



# Examining the influence of specific types of matter other than grape (MOG) on wine sensory properties.

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AGRICULTURE FLAGSHIP  
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# Contaminants can come from multiple sources

- Fuel, oils, lubricants from harvesting or transport vehicles
- Soil, dust and water during harvest and transport
- Fungal disease
- Matter other than grape (MOG)



With mechanical harvesting MOG levels increase

# What is MOG?

- Leaves, petioles and pieces of canes
- Green unripened fruit
- Broken arms of vines
- Pieces of trellising, irrigation, stones, etc
- Wildlife (e.g. snails and caterpillars)



# Aim of the study

- At what percent addition will common types of MOG, namely green berries or petioles, have an impact on the:
  - sensory properties and
  - chemical composition of Cabernet Sauvignon wine?



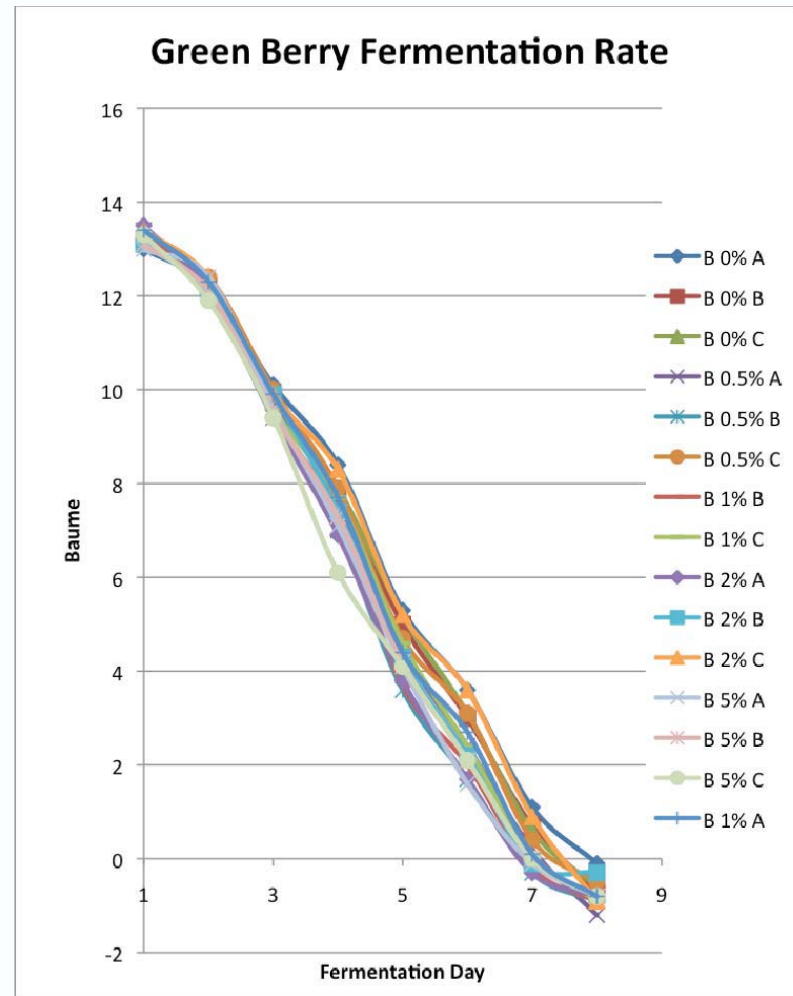
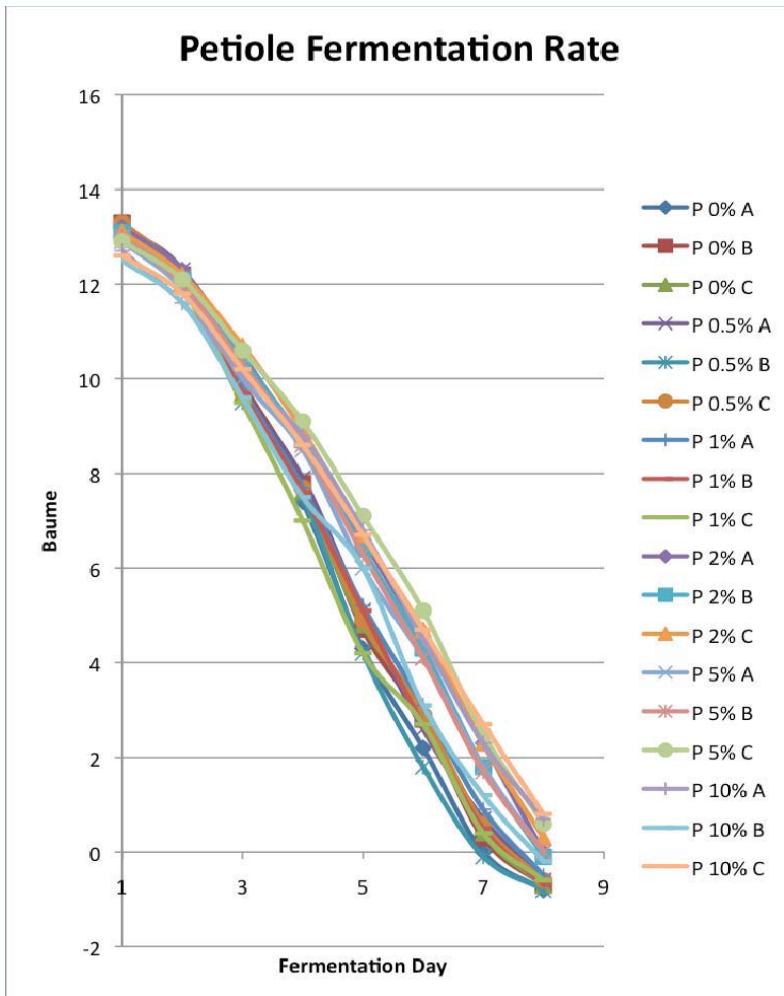
# Small scale winemaking

