

**Management of cool-climate Bacchus winemaking
to modify chemical and organoleptic properties.**

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ABSTRACT

Vitis vinifera cultivar Bacchus, a (Silvaner x Riesling) x Müller-Thurgau cross, is the most widely planted cv. for making still wine in the UK. Bacchus, a white grape, is suited to cool-climates where it generally yields well with good sugar levels and moderate acidity. Flavour profiles of Bacchus wines are characterised by the presence of both terpenes and thiols. Using techniques adapted for Sauvignon blanc and Riesling there are a wide range of opportunities during winemaking to modify wine composition and style. This project has identified, for the first time, key flavour compounds in the grape that affect wine composition and wine style, including α -terpineol, geraniol, linalool, hotrienol, 4-mercapto-4-methylpentan-2-one, 3-mercaptohexen-1-ol and 3-mercaptohexyl acetate. Furthermore, the impact of winemaking options including pre-ferment maceration, yeast strain, ferment temperature and exogenous enzymes on these compounds and their expression in Bacchus wine have been described. Wines were enhanced by maceration, with; higher juice yield, increased yeast assimilable nitrogen, increased polysaccharides and increased pH coupled with decreased acidity. Manipulating ferment conditions increased thiol and terpene levels, while the employment of exogenous enzymes improved terpene levels. Taken together, these results show that careful consideration and application of a range of winemaking techniques can produce high quality cool-climate Bacchus wine.

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BACCHUS

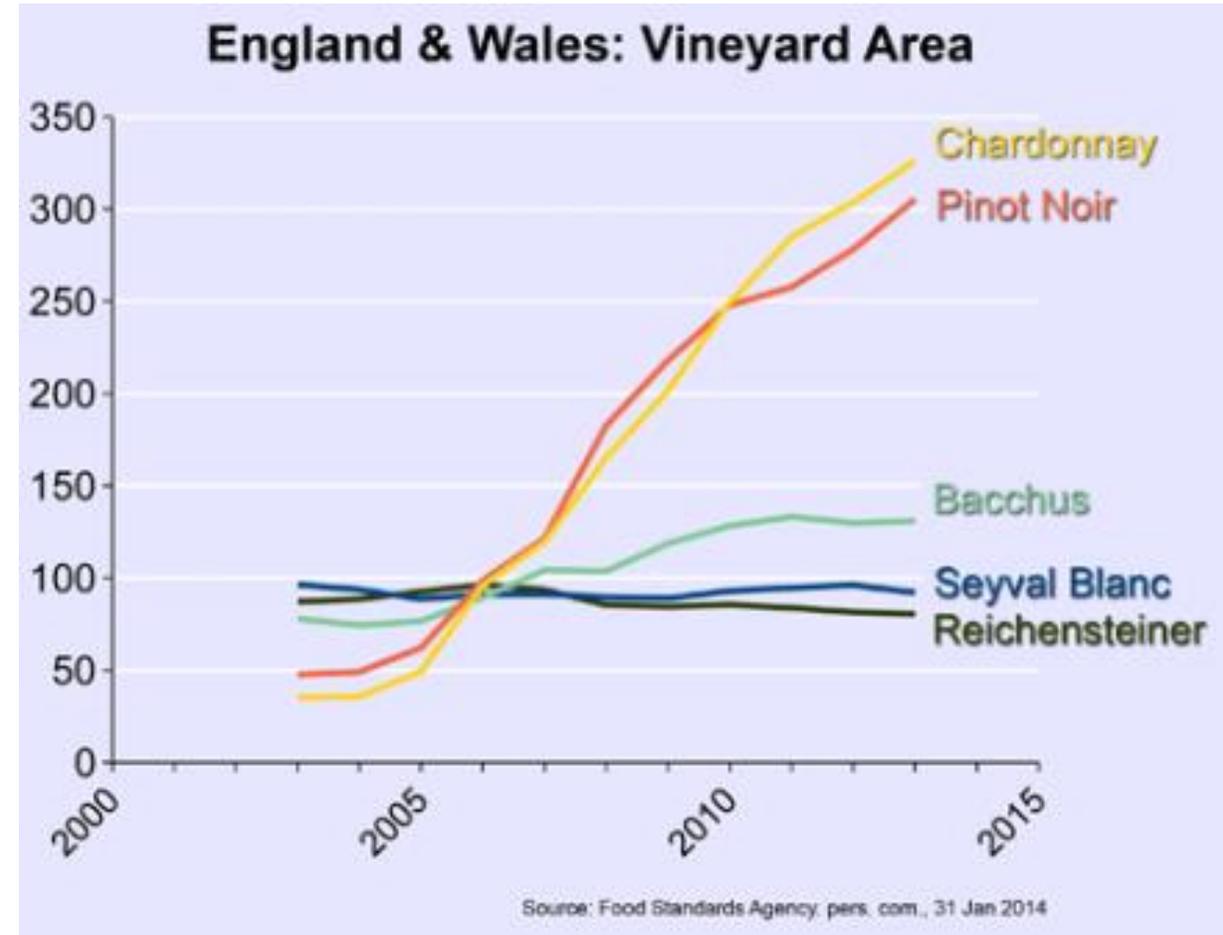
Vitis vinifera cultivar Bacchus,
(Silvaner x Riesling) x Müller-
Thurgau cross

