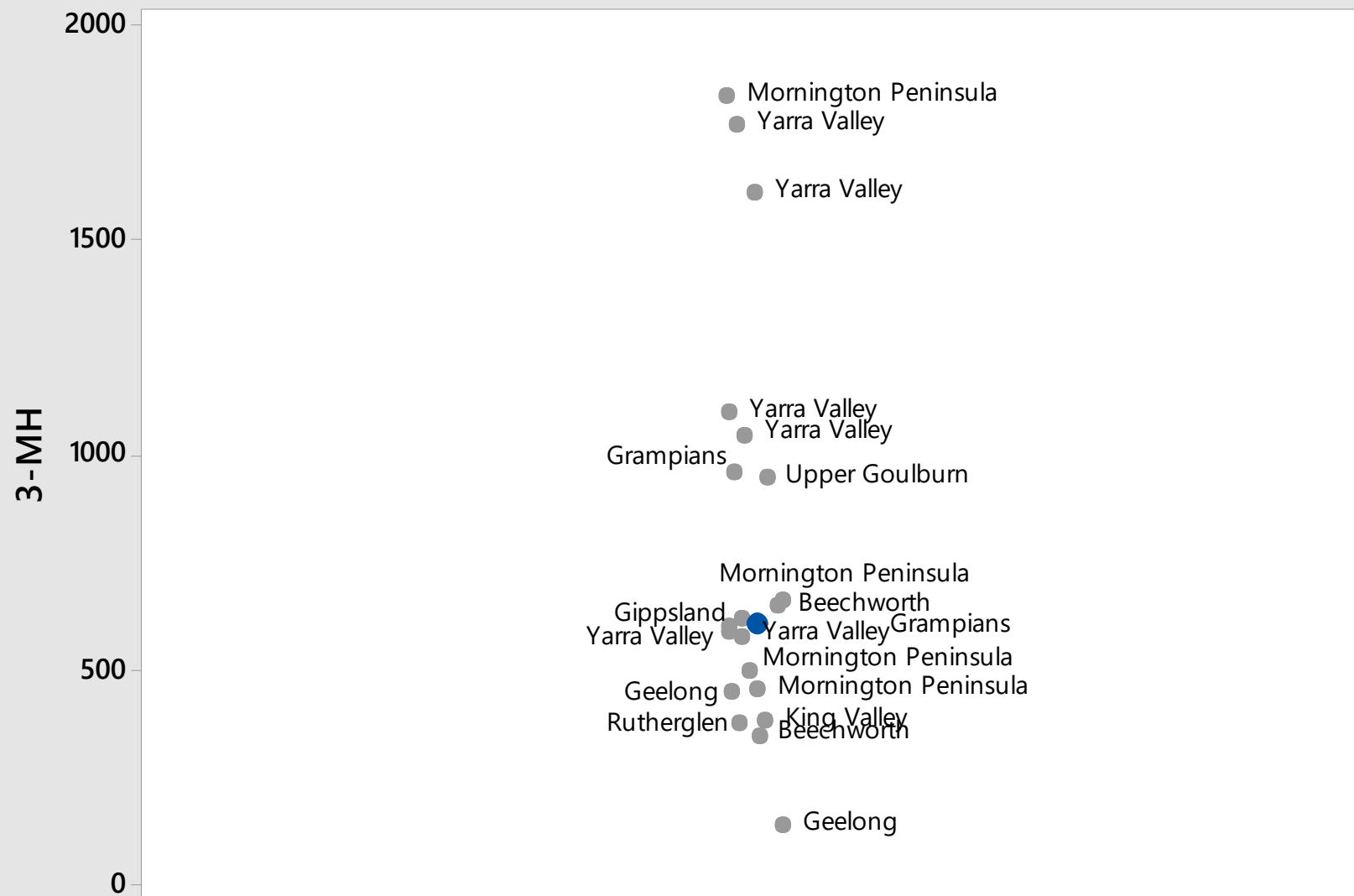
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# Victorian wines