- Coonawarra Cabernet Sauvignon
- 20 kg fermentations in triplicate



	Percent addition to must (w/w)					
Green Berries	0 %	0.5%	1 %	2 %	5 %	
Leaf Petioles	0 %	0.5 %	1 %	2 %	5 %	10 %

# Small scale wine production



# Wine analyses

## Chemical:

- Final wine parameters: volatile acidity, SO<sub>2</sub>, alcohol (% v/v), titratable acid, pH and residual sugar.
- 3-Isobutyl-2-methoxypyrazine (IBMP) and
- Non-targeted volatile profiling using gas chromatography mass spectrometry (GCMS)



## Sensory:

- Descriptive analysis panel = 12 judges



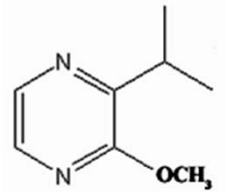
# Wine parameters very consistent

Wine	pH	Alcohol (% v/v)
Control	3.53 ab	13.60 ab
BER 0.5	3.53 ab	13.53 abc
BER 1	3.52 ab	13.60 ab
BER 2	3.46 b	13.53 abc
BER 5	3.46 b	13.23 c
PET 0.5	3.59 a	13.63 a
PET 1	3.54 ab	13.57 ab
PET 2	3.58 a	13.57 ab
PET 5	3.56 ab	13.30 bc
PET 10	3.54 ab	13.57ab



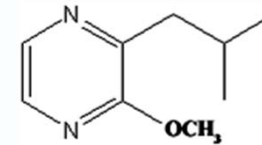
# Background - Methoxypyrazines in wine

3-Isopropyl-2-methoxypyrazine  
(IPMP)



Asparagus / Pea

3-Isobutyl-2-methoxypyrazine  
(IBMP)