1700 Ha Germany (Franken)

170 Ha UK

Most widely planted cv. for
making still wine in the UK.

Bacchus, a flavourful white
grape, suited to cool-climates
where it generally yields well
with good sugar levels and
moderate acidity



From EnglishWines.info



TERPENE AND THIOLS

Bacchus is not a widely studied cultivar

Early research indicate presence of thiols but conflicting results regarding terpenes

Difficulties with excluding oxygen during measurement and use of non-optimised GC/MS further confounds results

The juice and wine are aromatic during processing indicating free as well as bound aromas

INITIAL ANALYSIS

Work carried out by Flint
Vineyards and Campden BRI

10 bottled UK Bacchus wines
from the 2015 vintage

5 European wines including
Bacchus, the original cv. and
Sauvignon blanc from Germany

Analysed by SPME/GC/MS/MS

Non-selective scanning
approach with NIST database
was undertaken with
computational overlay and peak
integration

Results showed common
fermentation esters as well as
the following marker
compounds

1. Hotrienol (3, 7 dimethyl-
1,5,7-octatrien-3-ol)
2. alpha terpineol
3. 3- mercaptohexan-1-ol
4. methoxy-phenyl oxime



IMPROVING BACCHUS AROMA/FLAVOUR

Given the results of the initial survey plus other research, the following strategies were identified for further investigation

1. Pre-ferment maceration
2. Fermentation conditions
 1. Yeast Strain
 2. Ferment temperature
 3. Exogenous glycosidic enzymes



PRE-FERMENTATION MACERATION

Small scale trial

2017 Bacchus grapes

Macerated at 16°C for:

Control (30 min), 90 min, 3 hours, 6 hours and 24 hours

Fermented with QA23 at 16°C

Chemical and sensory analysis at juice and wine stages



Table 1. Selected results from compositional and chemical analysis of five different pre-fermentation maceration treatments carried out at 16°C with Bacchus juice prior to alcoholic fermentation.

	Control	90 min	3 hour	6 hour	24 hour
Press yield (%)	61	61	62	62	63
TA (g/L)	8.3	8.0	8.1	7.8	7.7
pH	3.07	3.10	3.14	3.12	3.34
YAN (mg/l)	130	137	145	153	162
Total polysaccharides (mg/L)	323	258	221	301	508
Total phenolics (A ₂₈₀ , au)	3.93	4.35	4.72	5.23	6.11
<i>CIELAB</i>					
L*	99.6	99.7	99.9	99.6	99.6
A*	-0.5	-0.6	-0.7	-0.7	-0.9
B*	1.6	1.6	1.7	2.1	2.4



Table 2. Selected results from compositional and chemical analysis of five different pre-fermentation maceration treatments carried out at 16°C with Bacchus wines post-alcoholic fermentation.