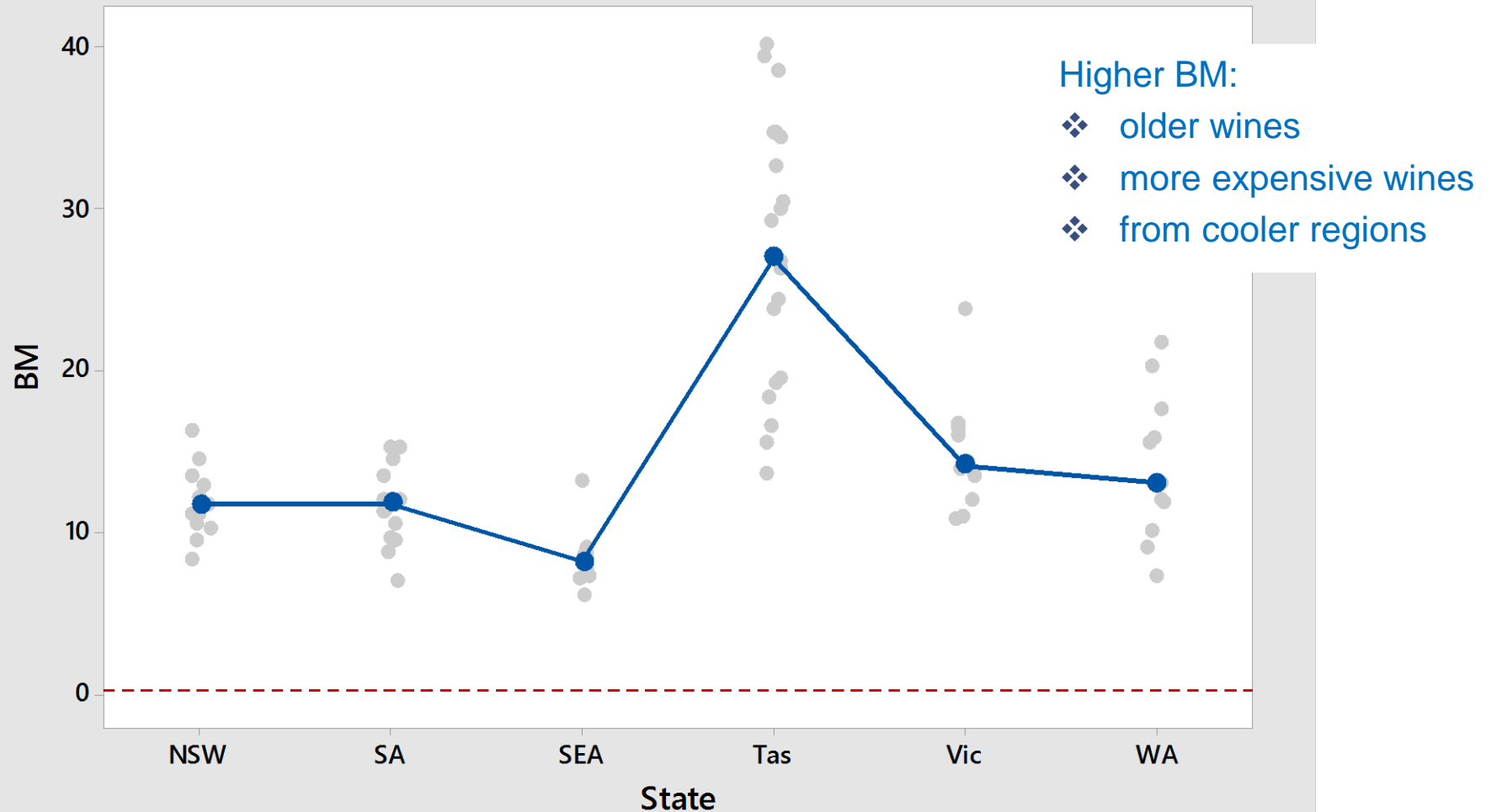
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# Benzyl mercaptan ('struck flint')



The Australian Wine Research Institute

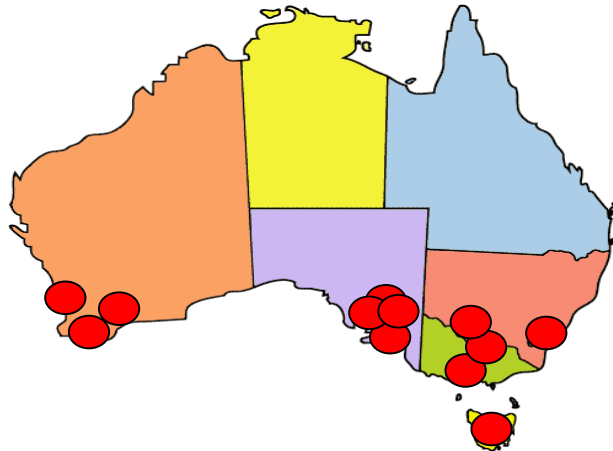




# Wines made from juice sourced across Australia



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16 Chardonnay juices were sourced  
from multiple Australian regions



Wines made,  
standardised,  
no oak  
influence

Volatile aroma  
compounds  
quantified

Sensory descriptive  
analysis  
11 judges x 3 reps

6 Wines,  
consumer liking



- ❖ Hand harvested grapes picked at similar TSS
- ❖ Grapes crushed soon after picking & pressed at similar press rates
- ❖ No enzyme addition & consistent  $\text{SO}_2$  addition
- ❖ All juices sent via refrigerated transport
- ❖ PDM yeast
- ❖ No oak
- ❖ No MLF



# Flavour compounds measured



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**Varietal Thiols  
&  
3-MH  
Precursors**

