

Volatile profile of commercial guacamoles

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Introduction

Avocado consumption has been increasing every year. However, the most common way in which avocado is consumed is the form of guacamole, which is arguably the most famous sauce worldwide. There are plenty of guacamole recipes commercialized in diverse formats and packings with different food preservation methods applied which could have an influence in the volatile composition.

Nowadays, there are two types of commercialized guacamoles: those denominated as fresh guacamoles preserved by means of high pressures and canned guacamoles which have been sterilized. Currently, consumers tend to search products as much natural as possible which preserve the sensorial properties of the original fresh product. Therefore, a study of the volatile profile of different commercial guacamoles has been carried out in order to evaluate the volatile composition among both types of guacamoles in comparison with the avocado puree.

Sample set

The study was conducted with a total of 6 different guacamole brands with two different preservation treatments: high pressures (fresh guacamoles) and sterilization (canned guacamoles). In parallel, an avocado puree was laboratory-made with 4% of water as reference.

Volatile extraction and GC/Q-TOF analysis

An automated SPME system (GC-Sampler 120) was used to carry out the extraction process. 1g of guacamole (5 g in case of avocado puree), 2 mL of deionized water and 30 μ L of 4-nonanol as internal standard (0.022 g/L) was placed in a 10-mL vial for guacamoles (20-mL vial for avocado) which were sealed with a screw-capped top containing a teflon-lined septum. The 50/30 μ m DVB/CAR/PDMS-coated fiber was exposed to the headspace at 40 °C for 20 min. Desorption was performed for 3 min, with the injector at 240 °C under splitless mode for 0.35 min.

Gas chromatography analysis was performed with a Agilent 7890B instrument coupled to Q-TOF mass spectrometer (7200). Compounds were separated on a HP-5MS column (30 m x 0.25 mm x 0.25 μ m). The column was maintained at 40 °C, then ramped to 125 °C at 2 °C/min and then to 270 °C at 25 °C/min. The transfer line temperature was 280 °C and electron energy was 70 eV. The mass acquisition range was 40-500 amu. Identifications were performed according to the NIST mass spectral library and the retention linear index reported in literature.

Results and Discussion

Figure 1. Representative volatile profile of a) Avocado puree, b) Fresh guacamole, c) Canned guacamole analyzed