	Control	90 min	3 hour	6 hour	24 hour
TA (g/L)	7.6	7.6	7.8	7.6	7.5
pH	3.10	3.08	3.21	3.09	3.20
Total alcohol (%)	12.0	12.3	12.2	12.3	12.3
Total phenolics (A ₂₈₀ , au)	4.29	4.91	4.96	5.31	5.78
<i>CIELAB</i>					
L*	99.1	99.2	99.2	99.2	99.2
A*	-0.9	-1.0	-1.0	-1.0	-1.0
B*	3.4	4.0	4.3	4.3	4.2

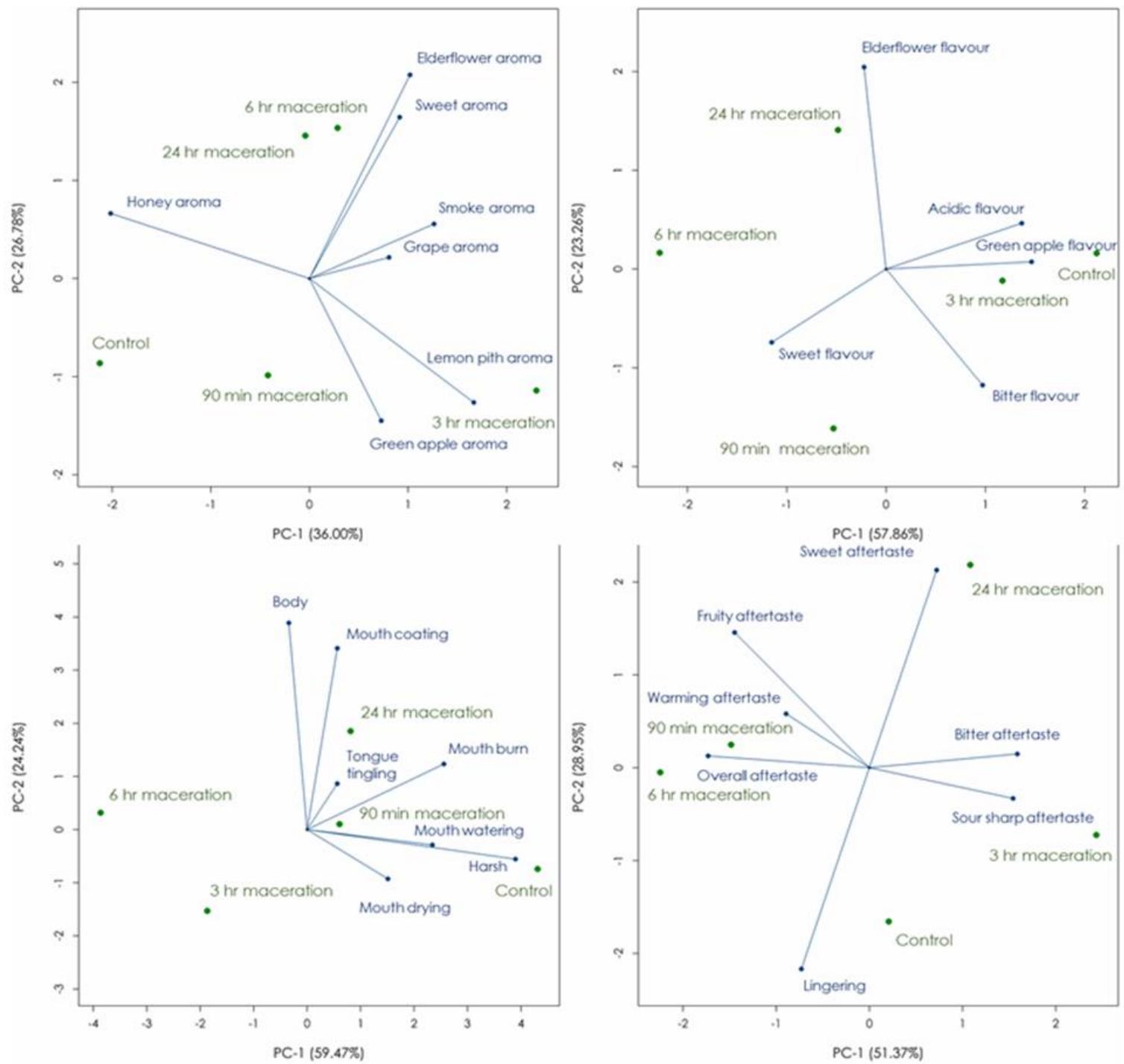


Figure 1. Principal component analysis biplots from quantitative descriptive analysis (11 judges, 2 replicates) results for five different pre-fermentation maceration treatments carried out at 16°C with Bacchus wines with respect to a) aroma, b) flavour, c) mouthfeel and d) finish



Table 3. Summary of quality descriptive analysis attributes for five different pre-fermentation maceration treatments carried out at 16°C with Bacchus wines.

	a) Aroma	b) Flavour	c) Mouthfeel	d) Finish
Control	Honey	Green apple, acidic	Harsh, low body, mouth-watering, drying and burning	Lingering, slightly sour and bitter
90 minute maceration	Green apple	Sweet, slightly bitter	Average	Fruity, warming
3 hour maceration	Lemon pith, green apple	Green apple, acidic	Low body, low harshness	Sour, sharp, bitter
6 hour maceration	Elderflower, sweet, honey	Sweet ,slightly elderflower	Average body, low harshness	Fruity, warming
24 hour maceration	Elderflower, sweet, honey	Elderflower	Fuller body, mouth- coating	Sweet, short, slightly sour/bitter



MACERATION RESULTS

Overall maceration had a positive impact upon wine chemistry including:

pH, Acidity, YAN, polyphenols, polysaccharides

Slight improvement to yield

Differentiation on sensory properties including a general improvement in aroma, flavour and mouthfeel at 6-24 hours



FERMENTATION CONDITIONS

Small scale trial

2017 Bacchus grapes

Juice taken from standard pressing of Bacchus

3 yeast strains: BO213 (low impact), VL1 (terpene release) and X5 (thiol release)

Fermented at 12, 16 and 20°C

Exogenous glycosidase enzyme treatment of Lafazym Arom at 8 g/hl for two weeks at 10°C to 16°C ferments

Chemical and sensory analysis at finished wine stages

Figure 2. Influence on monoterpene aroma levels in Bacchus wine from the yeast strain, fermentation temperature and exogenous glycosidase enzyme, as determined by SBSE/GC/MS.