**Various Fermentation  
Products: Ethyl  
Esters/Acids/Acetates**

**Norisoprenoids  
&  
Monoterpenes**

**$\gamma$ -Lactones**

**Various  
Aldehydes**

**C6 Compounds**

**Ethyl Cinnamate**

# Varietal thiol data from Chardonnay wines made from juices sourced across Australia



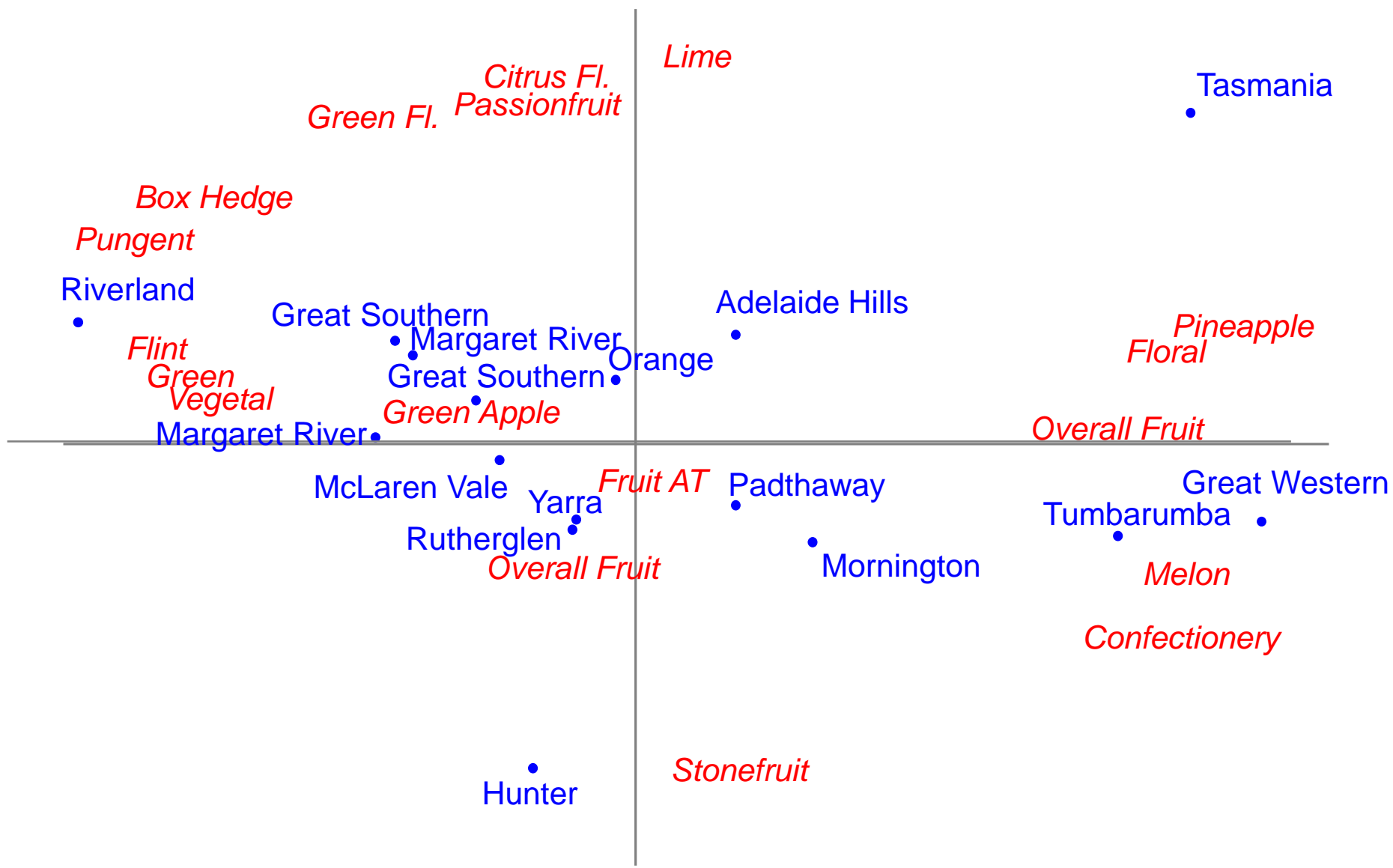
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Compound	Min (ng/L)	Max (ng/L)	Median (ng/L)	Aroma detection Threshold (ng/L)
4-MMP	0.13	0.95	0.15	0.8
<b>3-MH</b>	<b>168</b>	<b>5077</b>	<b>1704</b>	<b>60</b>
<b>3-MHA</b>	<b>2</b>	<b>205</b>	<b>47</b>	<b>4</b>
BM	2.8	14.5	5.9	0.3

