

The limonene-derived mint aroma compounds.

Recent advances in the knowledge of freshness perceived in aged red wines

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INTRODUCTION

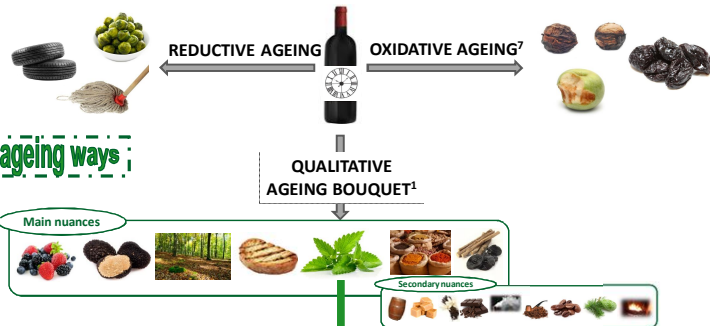
o The wine ageing bouquet is one of the most fascinating but least known phenomena in oenology. It denotes a set of aromas, which, together, form a perceptible equilibrium of pleasant sensations in aged fine wines.

o The ageing bouquet develops during bottle storage when oxygenation conditions are optimal, thus not promoting neither oxidation nor reduction defects. The development of a qualitative ageing bouquet is an essential quality attribute for fine old wines.

o The definition of the qualitative ageing bouquet, both by a sensory and by a molecular point of view, can be considered the starting point to understand how and at what extent viticultural and oenological parameters could influence it.

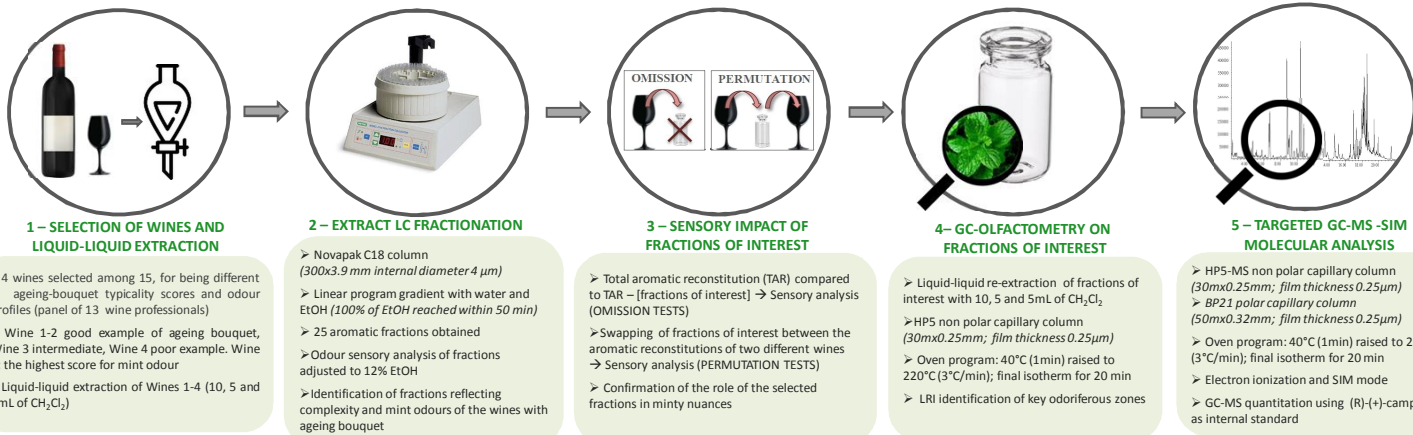
o Seven main aromatic notes were identified in red Bordeaux wines with an ageing bouquet: undergrowth, toasted, spicy, liquorice, mint, truffle, fresh red- and black-berry fruits.¹

o The aroma compounds contributing to minty nuances were investigated,^{2,3,6} along with some oenological parameters able to affect their concentrations in wine.^{4,5}

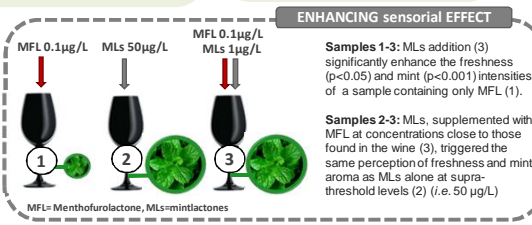
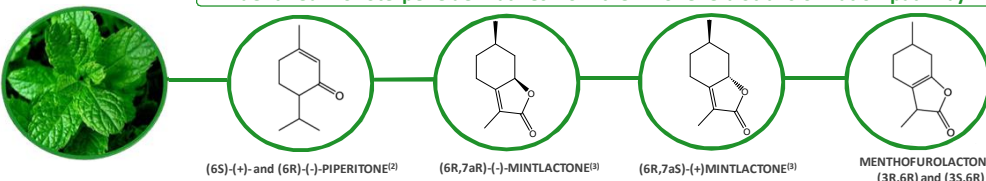


What are the molecules responsible for mint nuances?
What are the precursors? What are the quantities? What are the sensorial effects?
Are the choices in vine management and winemaking important for the levels of minty compounds?