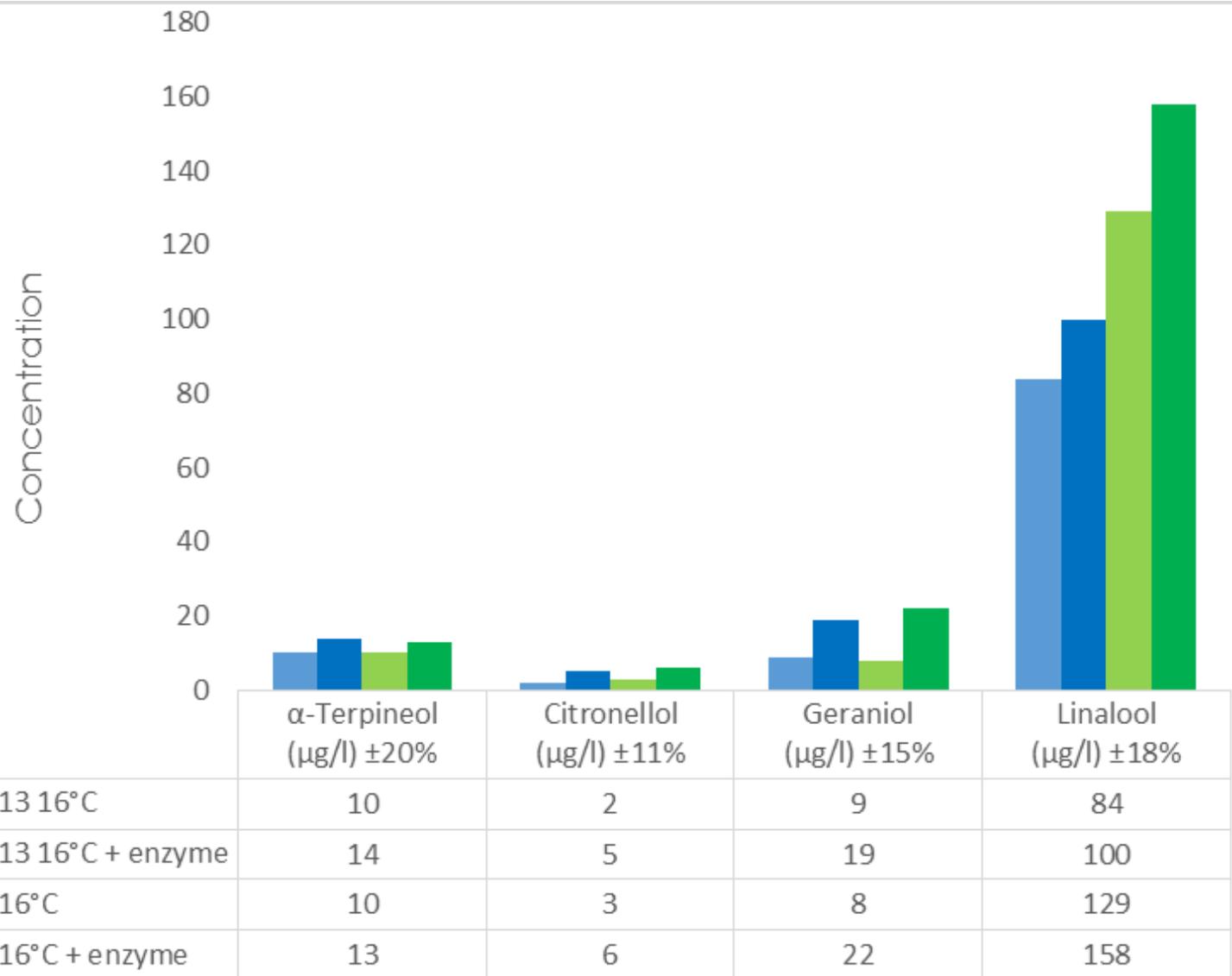


Figure 3. Influence on thiol aroma levels in Bacchus wine from yeast strain and fermentation temperature, as determined by SBSE/GC/MS.

