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Citrus juice concentrates obtained by crossflow microfiltration

Impact of the process on aroma and sensory profiles



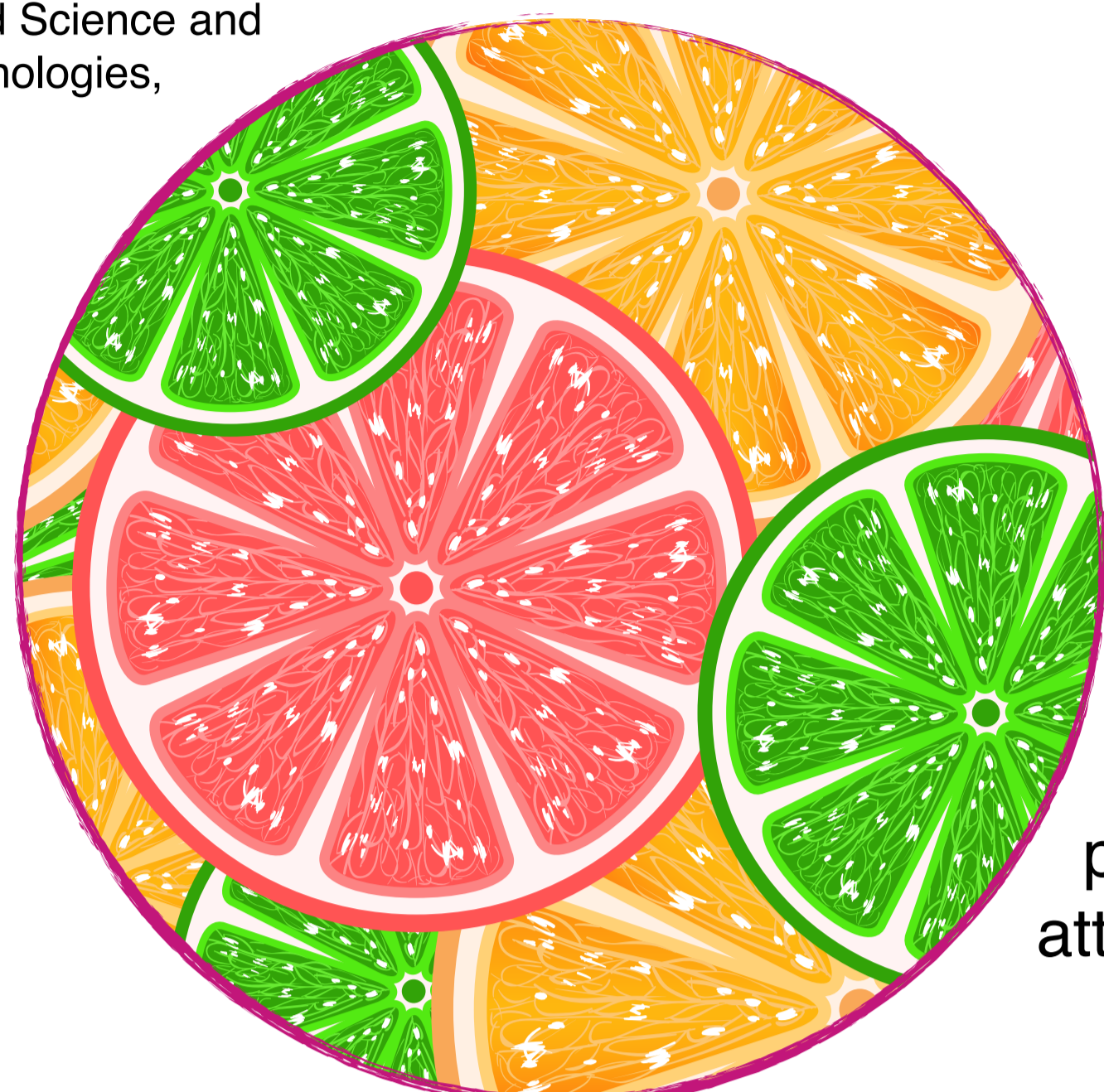
REFERENCE

¹ POLIDORI, J., DHUIQUE-MAYER, C. *et al.* (2018). Crossflow microfiltration coupled with diafiltration to concentrate and purify carotenoids and flavonoids from citrus juices. *Innovative Food Science and Emerging Technologies*, 45, 320-329.

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Introduction

Citrus juices are the most widely consumed fruit beverages in the world and considered as micronutrient-dense food with attractive taste and aroma. In order to enhance their nutritional quality, citrus juices can be cold-concentrated by crossflow microfiltration (CFM)¹. This process allows enriching the juice in phytonutrients but can also considerably modify its organoleptic properties. To better understand the impact of this membrane technology on the sensorial quality of the product, the study focused on aroma and sensory profiles. Moreover, it aimed to find correlations between aroma compounds and sensory attributes comparing 2 concentrates obtained with and without a diafiltration step.

Materials & methods

The initial citrus juice was formulated with 60% *Citrus clementina* and 40% *Citrus paradisi* juices. The CMF was carried out at 30°C, 2.6 bar and 5 m.s⁻¹ with a laboratory device equipped with ceramic tubular membranes of 0.2 µm average pore diameter. Two concentrates were obtained by recovering the retentate up to a mass reduction factor between 8 and 9 without (DV0) or after a final diafiltration step (DV1) (figure 1). Aroma compounds were extracted by Solid Phase Micro-Extraction (SPME) technic (Fiber PDMS/DVB 65 µm, SUPELCO) and analyzed by GC-MS (figure 2). Sensorial descriptive analysis was conducted thanks to 12 highly trained panelists (figure 3).

