# How truffle nests, an agronomic technique, affects to black truffle quality?

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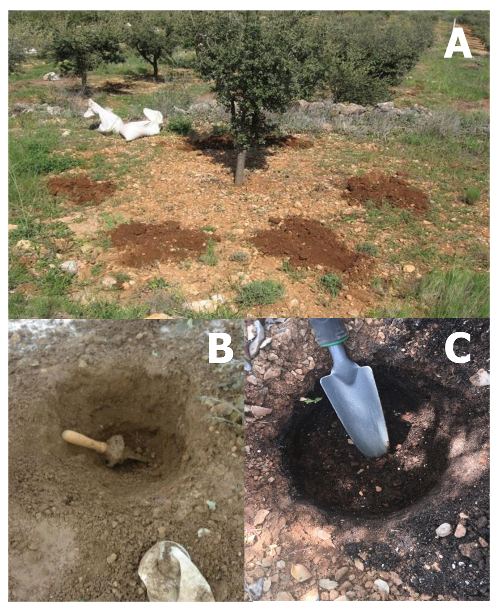



Figure 1. A) "Truffle-nests" technique; B) Hole after harvesting Bulk-soil truffle; C) Hole after harvesting nest truffle

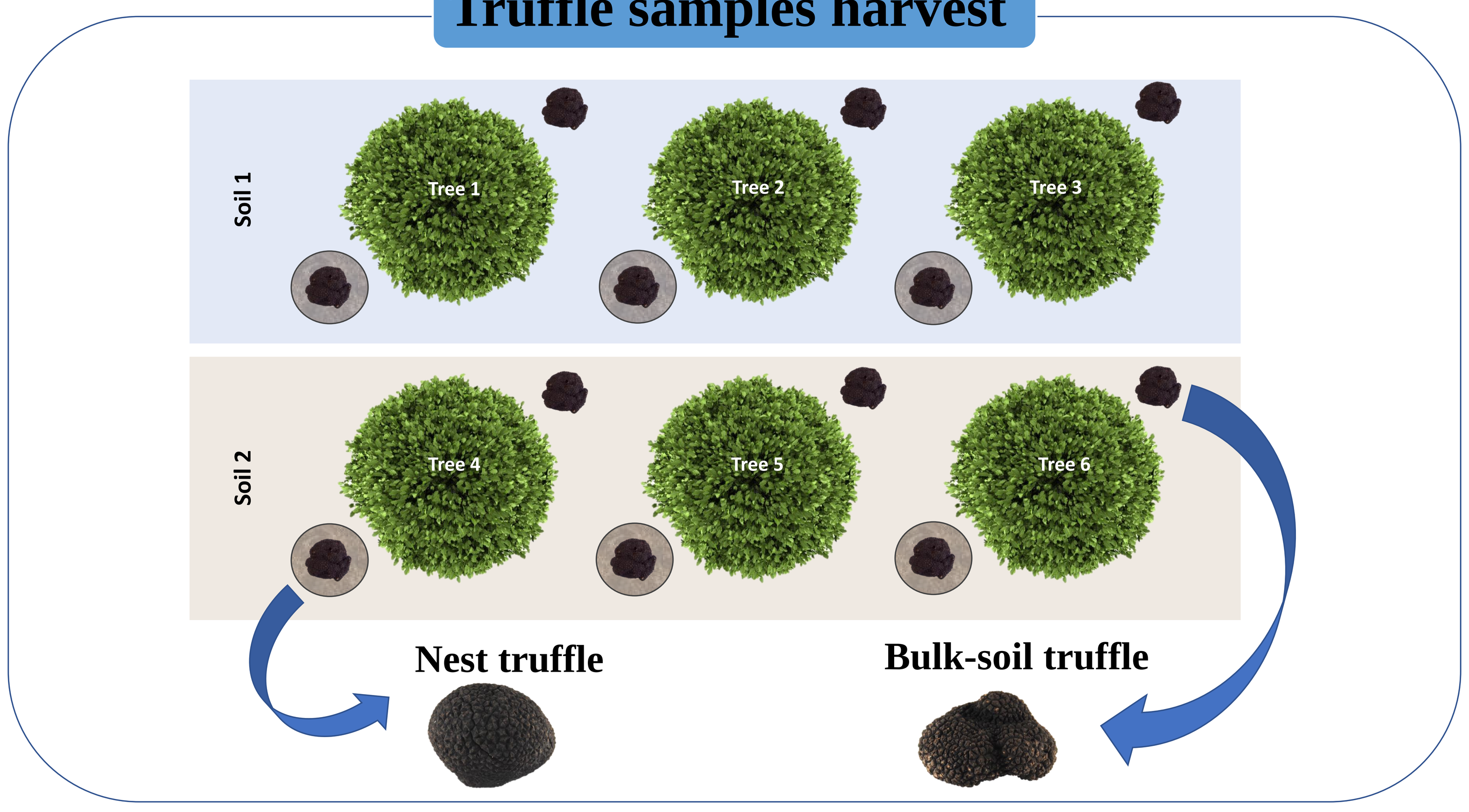
## INTRODUCTION

*Tuber melanosporum*, the European black truffle, is a culinary delicacy very appreciated worldwide due to its aroma. A standard profile of VOCs (Volatile Organic Compounds) can be established for *Tuber melanosporum* species, however there is individual-to-individual variability attributed to factors such as its origin, the soil composition, the tree species associated with it (Culleré et al. 2017) and also interactions on the fruity body with microorganism (Splivallo et al. 2011). This species grows as an obligate symbiont of several woody plants forming