Detection and consumer rejection thresholds of honey off-flavour in sparkling wine.

Gary Pickering±, Hannah Pickering±, Stephanie Small-Kelly±, Amy Blake†, Amy Bowen†, Debbie Inglis± & Belinda Kemp*±
*Corresponding author: bkemp@brocku.ca
±Cool Climate Oenology and Viticulture Institute (CCOVI), Brock University, 1812, Sir Isaac Brock Way, St Catharines, ON L2S 3A1. Canada.
†Vineland Research & Innovation Centre, 4890 Victoria Ave N, Lincoln, ON L0R 2E0. Canada.

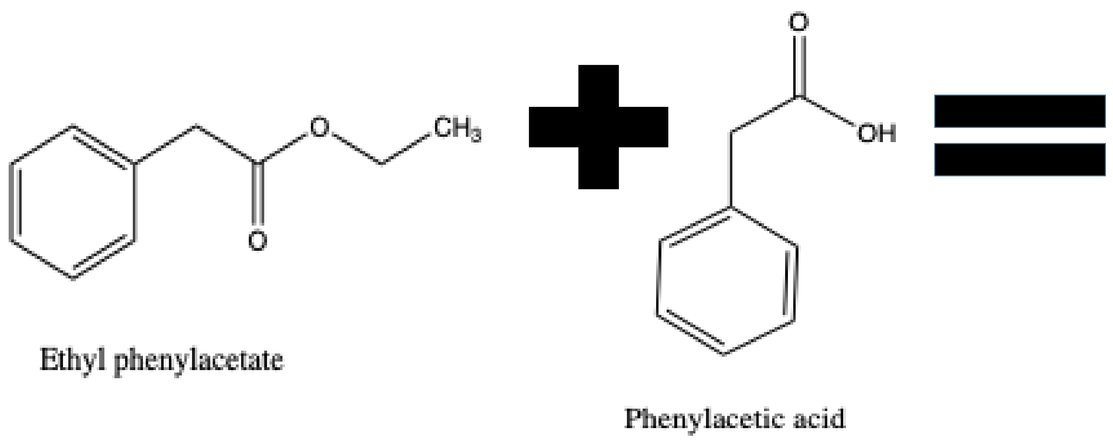
Introduction

- Ethyl phenylacetate (EPhA) and phenylacetic acid (PhAA) may be chemical markers of sour rot infection & both compounds are the cause of the sweet, moldy honey-like, off-odour.
- Determining the concentration at which these compounds are detected in sparkling wine is important in helping wineries to establish 'tolerance' levels for the flavours.
- Threshold levels can provide a baseline target for remedial treatments aimed at reducing EPhA and PhAA to 'acceptable' levels.

Aims

To determine the detection and rejection thresholds in Pinot Noir Sparkling wine:

- For ethyl phenylacetate (EPhA only)
- For ethyl phenylacetate + phenylacetic acid (EPhA/PhAA)