Green Capsicum

Earthy / Herbaceous / Grassy

Descriptors

Sensory threshold

1 - 2 ng/L

2 - 15 ng/L

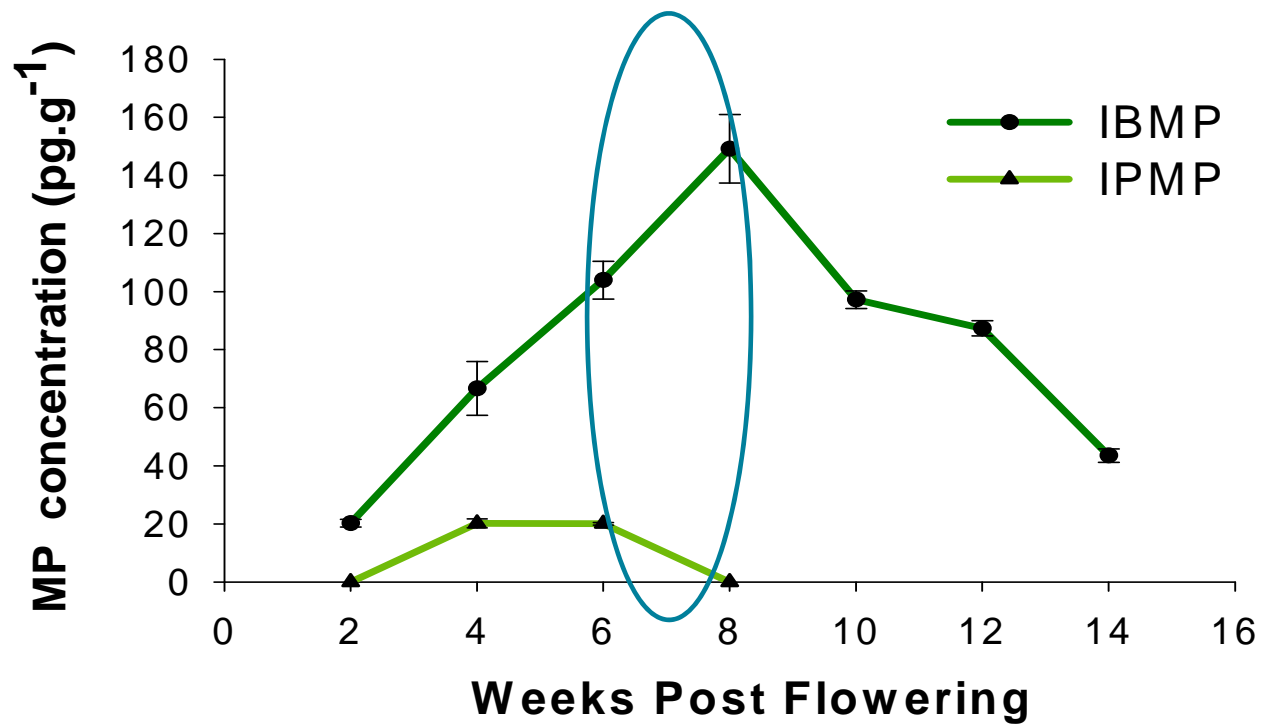
Wine concentration

0 - 5 ng/L

0 - 80 ng/L

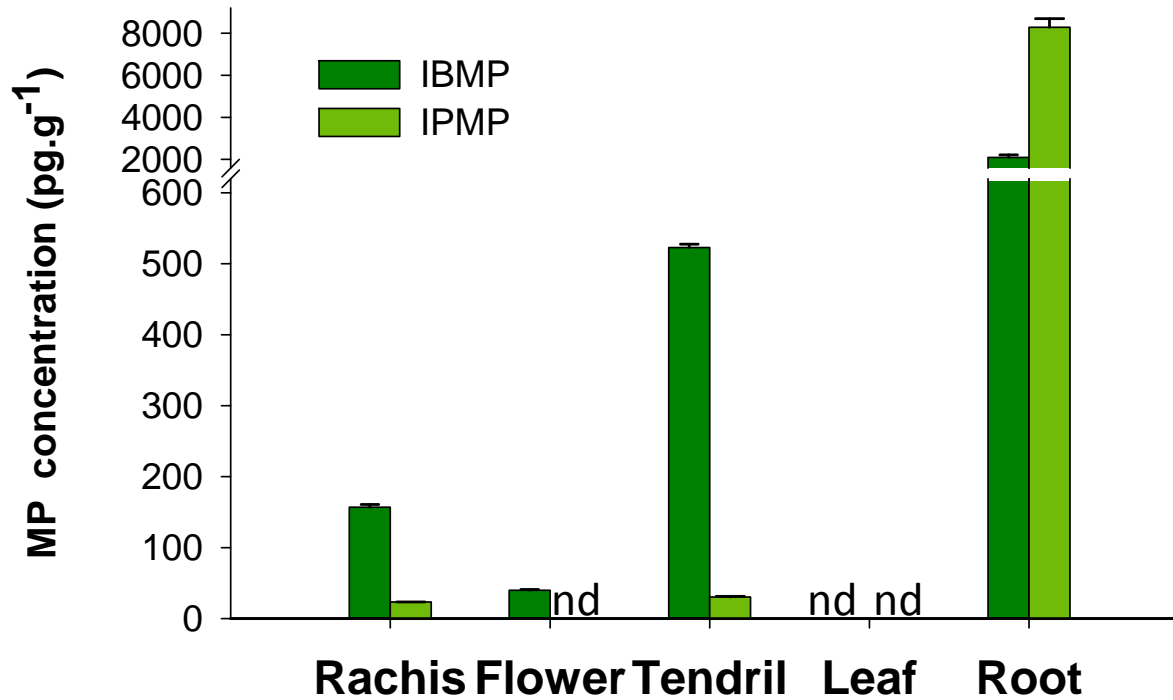
Considered to be undesirable at high concentrations, but can add complexity at low concentrations

