

Olfactometry profile and evaluation of odour-active compounds in Chasselas wines

Pascal Fuchsmann¹, Mireille Tena Stern¹, Pascale Deneulin² and Ágnes Dienes-Nagy¹

¹ Agroscope, Switzerland

² Changins, Viticulture and oenology, HES-SO University of Applied Sciences and Arts Western Switzerland

Contact: pascal.fuchsmann@agroscope.admin.ch

www.agroscope.ch

Introduction

Appreciation of a wine is mainly influenced by the first perception of its aromas. On the one side, sensory analysis characterizes wine aromatic profile with specific descriptors and, on the other side, chemical analyses identify the volatile compounds. Gas Chromatography - Mass spectrometry - Olfactometry offers the opportunity to combine these two worlds together by connecting odour perception and chemical identification of odour-active compounds in a complex mixture such as wine. Chasselas wine is very popular in the French part of Switzerland. It is described with attributes like freshness, delicate fruity, floral and mineral flavors.

Objectives

The objective was to describe the aromatic profile of Swiss Chasselas white wine by sensory analysis and to identify odour-active compounds by Gas chromatography - Mass spectrometry - Olfactometry (GC-MS-O).



Sensory results

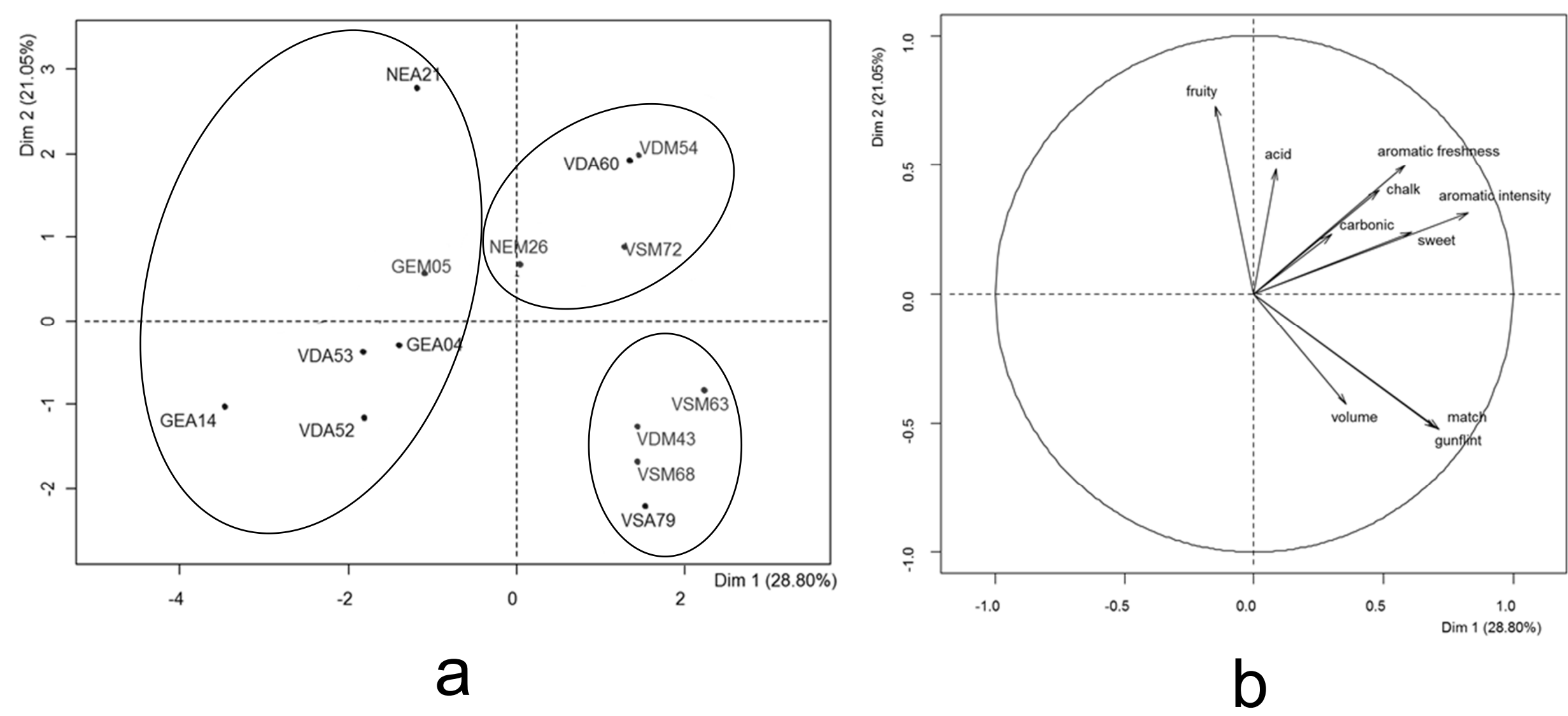


Fig. 1 PCA biplot (axes 1-2) on sensory attributes. Ellipses represent groups from cluster analysis. Attributes map (b) 10 attributes were significantly different at 5% level of ANOVA (judge and wine effects): aromatic intensity, fruity, chalk, match, gunflint, aromatic freshness, carbonic, acid, sweet, volume.

Three groups of wines are distinct.

Higher diversity of aroma : fruity, lactic or honey aromas



Gunflint and match aroma with volume in mouth: VSm63, VDM43, VSM68, VSA79



Aromatic freshness with acidity (3 wines without malolactic fermentation: NEM26, VDM54, VSM72)



Conclusion

- Sensory analyses show a wide aromatic diversity between the different Chasselas wine, dominated by fruity, mineral or aromatic freshness with acidity.
