Characterization of key aroma compounds in Burgundy truffle

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Truffles are a fungus of the genus Tuber. Some of them have an important economic value due to their gastronomic qualities appreciated in "grand cuisine". Perigord truffle (Tuber melanosporum or Black truffle) and White Alba truffle (Tuber magnatum pico) are actually the noblest ones. While these two species are well-valued, Burgundy truffle (Tuber uncinatum) is less well-characterized in its production area and truffle producers encounter some difficulties to sell their harvest at its fair value. The aroma compounds in truffles are investigated with sensory evaluation and two physico-chemical methods.

**Methodology**

- **Sensory analysis**
  - 16 panelists were trained with 8 sessions
  - Truffles were evaluated only by olfaction

- **Classical descriptive profile (QDA)**
  - Button mushroom: Spicy
  - Cep: Smoked
  - Giraffe mushroom: Animal
  - Undergrowth: Pungent
  - Earthy: Pepper
  - Mouldy: Fruity
  - Nut: Vanilla
  - Alcohol, pharmaceutical: Bread

- **Dynamic HeadSpace (DHS)**
  - 1 g truffles
  - Incubation 36°C 15 min
  - Tapping 20°C
  - Crying 40°C
  - Thermal desorption 30 to 370°C at 10°C/min
  - CIS 100°C at 12/Cs

- **Gas Chromatography – Mass Spectrometry (GC-MS)**
  - GC-MS parameters:
    - Column: DB-Heavy-Wax (30 m, 0.25 mm, 0.35 um)
    - Injection: Splitless 1 min 25 mL
    - Detector: Electron Impact
  - PTR-MS parameters:
    - M1
    - PTR TOP 5000 (ionizer)
    - M2
    - PTR TOP 8000
  - P-Geraniol 9:1
  - F:D 5:1
  - F:N 99:1

- **Retention index**
  - Aroma compounds identification (NIST08, INRMAss, WILEY11N17)

- **Proton Transfer Reaction – Mass Spectrometry (PTR-MS)**
  - m/z: Peak area
  - Aroma compounds mass fingerprint (statistical analysis)

**Results**

- **PTR-MS analysis**
  - The results presented in figure 3 and 4 show that it is possible to discriminate the truffles according to places and seasons (autumn, summer).
  - However, the analysis of frozen mix truffles as a control have shown a sample dispersion according to time from June to November (data not shown).
  - We can suspect truffle conservation problems and/or an instrumental bias.

- **GC-MS analysis**
  - The results obtained by GC-MS confirm the results obtained by PTR-MS and sensory analyses.
  - The truffles are separated according to harvest places and seasons (Figure 5).
  - A volcano plot with a foldchange higher than 3 and 3-pvalue$^{10^{-5}}$ allows compounds to be discriminated depending on their peak area in the TIC of the chromatogram. The results are presented in Table 1.

**Conclusion & Perspectives**

- Sensory analyses, PTR-MS, GC-MS are, three of them, good methods to differentiate truffles according to harvest places and the seasons.
  - The Burgundy truffles harvested in summer are less odorant than Burgundy truffles harvested in autumn.
  - These results will have to be combined to microbiota and genetic analyses.
  - This work will bring a scientific contribution to the creation of an IGP (Indication Géographique Protégée) request.