# Methoxypyrazines during berry development



Dunlevy et al. 2010

# Methoxypyrazines in grapevine tissues



Dunlevy et al. 2010

# Methoxypyrazines in experimental wines

Wine	IBMP (ng/L)
Control	15.20 <sup>bc</sup>
Berry 0.5%	15.75 <sup>abc</sup>
Berry 1%	16.07 <sup>abc</sup>
Berry 2%	16.38 <sup>ab</sup>
Berry 5%	18.59 <sup>a</sup>
Petioles 0.5%	15.63 <sup>abc</sup>
Petioles 1%	15.07 <sup>bc</sup>
Petioles 2%	13.14 <sup>bc</sup>
Petioles 5%	13.07 <sup>c</sup>
Petioles 10%	13.61 <sup>bc</sup>

# Sensory analysis of wines

## 18 Attributes

### 8 Aroma:

Fruit = Dark berry, red berry and jammy.

Floral = Rose, musk and floral.

Spice = Black pepper, white pepper, clove and mixed spice.

Earthy = Dirt.

Vegetable Green = Green capsicum, bean, asparagus

Herbal Green = Thyme, dill and mixed herbs.

Leafy Green = Tomato leaf, grassy and stalky.

Medicinal Green = Menthol, mint, eucalyptus.

### 2 Taste:

Acid = Low - High

Bitter = Low – High

### 3 Mouthfeel:

Body = Light - Full

Astringency = Not drying – very drying

Tannin Quality = Silky - Coarse

### 3 Palate flavour:

Fruit = Dark berry, red berry and jammy.

Any Green = Vegetable, medicinal and leafy green.

Spice = Black pepper, white pepper, clove and mixed spice.

### 2 Aftertaste:

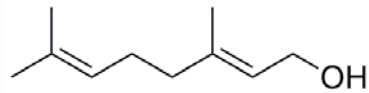
Fruit Length = 0 – 15 seconds

Other Length = 0- 15 seconds

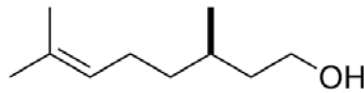
# Sensory analysis of wines

	BER0.5	BER 1	BER 2	BER 5	Control	PET 0.5	PET 1	PET 2	PET 5	PET10
Aroma										
Floral	4.8 c	4.9 bc	5.1 bc	5.5 bc	<b>4.9 bc</b>	4.7 c	4.7 c	5.1 bc	5.7 ab	<b>6.4 a</b>
Vegetal	4.7 abc	4.8 ab	4.6abc	4.5abc	<b>4.5 abc</b>	4.7abc	4.9 a	4.2bcd	4.1 cd	<b>3.7 d</b>
Leaf y	5.1 a	4.8 ab	5.1 a	4.8ab	<b>4.6ab</b>	4.7ab	4.9a	4.2bc	4.5abc	<b>3.9 c</b>
Earthy	2.7 bc	3.2 a	2.8 ab	2.8 ac	<b>3.0 ab</b>	<b>2.3 c</b>	2.9 ab	2.7 bc	2.6 bc	2.5 bc
Taste										
Acid	7.5abc	7.4 bc	7.6abc	7.9 a	<b>7.5abc</b>	7.8ab	7.4 bc	7.3 c	7.3 c	7.3 c
Bitterness	<b>2.1 c</b>	2.5abc	2.4bc	2.3bc	<b>2.5 ab</b>	2.6ab	2.6ab	2.6ab	2.9a	<b>2.1 c</b>
Mouthfeel										
Body	7.0 d	7.2bcd	7.0d	7.2 cd	<b>7.3abcd</b>	7.3abcd	7.5abc	7.7 ab	7.8 a	7.6abc