ectomycorrhizas. "Truffle-nests" setting-up is a novel, but very spread, technique that consists of installing punctual amendments in the soil, by incorporating a soft substrate with truffle spores. This leads to a rounder shape and a lower presence of insect damages (Garcia-Barreda et al. 2019). This study aimed to assess how truffle nests installation (Figure 1) affects black truffle aroma on both organoleptic and analytic ways by comparing truffles from nests and truffles from bulk soil.

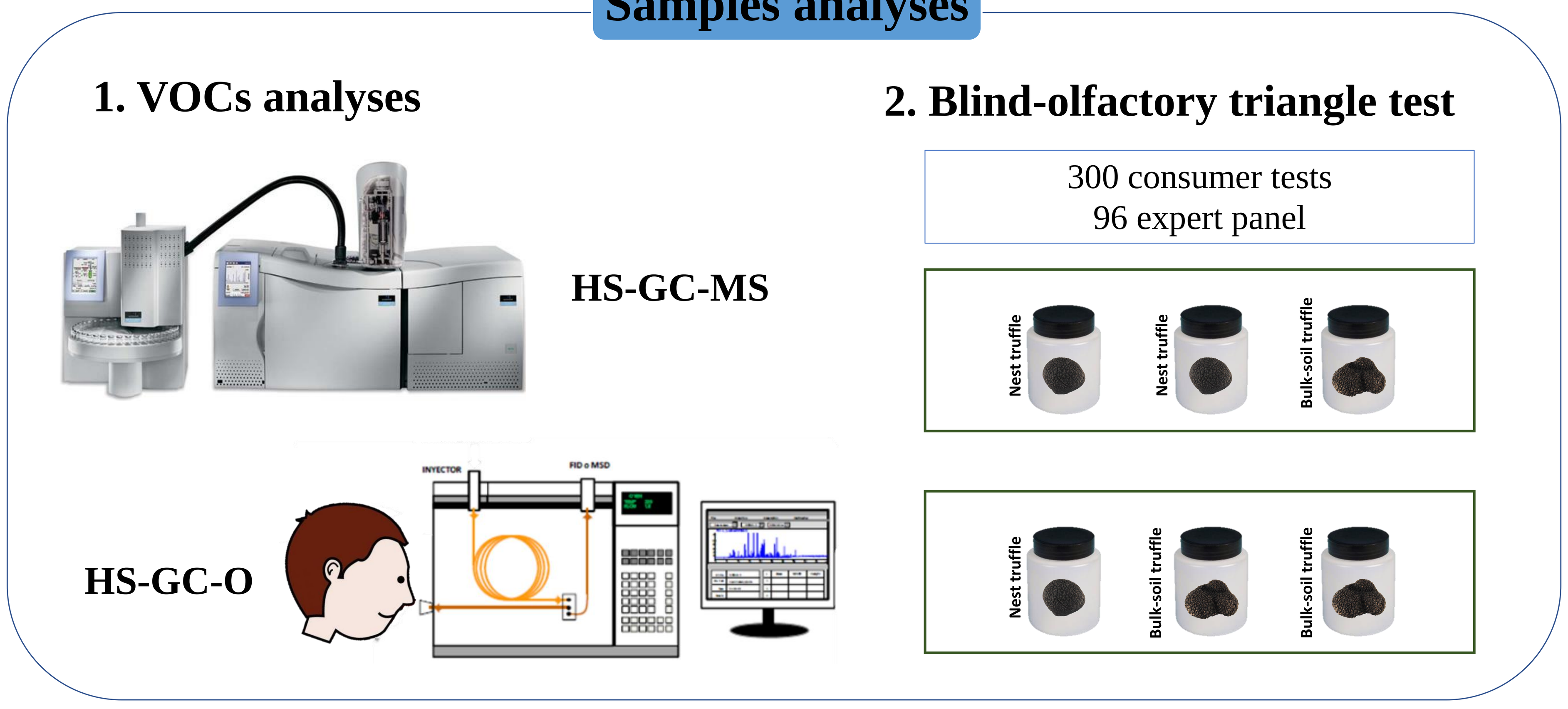
## MATERIAL & METHODS

Truffles were harvested and immediately were cleaned, surface air dried and cooled (4 ºC). 24 hours after harvesting, VOCs from truffles were analyzed by HS-GC-O (headspace-gas chromatography-olfactometry) and HS-GC-MS (head space-gas chromatography/mass spectrometry) techniques. Also, a blind-olfactory triangle test was tested with a consumer and an expert panel.