# Sensory properties of the 16 wines



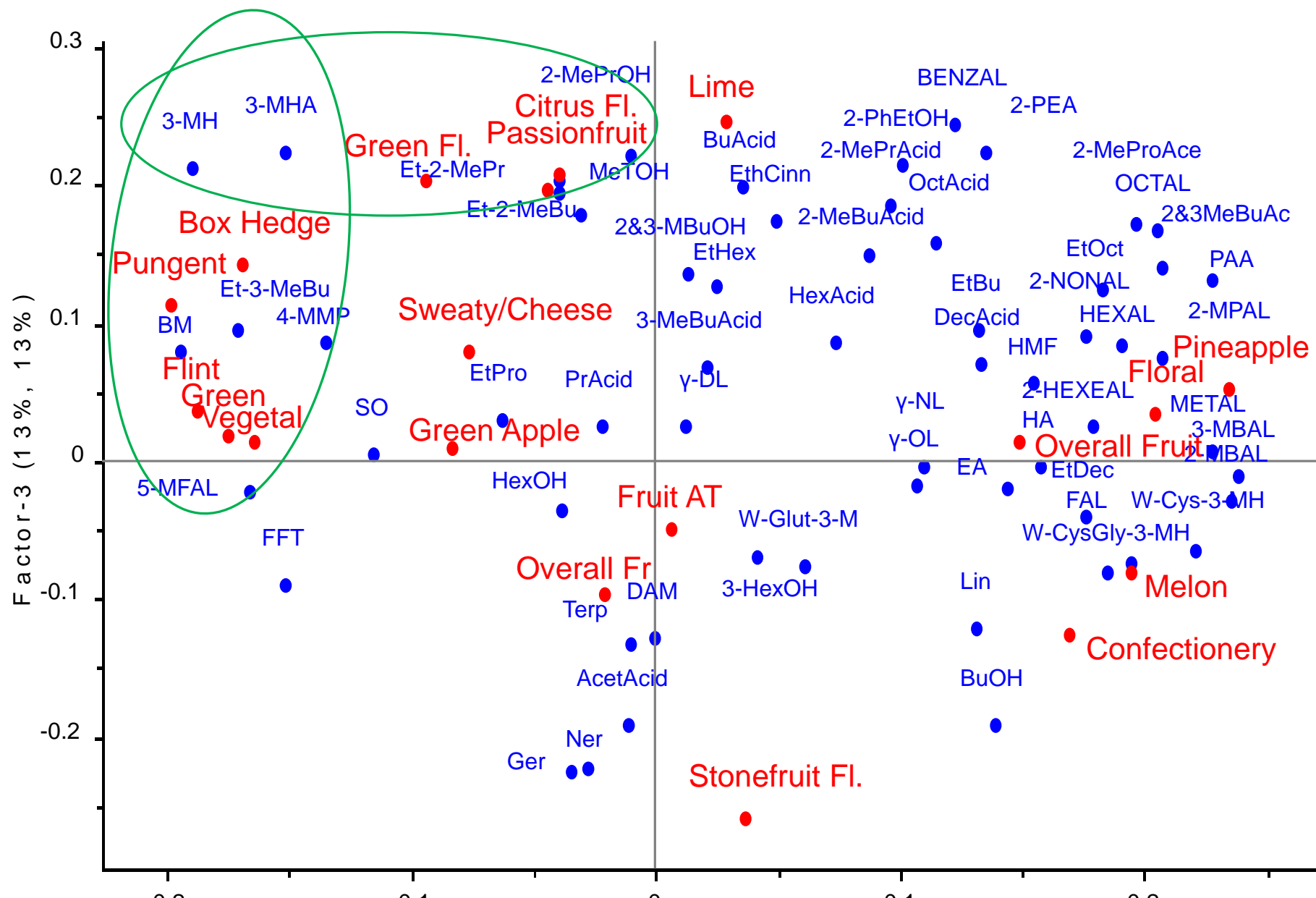
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