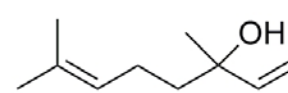
# Floral aromas are often caused by monoterpenes



Geraniol



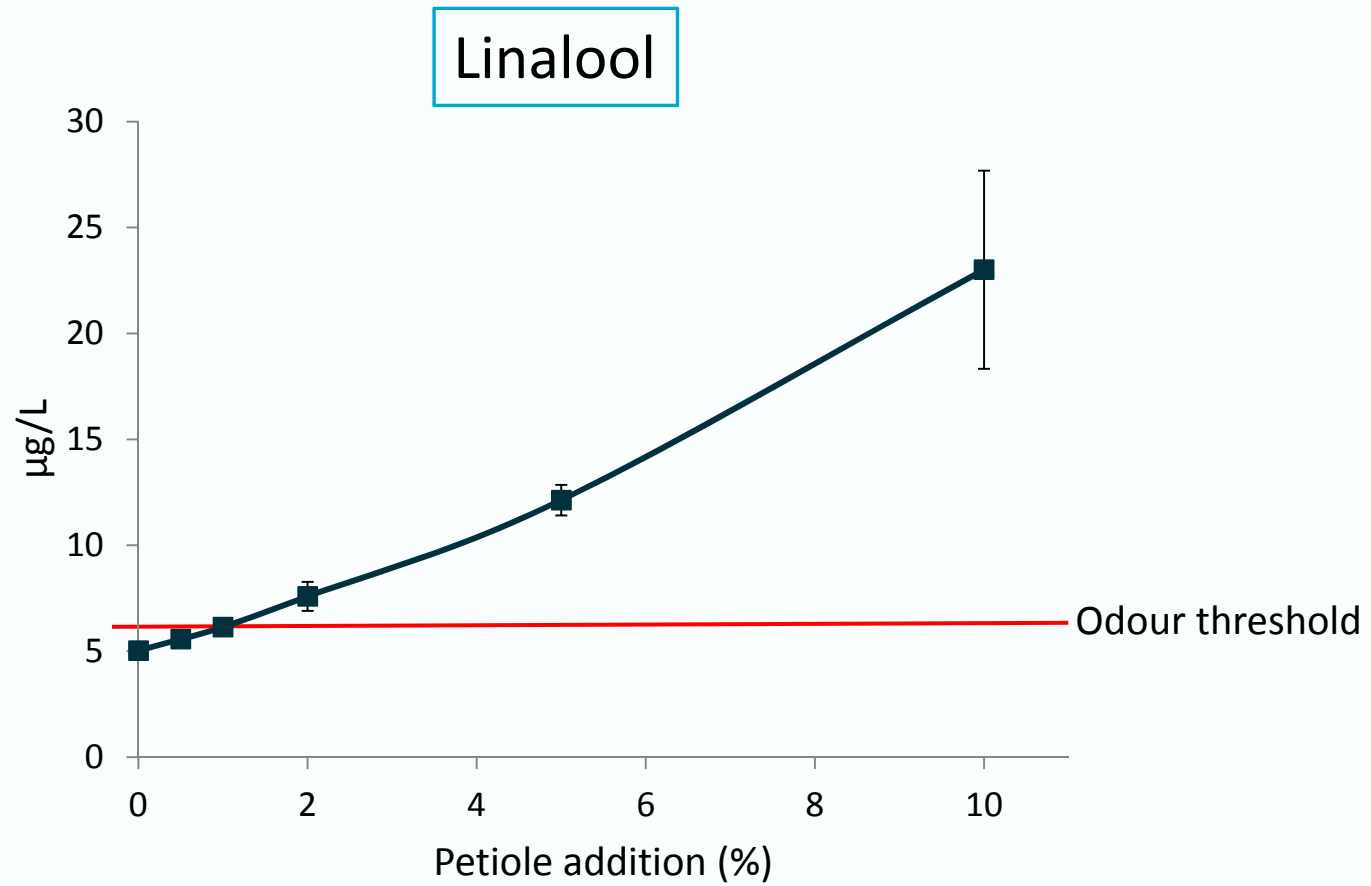
Citronellol



Linalool

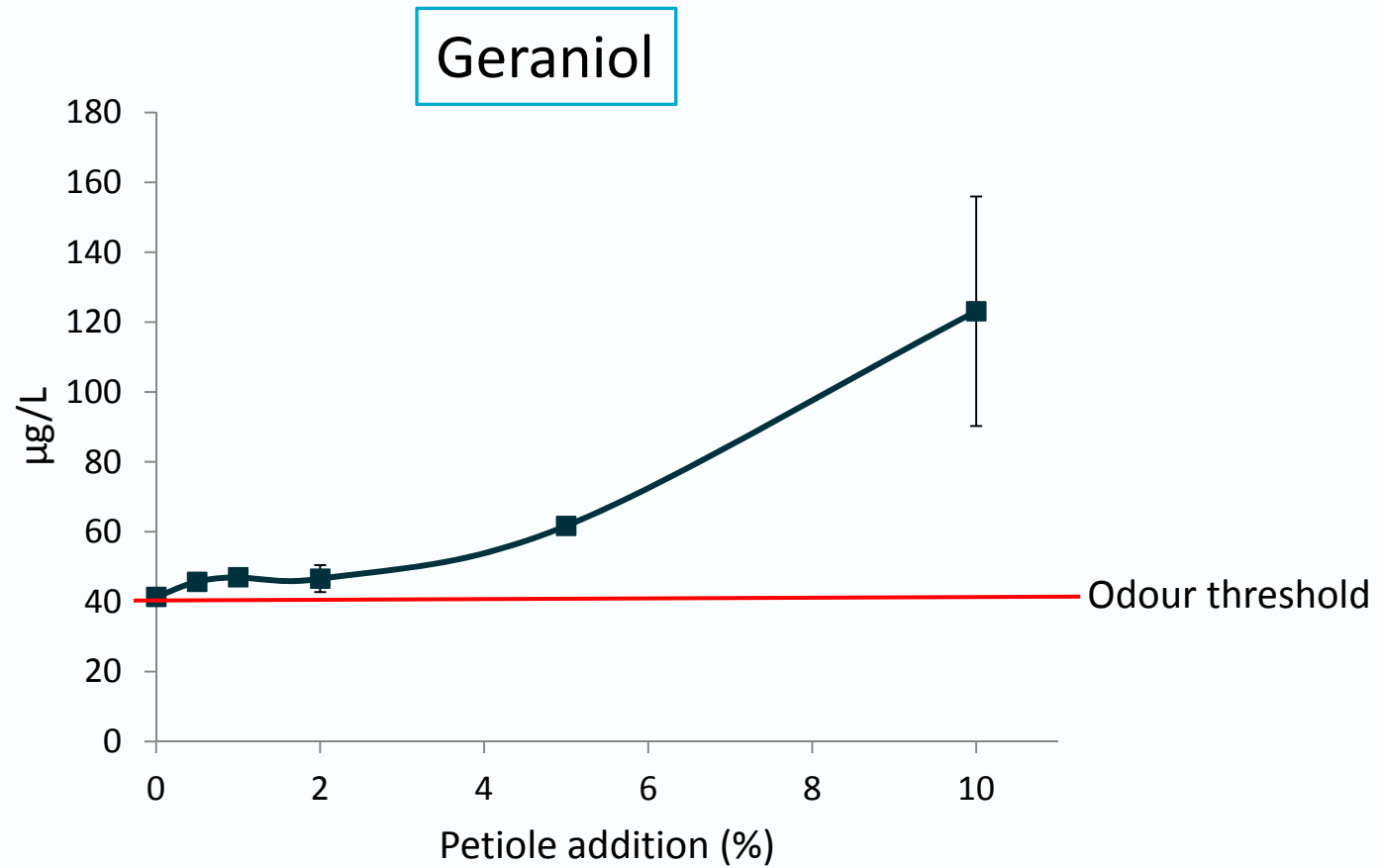
- very high in varieties with “Muscat” character
- moderate concentrations in non-muscat aromatic varieties (e.g. Riesling, Gewürztraminer)
- low in “neutral” or non-aromatic varieties
- descriptors include “floral”, “spice”, “rose”