### Truffle samples harvest

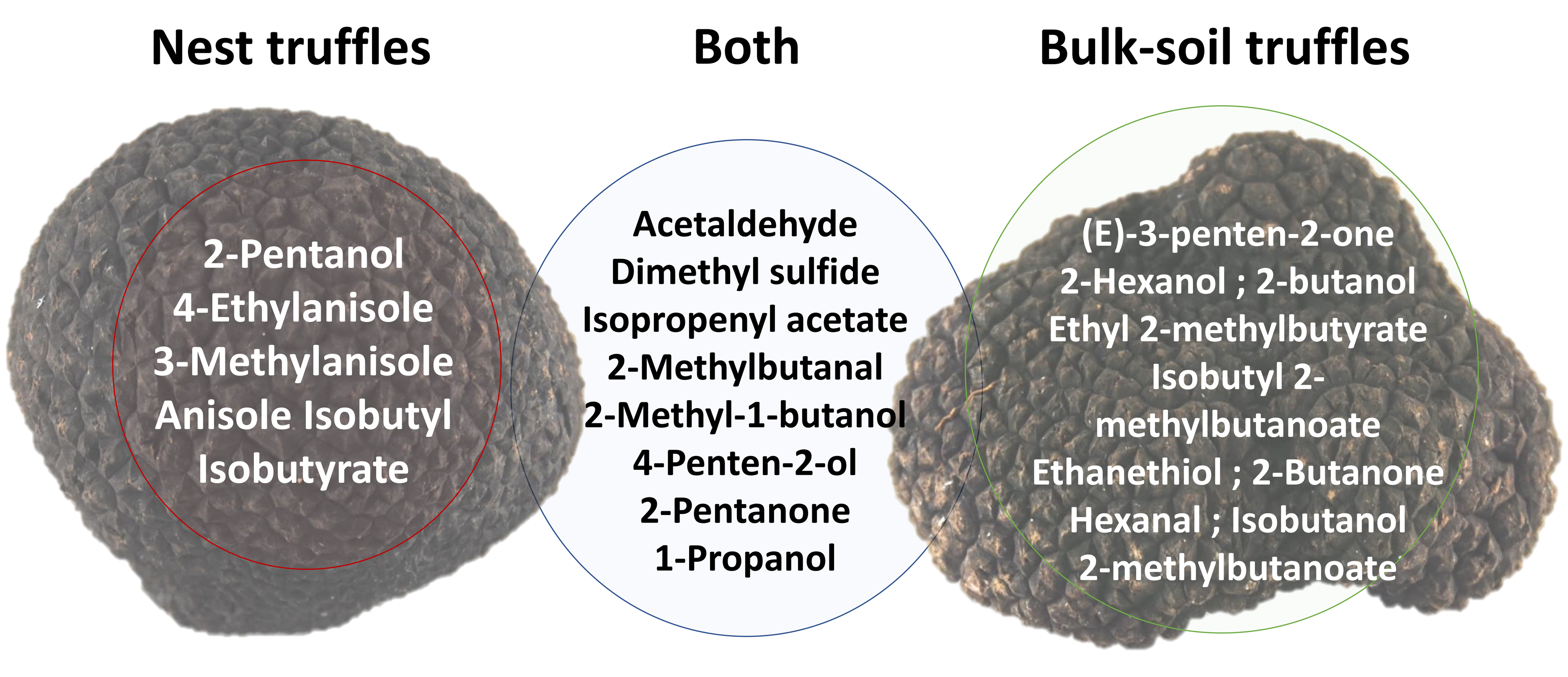



### Samples analyses




## RESULTS

Bulk-soil truffles clearly have a more complex aromatic profile than those formed on nests. For both instrumental methodologies (HS-GC-O and HS-GC-MS) the same results were reported. Some molecules were only found in bulk-soil truffle samples ((E)-3-penten-2-one, 2-Hexanol, 2-butanol, Ethyl 2-methylbutyrate, Isobutyl 2-methylbutanoate, Ethanethiol, 2-Butanone, Hexanal, Isobutanol and 2-methylbutanoate); and alternatively between nest and bulk-soil (2-Pentanol, 4-Ethylanisole, 3-Methylanisole and Anisole Isobutyl Isobutyrate).