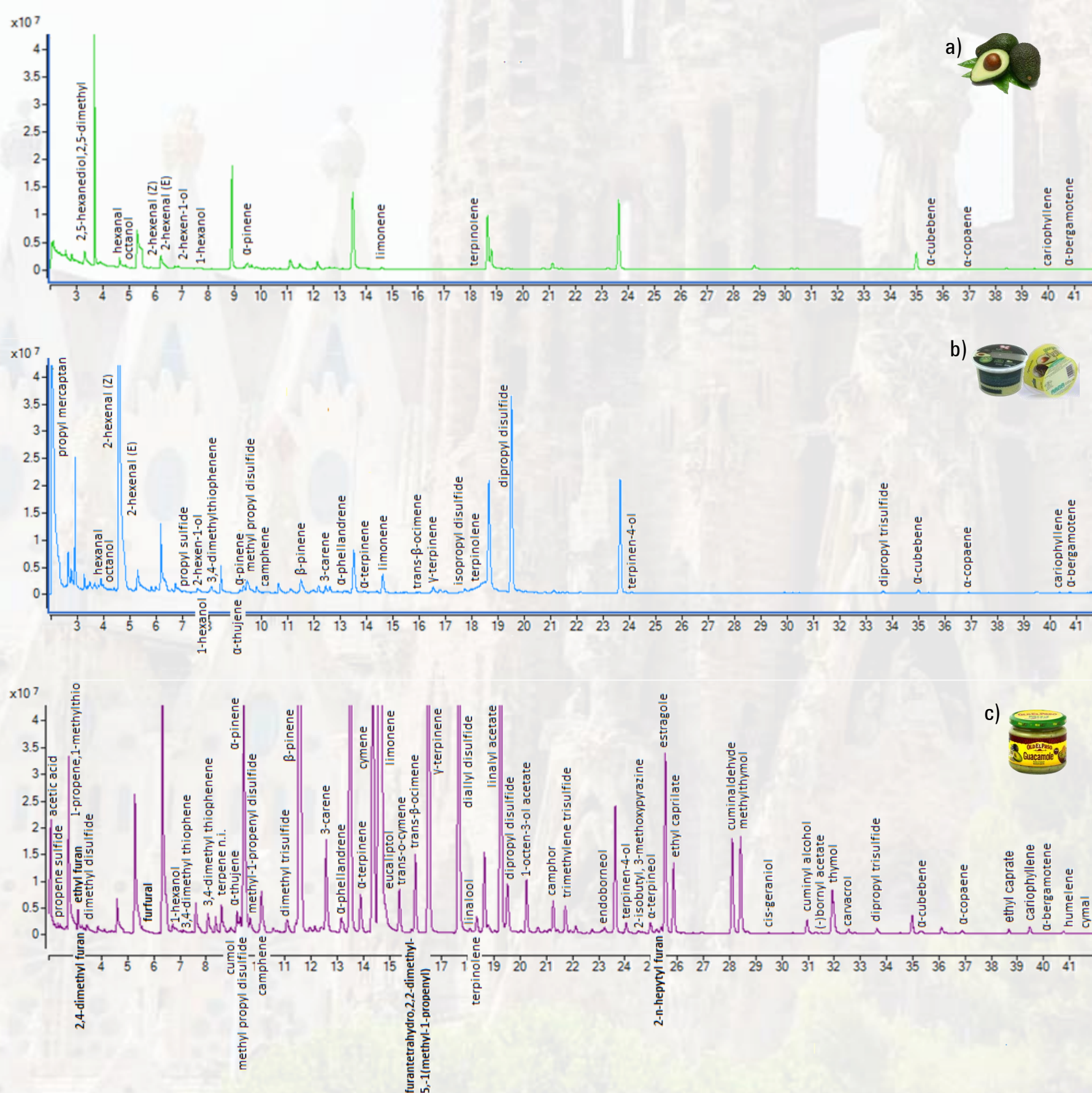


Table 1. Volatile compounds detected in avocado and guacamole samples analyzed with their sensorial descriptors grouped by chemical families

Chemical Families	Compounds	Sensorial descriptor
C₆ compounds	hexanal, 2-hexenal, 1-hexanol, 2-hexanol-1-ol, 2,5-hexanediol, 2,5-dimethyl	Green, fresh
Terpenes	α -pinene, limonene, terpinolene, α -copaene, α -cubebene, cariophyllene, α -bergamotene, α -phellandrene, α -pinene, β -pinene, γ -terpinene, terpinen-4-ol, linalool, geraniol, α -terpineol...	Citrus, herbal, fresh, fruity, floral, woody
	cumene, cymal, cuminaldehyde, cumyl alcohol, carvone, carvacrol, thymol, methyl thymol, estragole.	Spice, balsamic, spicy
Pyrazines	2-isobutyl-3-methoxypyrazine	Pepper
Sulphur compounds	propyl mercaptane, propene sulfide, 1-propene-1-methylthio, dimethyl disulfide, 2-methyl thiophene, diallyl sulfide, propyl sulfide, 3,4-dimethyl thiophene, methyl isopropyl disulfide, dimethyl trisulfide, diallyl disulfide, dipropyl disulfide, dipropyl trisulfide	Onion, garlic, cooked cabbage, rotten eggs, sulphureous
Furan compounds	furfural, ethyl furan, 2,4-dimethylfuran, 2-n-heptylfuran	Toasted, caramel, smooky

Conclusions

- ✓ Canned guacamoles contained more volatile compounds of diverse nature and structure as consequence of the multitude ingredients used in their recipes to achieve the typical flavour "tex mex".
- ✓ The use of high temperatures in the sterilization process applied to canned guacamoles produced the appearance of the furan compounds such as furfural and its derivatives as consequence of the Maillard reaction and the decreased of the C₆ compounds detected.
- ✓ Among guacamoles commercialized, fresh guacamoles pasteurized by means of high pressures without high temperature and whose percentage of avocado is higher, preserve better the volatile components from avocado.

- Avocado puree exhibited a simple volatile profile characterized by the presence of the C₆ compounds, with marked green and fresh notes, and some varietal terpenes in discrete amounts.
- Fresh guacamoles displayed C₆ compounds and increased their sensorial features due to the presence of other terpenes with citrus, herbal, fruity and floral notes and some sulphur compounds coming from the diverse ingredients used such as onion or garlic.
- Canned guacamoles showed the most complex volatile profile. Although the presence of C₆ compounds were attenuated, new volatile compounds were detected such as different terpenes, methoxypyrazines, and sulphure compounds as a consequence of the multitude ingredients used in the product manufacturing. Several compounds from spices were detected as estragole, thymol, cumene and their derivatives whose sensorial features are described as spice, balsamic and spicy. It is especially noteworthy the presence of furan compounds probably due to the high temperatures reached in the sterilization stage as preservation method.

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