- More than 200 volatile compounds were identified in these wines. GC-O using vocabulary-intensity-duration of elementary odours by sniffing methodology (VIDEO-Sniff) permits to panelists perceived 60 odorants, classified into ten different families (buttery-cheesy, empyreumatic, floral-fruity, green-fatty, malty-chemical, meaty, spicy, nutty, sulphur and earthy-undergrowth).
- The olfactometry combined with GC-MS/PFPD revealed the dominant odour-active compounds responsible for the fruity aroma in Chasselas wine: Ethyl-2-methyl propanoate, Propyl acetate, Ethyl butanoate, Ethyl-3-methyl butanoate, Isoamyl acetate, Ethyl hexanoate and 2-Phenylethan-1-ol.

Experimental

Sensory methodology

Quantitative Descriptive Analysis (QDA) of 14 Chasselas wine was obtained by 13 trained panellists who rated the intensity of 25 sensory attributes (Nose and mouth) PCA and cluster analysis were performed on significant attributes

Volatile compounds determination by DHS-VTT-GC-MS

- DHS-VTT: $T = 50\text{ }^{\circ}\text{C}$; $t_{\text{extraction}} = 15\text{ min}$; $P = 5\text{ millibars}$; microtrap: Tenax® TA 80/100 mesh

GC-Olfactometry

- DHS-VTT: $T = 50\text{ }^{\circ}\text{C}$; $t_{\text{extraction}} = 15\text{ min}$, $P = 5\text{ millibars}$, microtrap: Tenax® TA 80/100 mesh
- Trained panellists (total $n = 8$; two at a time on a 2W-GC-O-setup) described the perceived odours and rated their intensity on a five-point-scale according to the VIDEO-Sniff-method
- Data were processed taking into account detection frequency and odour intensity (mean olfactory signal by classes ($\text{OSC}_{\text{Int} \times \text{Det}}$) as well as the employed descriptive vocabulary sorted into ten odour classes using the Acquisniff® software

Analytical results

Odour descriptions given by the panellists were classified into ten different families (buttery-cheesy, empyreumatic, floral-fruity, green-fatty, malty-chemical, meaty, spicy, nutty, sulphur and earthy-undergrowth)