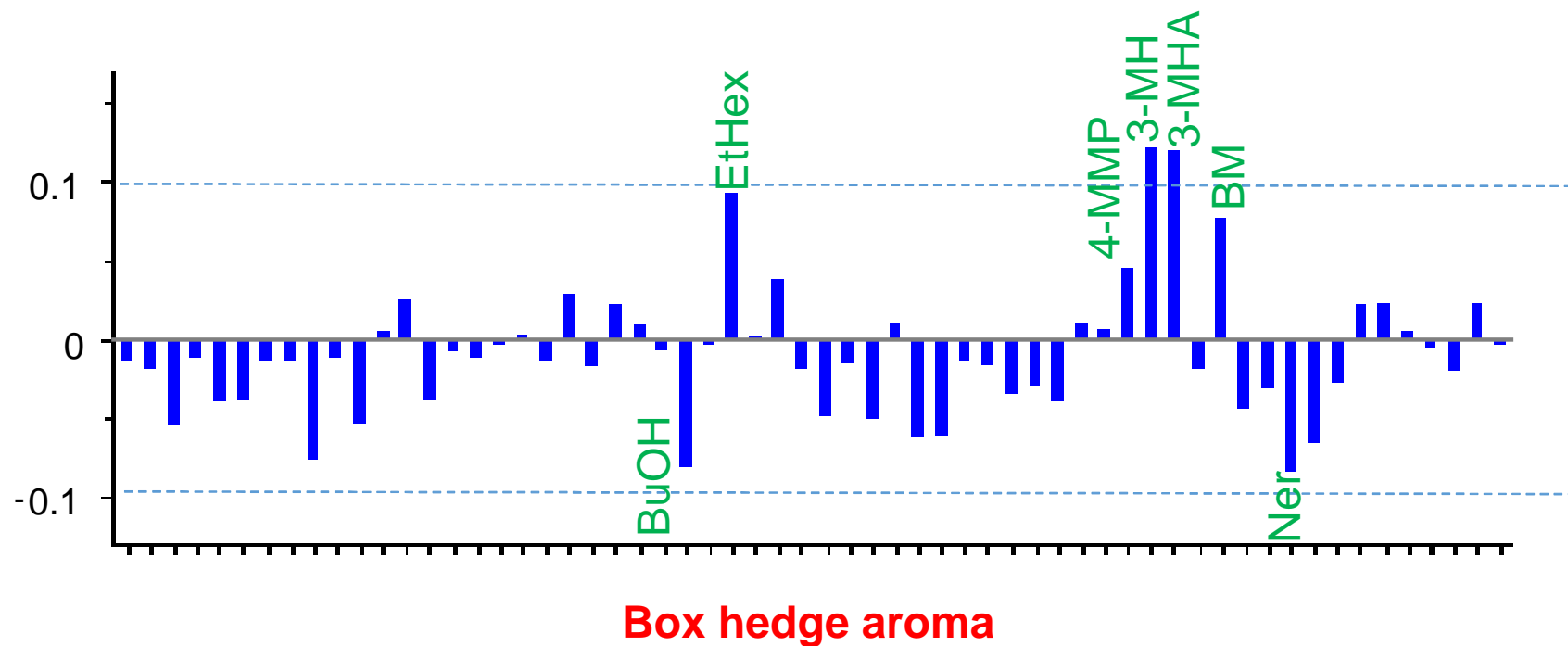
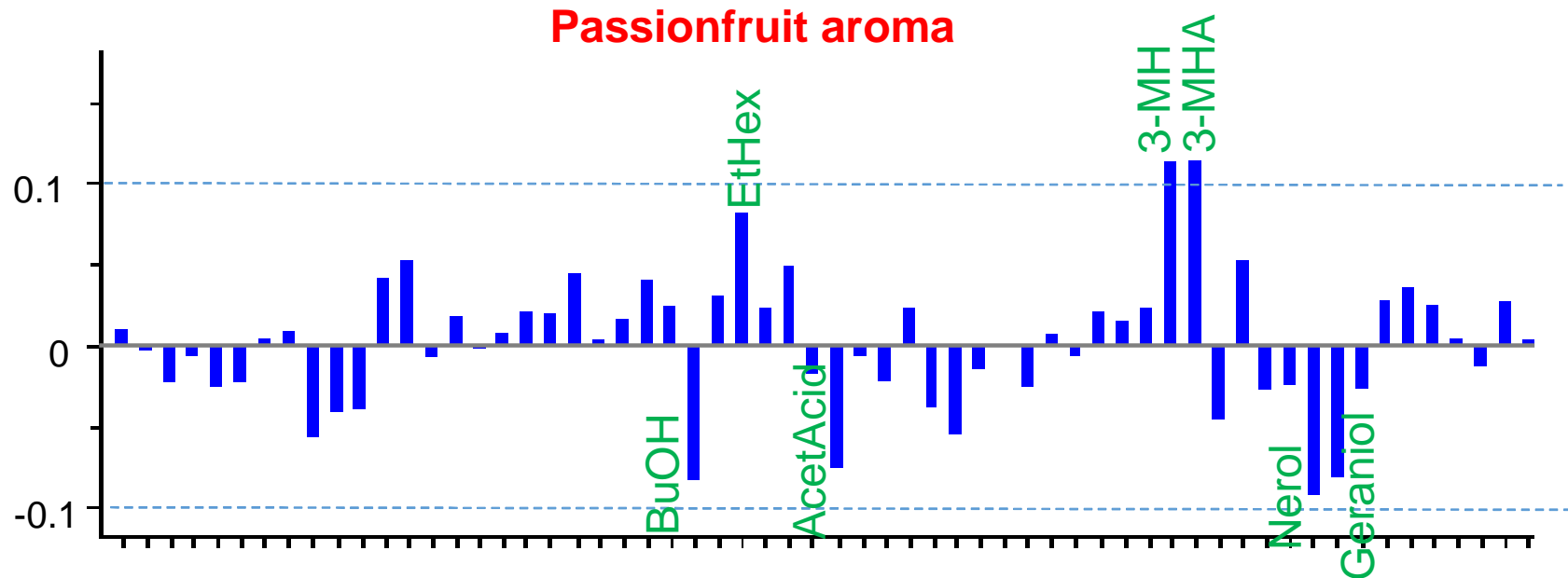
# Sensory attributes and chemical compounds