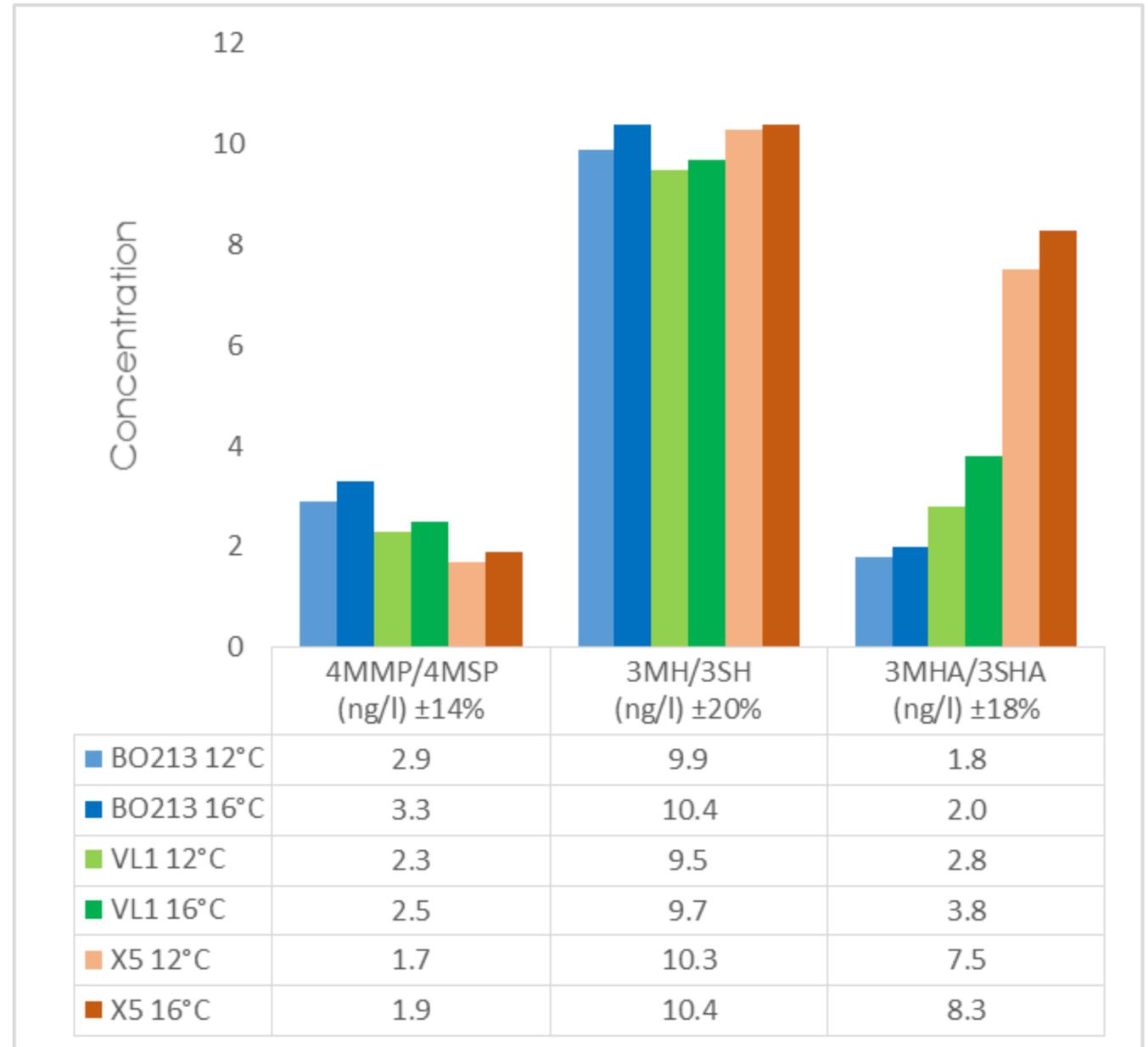
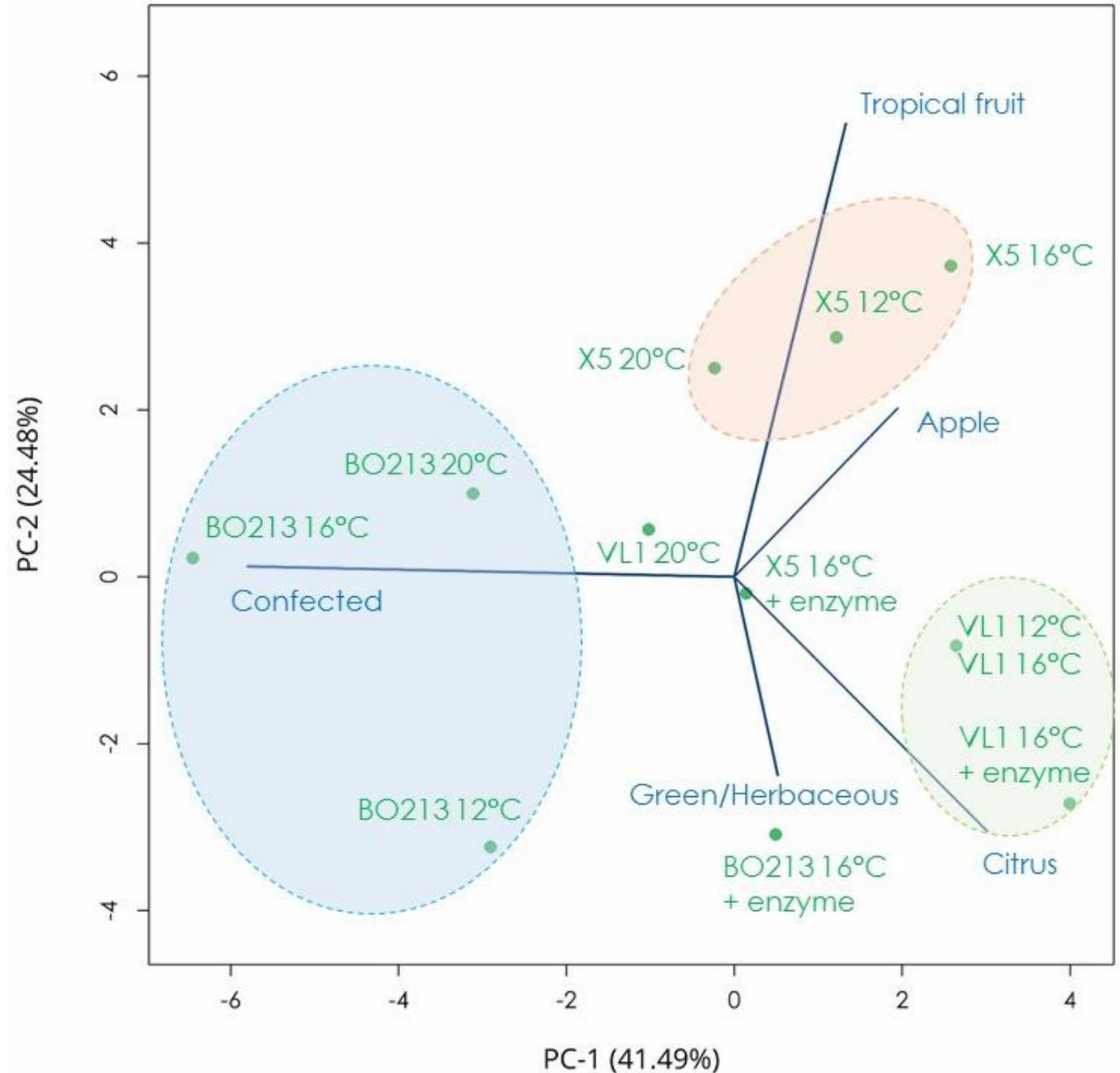


Figure 4. Influence on aromas descriptors in Bacchus wine from the yeast strain, fermentation temperature and exogenous glycosidase enzyme, as determined by labelled sorting task analysed by multidimensional scaling combined with collective descriptors analysed using principle component analysis.





FERMENTATION RESULTS

Yeast strain is important for the release of terpene and thiol aromas

Yeast strains does lead to differentiation between wines

Temperature had only a small impact on aroma especially with regards to strain

Exogenous enzymes had an impact upon terpene aromas and led increase in green/herbaceous aroma compared to their respective non-enzyme treatments.



CONCLUSIONS

Bacchus is a cool-climate variety with both thiol and terpene profile

Cold and cool climate winemakers can easily make positive differences to wine through the use of

Pre ferment skin maceration

Yeast strain selection

Exogenous enzymes