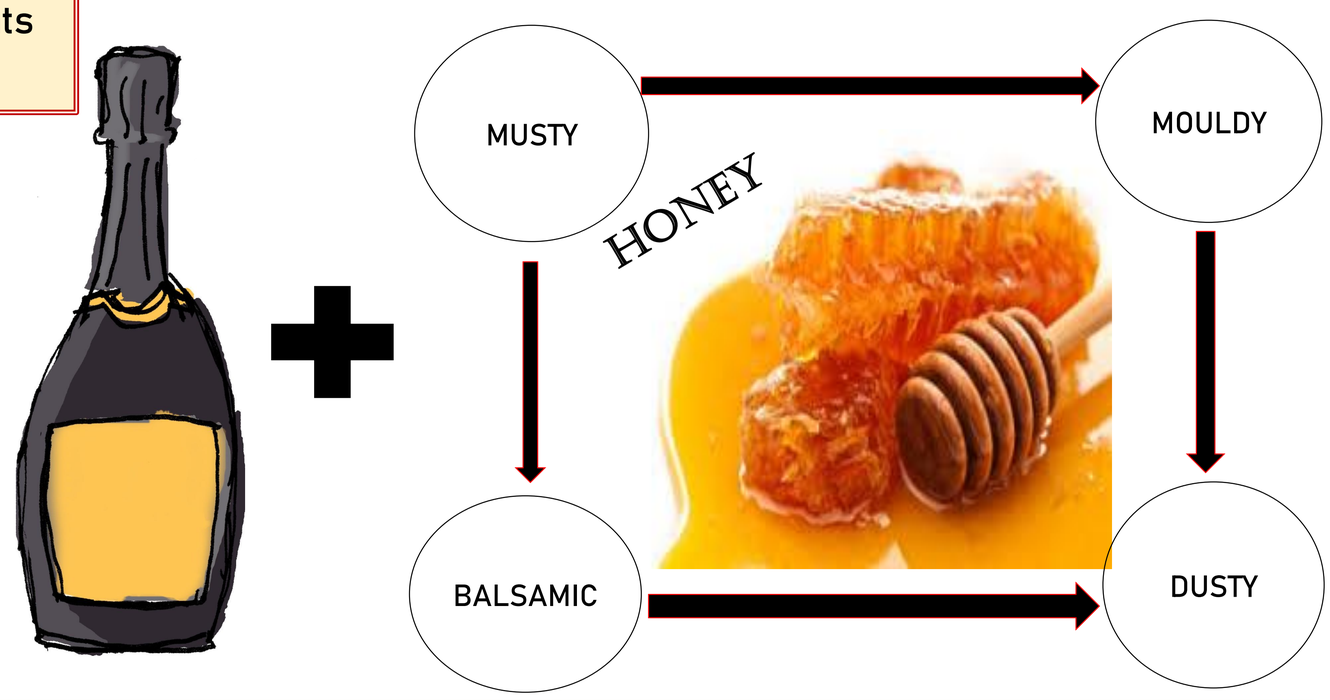


Figure 1. Diagram illustrating the impact of ethyl phenylacetate and phenylacetic acid on Pinot Noir sparkling wine flavour.

Methods

- Initial concentration of EPhA & PhAA determined by HS-SPME-GC-MS. Endogenous compounds in the sparkling wines: EPhA = 4µg/L & PhAA = 59 µg/L.
- Six panelists carried out bench testing trials to establish the concentration ranges for the main study.
- Final concentration range (ug/L) = EPhA: 5 - 644.9; EPhA + PhAA: 5 + 25 – 644.9 + 3224.5.
- Formal testing conducted in the CCOVI sensory laboratory with 32 participants.
- Detection threshold testing: Forced choice ascending concentration series, method of limits (each triad = 2 base wines "blanks, 0" and 1 base wine + added substance "target, +"). Five scale steps used at concentration factor of 3.37 .
- Rejection Threshold testing: Paired preference tests presented in ascending concentration series (each pair = 1 base wine "blank, 0" and 1 base wine + added substance "target, +"). Five scale steps used at concentration factor of 3.37 .
- Data analysis carried out using Best-estimate [threshold] criterion (BET; ASTM E-679, 2011) and Extrapolation method (EM; Roessler et al. 1978 as in Prescott et al. 2005).

Results

Table 1. Detection and consumer rejection thresholds for EPhA and PhAA.

Compound/combination	Detection threshold (DT)	DT results	Consumer rejection threshold (CRT)	CRT results
Ethyl phenylacetate (EPhA)	285.8 µg/L	21/31 (67.7%) of panelists' BET were not verified per ASTM. Likely due to guessing or under estimation as threshold not reached.	604 µg/L	The group rejection threshold for EPhA can be concluded from the data set.
Ethyl phenylacetate (EPhA) + phenylacetic acid (PhAA)	EPhA + PhAA = 261.0 µg/L / 1347.3 µg/L	Group DT cannot be concluded. 68% of individual thresholds were not determined via more than one consecutive target identification per ASTM protocol.	EPhA + PhAA = 95 µg/L / 509 µg/L	CRT cannot be concluded with confidence. Significance was not maintained as the concentration increased.

Conclusions

- EPhA consumer rejection threshold but not detection threshold determined.
- Consumer rejection threshold could not be determined for EPhA + PhAA combination by a consumer panel.
- The ranges of EPhA & PhAA present in sparkling wines is currently unknown.
- EPhA & PhAA will be investigated for the ability to act as biomarkers in sour rot prone grapes during ripening.
- Allowing panelists to re-do the tests until stable responses are achieved is recommended for threshold tests with sparkling wine.

Acknowledgements
With thanks to the Canadian Grapevine Certification Network (CGCN) and Ontario Grape & Wine Research Inc (OGWRI) for funding. The authors with to thank Shufen Xu for HS-SPME-GC-MS analysis, the Sparkling Winos for the graphic design of sparkling wine bottles and Rodela Kaleci for drawing the chemical structures.