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Passionfruit aroma



# Outcomes



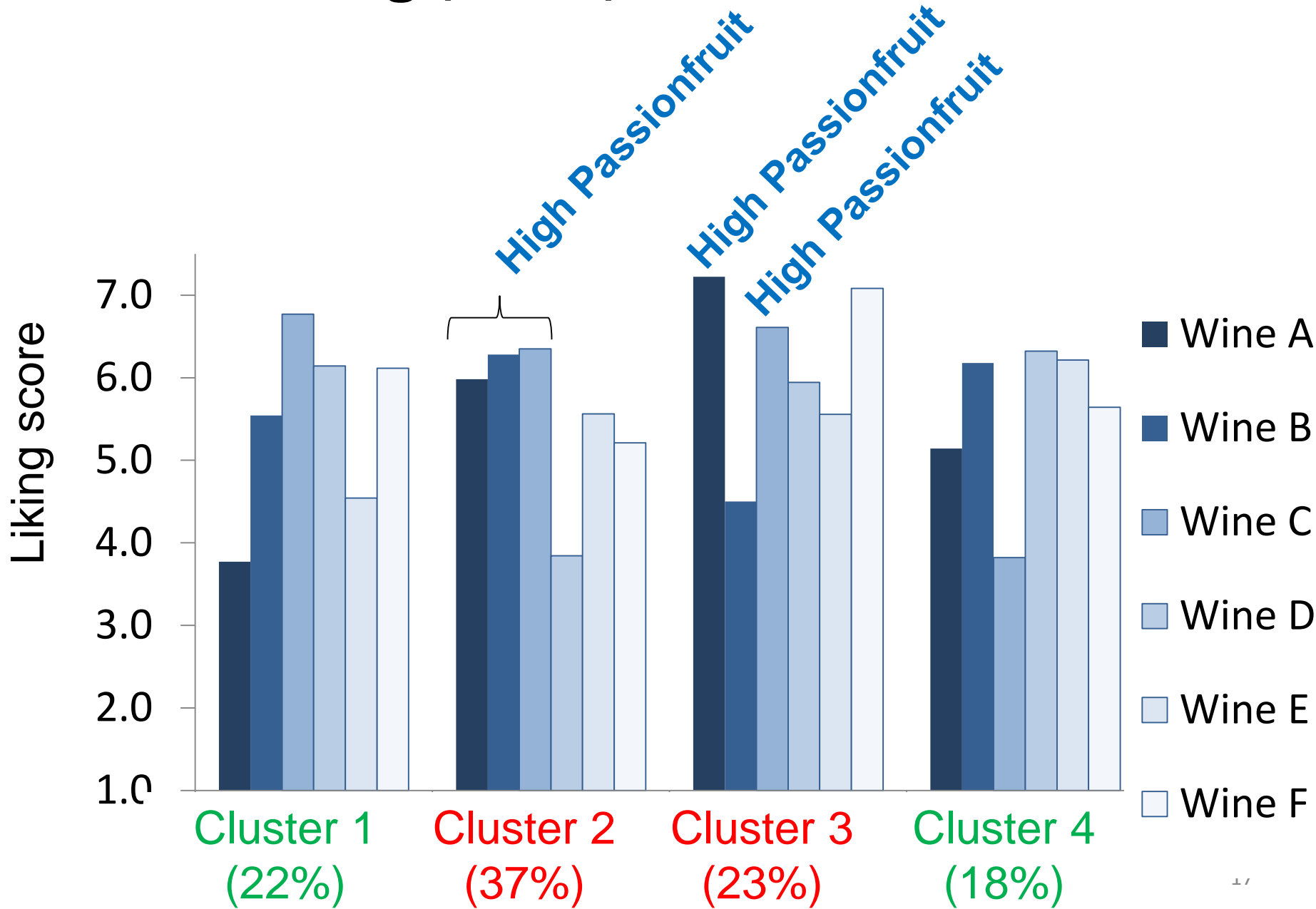
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- ❖ Passionfruit: 3-MH, 3-MHA
- ❖ Box hedge: 4-MMP, benzyl mercaptan
- ❖ Flint: benzyl mercaptan
- ❖ Melon, pineapple: multiple esters, linalool, lactones
- ❖ Stone fruit: nerol, geraniol
- ❖ Fruit flavour, fruit aftertaste: 3-MH precursors





# Consumer liking (n=156)



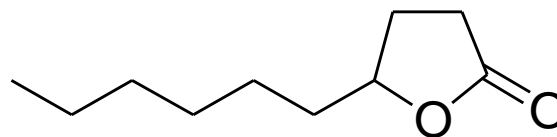
# Stone fruit: apricot, peach



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- ❖  $\gamma$ -nonalactone
- ❖  $\gamma$ -decalactone
- ❖  $\gamma$ -dodecalactone



Found at or below sensory threshold ( $\sim 10 \mu\text{g/L}$ ) : additive effect?

