The limonene-derived mint aroma compounds. Recent advances in the knowledge of freshness perceived in aged red wines

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The limonene-derived mint aroma compounds are related to the mint note intensity and to the aging bouquet typicality of young wines.

**INTRODUCTION**

- 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 perceptive equilibrium of pleasant sensations in aged fine wines.
- 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.

**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 oculicolial and oenological parameters could influence it.**

- Seven main aromatic notes were identified in red Bordeaux wines with an ageing bouquet: undergrowth, toasted, spicy, liquorice, mint, truffle, fresh red- and black-berried fruits.  
- The aroma compounds contributing to minty nuances were investigated, along with some oenological parameters able to affect their concentrations in wine.

**A multiple-step approach to identify the minty molecular markers**

1. **SELECTION OF WINES AND LIQUID-LIQUID EXTRACTION**
   - 4 wines selected among 15, for being different in:
     - ageing trophy-type samples and oenologist profiles (panel of 13 wine professionals).
     - Wine 2, a good example of ageing bouquet, Wine 3: intermediate, Wine 4: poor example. Wine 1: the highest score for mint aroma.
   - Liquid-liquid extraction of Wines 1-4 (10, 5 and 5mls of CH2Cl2).

2. **EXTRACT LC FRACTIONATION**
   - Nonapole C18 column (50×2.5 mm internal diameter 6-µm).
   - Linear gradient program with water and CH2Cl2 (100% of CH2Cl2 reached within 50 min).
   - 25 aromatic fractions obtained.
   - Obvious sensory analysis of fractions adjusted to 12% CH2Cl2.
   - Identification of fractions reflecting complexity and mint odours of the wines with ageing bouquet.

3. **SENSORY IMPACT OF FRACTIONS OF INTEREST**
   - Total aromatic reconstitution (TAR) compared to TAR – Fractions of interest (PIPERITONE LEAVES).
   - Sensory analysis (PERCEPTION TESTS):
     - Sensory contributors of interest between the aromatic reconstitutions of two different wines.
   - Confimation of the role of the selected fractions in minty nuances.

4. **GC-OCTALOMETRY ON FRACTIONS OF INTEREST**
   - Liquid-liquid re-extraction of fractions of interest with 1 µL 5 µL and 5 µL of CH2Cl2.
   - HP-1 non polar capillary column (300 m × 0.25 mm; 1.0 µm). Oven program: 40°C (1 min) raised to 220°C (20°C/min). Final isotherm for 20 min.
   - Identification of key odorous zones.

5. **TARGETED GC-MS SIM MOLECULAR ANALYSIS**
   - HP-1 polar capillary column (30 m × 0.25 mm; 1.0 µm) Oven program: 40°C (1 min) raised to 220°C (20°C/min). Final isotherm for 20 min.
   - Electron ionization and SIM mode.
   - GC-MS quantification using (R)-(+)-camphor as internal standard.

**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

**REFERENCES**