However, these differences obtained by instrumental techniques, were not detected by the consumers, only 140 of 300 tests, and nor by the expert panel, 56 of 96, resulting in a non-practical effect of this technique on truffle flavour.

Principal Components Analysis developed on VOCs shows a very strong clustering of the samples in two groups clearly influenced by nests technique (figure 2).

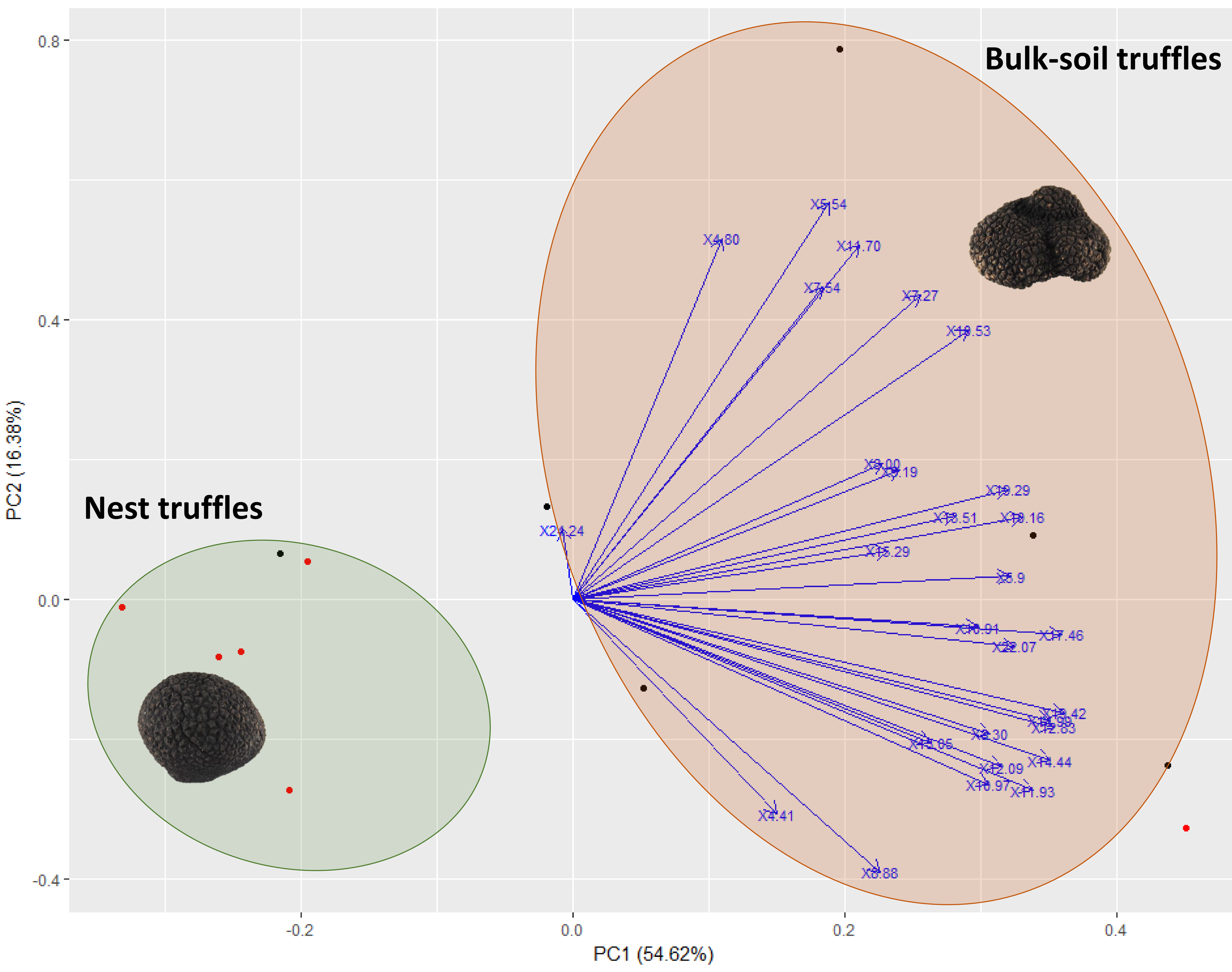



Figure 2. PCA analyses of VOCs. Red dots are samples from truffle nests and black dots samples from bulk soil.

## CONCLUSIONS

**Truffles from bulk soil have a more quantity of some compounds being dimethyl sulphide and 2-methylbutanal the most representatives. However, consumers and also the expert panel were no capable to distinguish truffle differences, so that molecules were not enough appreciated for human sensory abilities.**

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