- ❖ 'dairy' lactone
  - Sensory threshold  $< 1 \mu\text{g/L}$

# Commercial Chardonnay and Viognier wines



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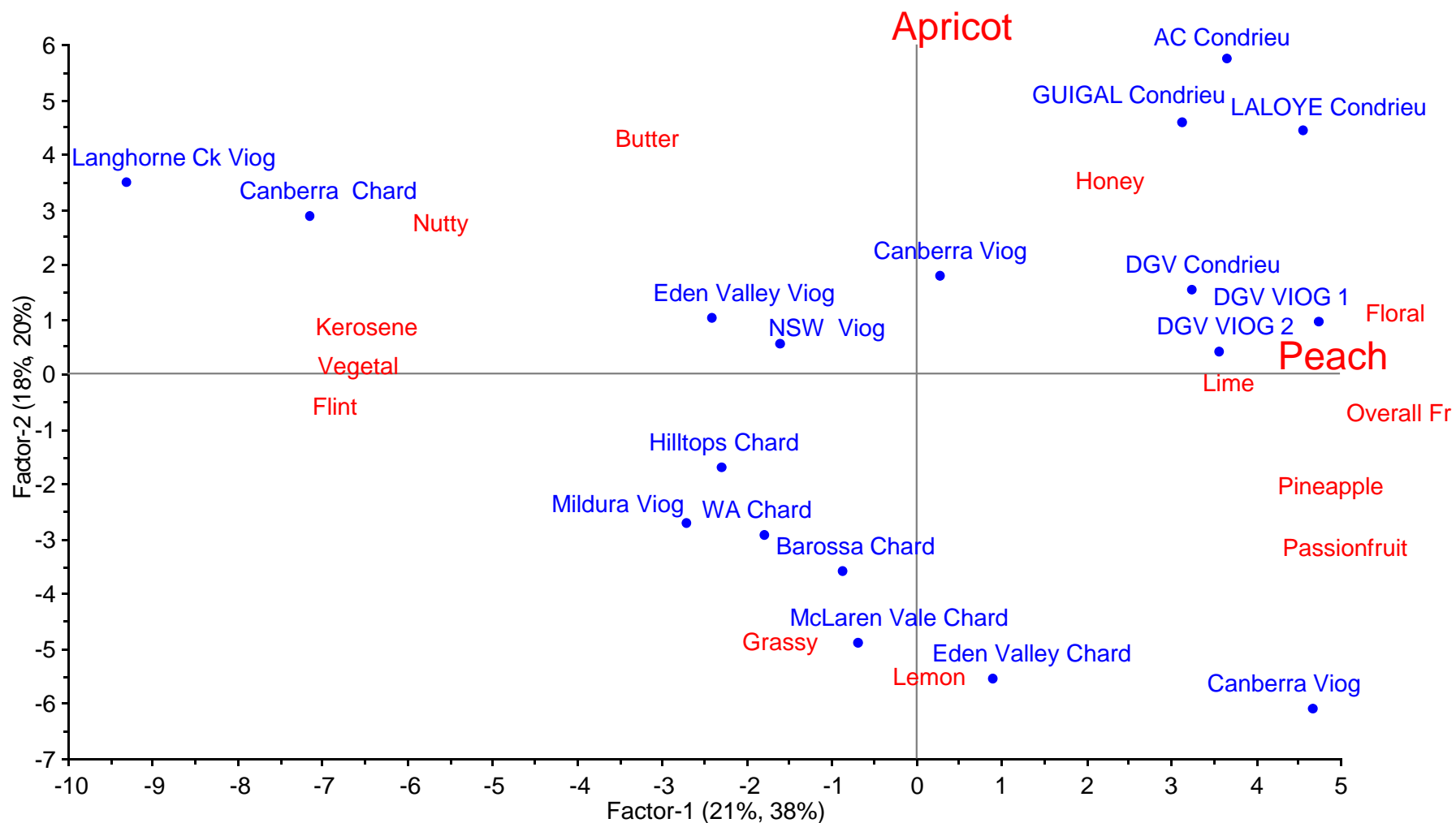
- ❖ 18 wines, including four Condrieu AOC wines
- ❖ Sensory and chemical study