# Monoterpenes increase due to petiole addition

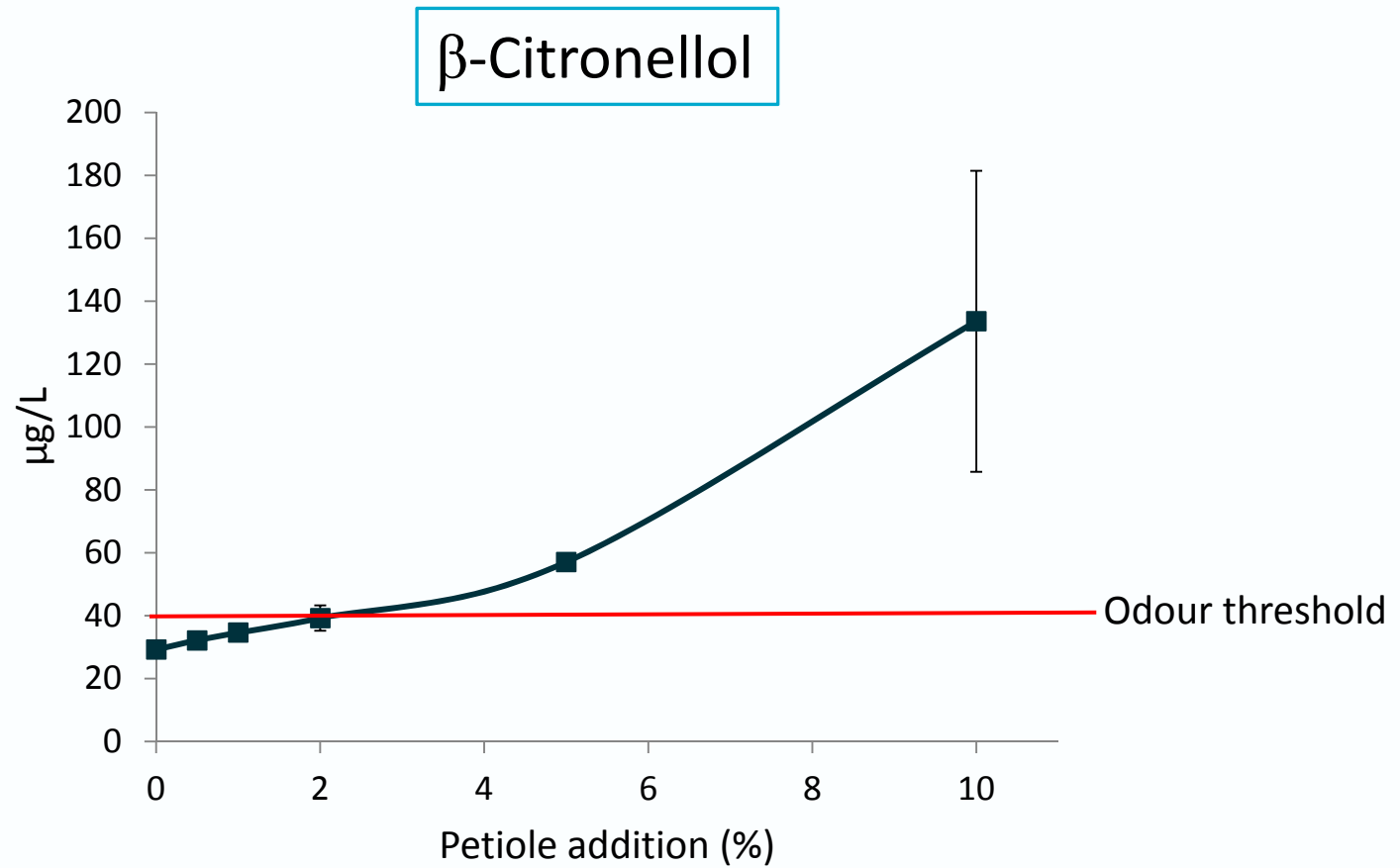




# Monoterpenes increase due to petiole addition



# Monoterpenes increase due to petiole addition



# Conclusions

- needed 5% unripe berries to increase IBMP significantly
- most of the sensory differences compared to control wines seen in the 10% petiole addition wines
- and these were a decrease in “green” characters and increase in “floral” character
- “floral” attribute probably comes from monoterpenes



# Conclusions

1. This study suggests that it takes a considerable percentage (5-10%) of unripe berries or petioles as MOG in fermentations to alter the sensory properties of the wine.
2. The changes in sensory properties may not necessarily be negative.



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# Thank you

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