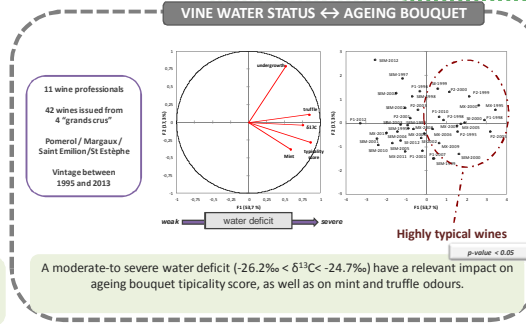
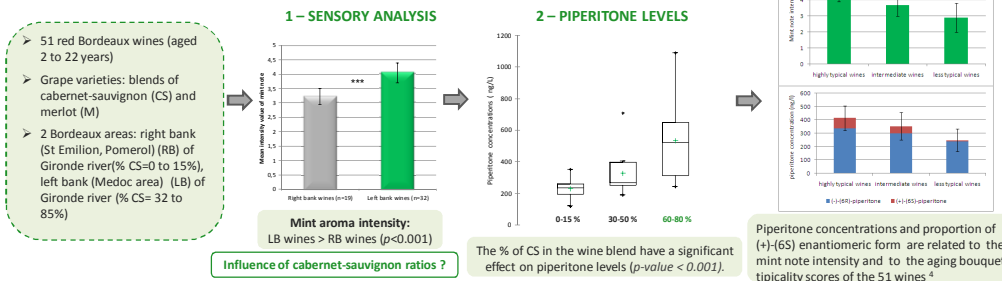
A multiple-step approach to identify the minty molecular markers



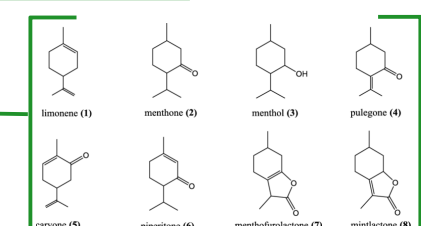
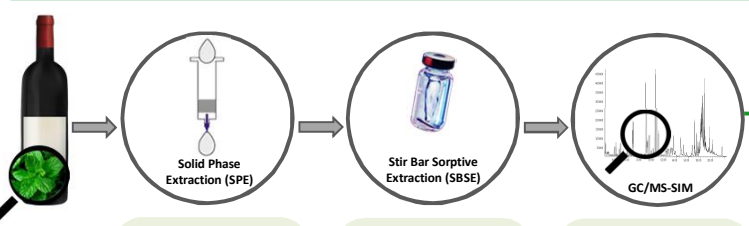
Identified monoterpene derivatives from the limonene biotransformation pathway



Do grape variety and vine water status play a role in the ageing bouquet expression?



A new analytical method to quantify at trace amounts eight limonene-derived mint aroma compounds⁶



PERSPECTIVES

- ✓ To identify precisely the precursors
- ✓ To understand finely the complex perceptive effects
- ✓ To know the richness of the minty compounds of the guard wine varieties
- ✓ To understand the influence of water status on minty compounds

Compound	Odour	Specific ions (m/z) ^a	Concentration range (ng/L, n=3) ^b
(5S)-(-)-limonene 1	Terpenic, herbal	68/93/136	88±10 - 326±21
(1R,2S,5R)-(+)-menthone 2	Mint	69/112/139	10±4 - 27±5
(1R)-(+)-pulegone 4	Mint, cool	81/95/138	260±10 - 597±21
(5S)-(+)-carvone 5	Peppermint, camphor, herbal	81/109/152	9±1 - 122±6
(6S)-(+)- and (6R)-(-)-piperitone 6	Mint	82/108/150	74±6 - 248±7
(3R,6R) and (3S,6R)-menthofurrolactone 7	Peppermint, fresh	82/95/110	35±6 - 1527±32
(6R,7aR)-(-)-mintlactone 8	Coconut, fresh, powdery	81/95/166	53±0 - 89±10
	Mint	109/137/166	227±3 - 987±7

^aQuantifier ions are in bold. ^b15 red Bordeaux wines aged from 0 to 3-23 years

References:
 [1] Picard et al., 2015, Food Qual. Prefer., 42, 110-122; [2] Picard et al., 2016, JAF, 64, 451-460; [3] Picard et al., 2017, Food Chem., 217, 294-302; [4] Picard et al., 2016, JAF, 64, 7576-7584; [5] Picard et al., 2017, Frontiers Chem., 5 (56), 1-8; [6] Picard et al., 2018, An Chim Acta, 1001, 168-178; [7] Pons et al., 2008, J. Agric. Food Chem., 56 (13) 5285-5290