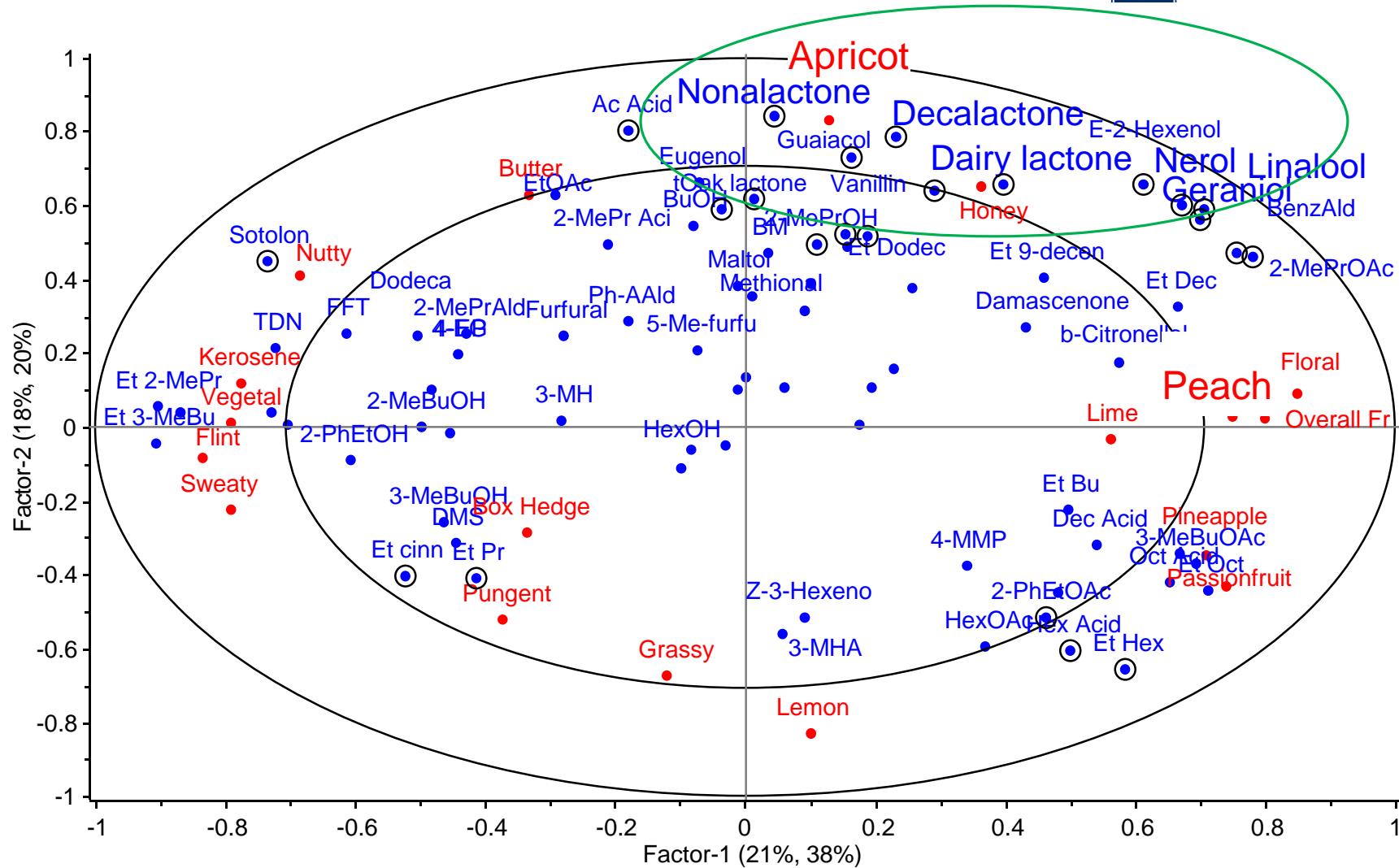


# Sensory properties of the wines



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# Conclusions



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- ❖ Concentration of varietal thiols (in-particular 3-MH) in Chardonnay wine is much higher than previously determined
- ❖ Thiols can be major contributors to Chardonnay wine flavour
- ❖ Struck flint: benzyl mercaptan
- ❖ Unwooded wines with high thiols are well accepted by a majority of consumers
- ❖ Lactones are important contributors to apricot/peach flavor



# Influences on these compounds



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## ❖ Varietal thiols

- time post-harvest prior to pressing
- yeast choice
- Irrigation, nitrogen status
- Struck flint: benzaldehyde?

## ❖ Lactones

- amino acid profile?
- yeast metabolism



# Acknowledgements



The Australian Wine  
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- Australian wine producers – juices, wines
- Wes Pearson
- Amanda Agius, Joanna Verwey
- Dr Yoji Hayasaka
- Dr David Jeffery
- AWRI Flavour team
- AWRI Sensory panelists

This project is supported by Australia's grapegrowers and winemakers through their investment body, Wine Australia, with matching funds from the Australian Government. The AWRI is a member of the Wine Innovation Cluster in Adelaide, South Australia.

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Australia  
for  
Australian  
Wine**