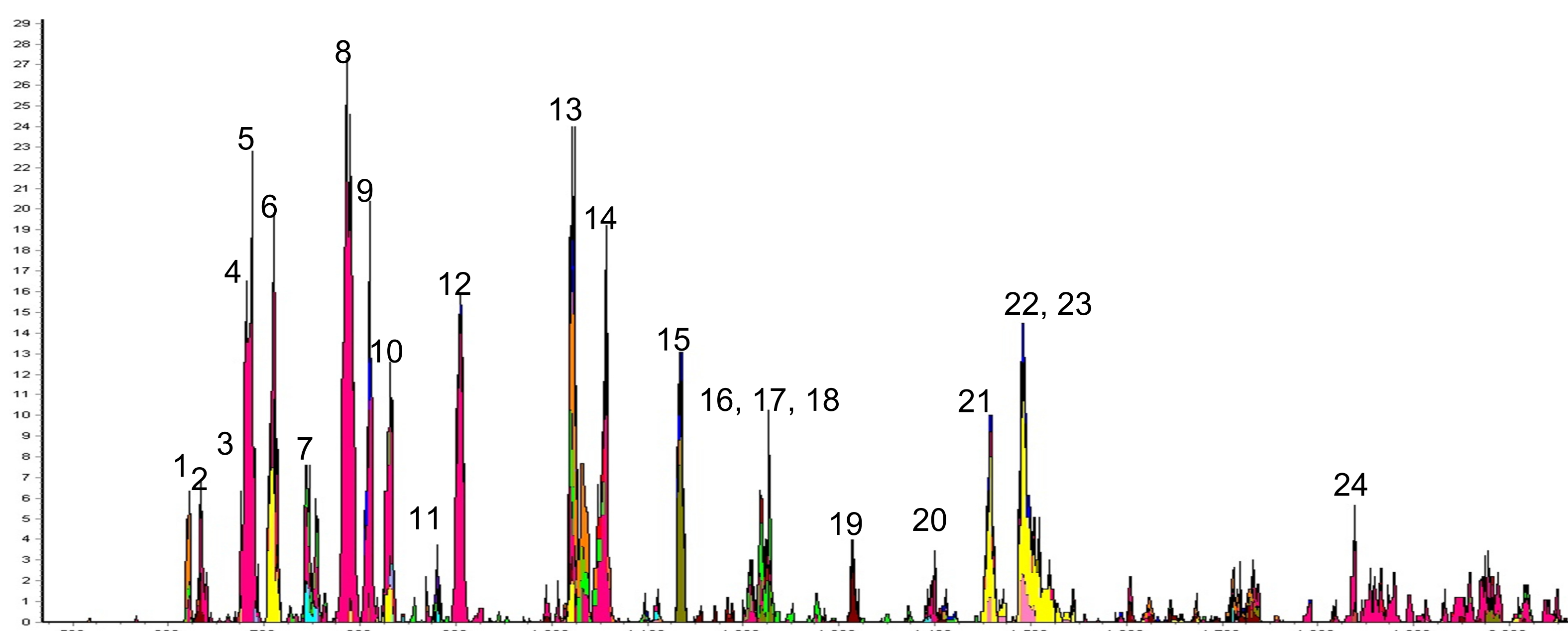


Fig. 2 Mean olfactory signal by classes ($\text{OSC}_{\text{Int} \times \text{Det}}$) of a selected Chasselas wine over eight panellists.

Table 1 Identification of the most relevant aroma active compounds after olfactometry in a fruity Chasselas wine.

ID	Retention time [s]	Compound name	odour identification
1	570	Ethyl acetate	Ethereal
2	612	3-Methylbutanal	Malty, chocolate
3	668	Ethyl propanoate	Fruity, grape, winey and fermented
4	676	Ethyl-2-methyl propanoate	Fruity, ethereal and alcoholic
5	692	Propyl acetate	Fruity, solvent like, pungency, lifting and fusel
6	698	2,3-Butanedione	Buttery, creamy, pungent with caramellic nuance
7	779	Methyl butanoate	Fruity, pungent, ethereal and perfumery
8	779	Ethyl butanoate	Fruity and tutti frutti
9	808	Methylthioacetate	Sulfurous, eggy vegetable and cabbage
10	816	Ethyl-3-methyl butanoate	Fruity, sharp, pineapple, apple, green and orange
11	875	2-Methyl propanol	Ethereal winey
12	895	Isoamyl acetate	Banana and fruity
13	1018	3-Ethylbutan-1-ol	Fusel, alcoholic, pungent, cognac, fruity and banana
14	1050	Ethyl hexanoate	Fruity and pineapple
15	1125	1-Octen-3-one	Herbal, mushroom, earthy, musty and metallic
16	1196	1-Hexanol	Pungent, fusel oil, fruity and alcoholic
17	1239	3-Hexen-1-ol	Green, earthy and fatty
18	1253	Ethyl octanoate	Waxy, sweet, musty and pineapple
19	1268	Acetic acid	Pungent and vinegar
20	1385	2-Methyltetrahydrothiophen-3-one	Sulfur and fruity berry
21	1438	Butanoic acid	Dairy-like, cheesy and buttery
22	1630	2-Phenylethyl acetate	Floral
23	1630	Hexanoic acid	Fatty and sweat cheese
24	1728	2-Phenylethan-1-ol	Floral, fresh and bready with rose honey nuance