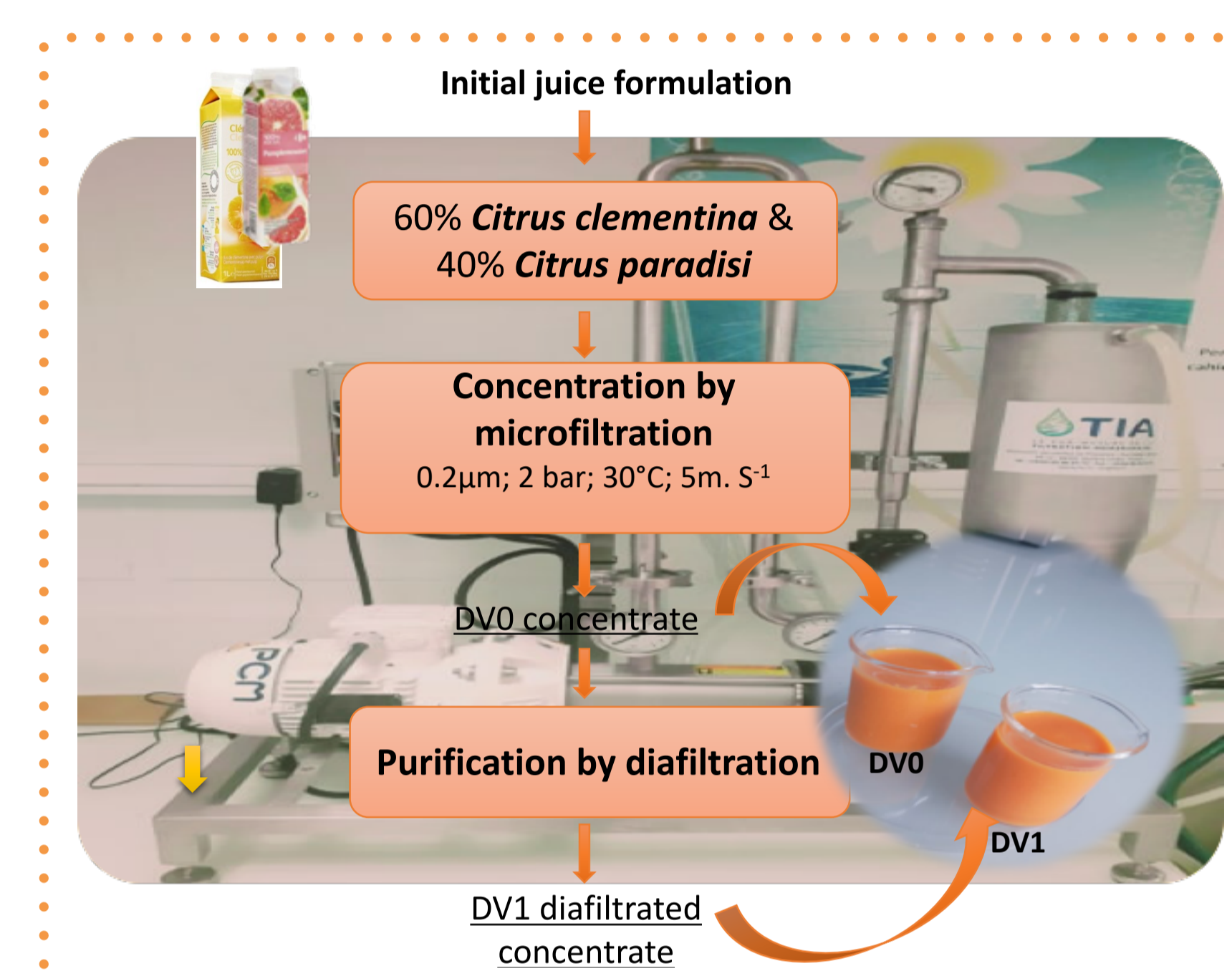


Figure 1. Pilot and Flow diagram for the concentration and purification processes.



Figure 2. (SPME) combined with gas chromatography/mass spectrometry (GC/MS).



Figure 3. Descriptive sensory analysis of citrus products (DV0 and DV1).

Results

The process concentrated 4-8 fold the aromas compounds excepted linalool, terpinen 4-ol and 1-octanol. The statistical Principal Component Analysis (PCA) visualized the quite distinct concentrates DV0 and DV1 and the correlations between the 21 quantified aroma compounds and the 13 defined sensory attributes (figure 4).

The DV0 concentrate was characterized by a typical nice citrus odor and was the preferred product for panelists. Strong correlations (0.84-0.94) were observed between citrus odor, overall quality, **octanal**, **α-terpineol** and some monoterpenes (**D- Limonene** and **p-cymene**).

In contrast, DV1 has the lowest content of key volatile compounds, higher **bitterness** values and the lowest intensities of key sensory attributes (**citrus odor**, **overall quality** and **taste** values) than DV0 and was found less pleasant with fermented and chemical associated notes.

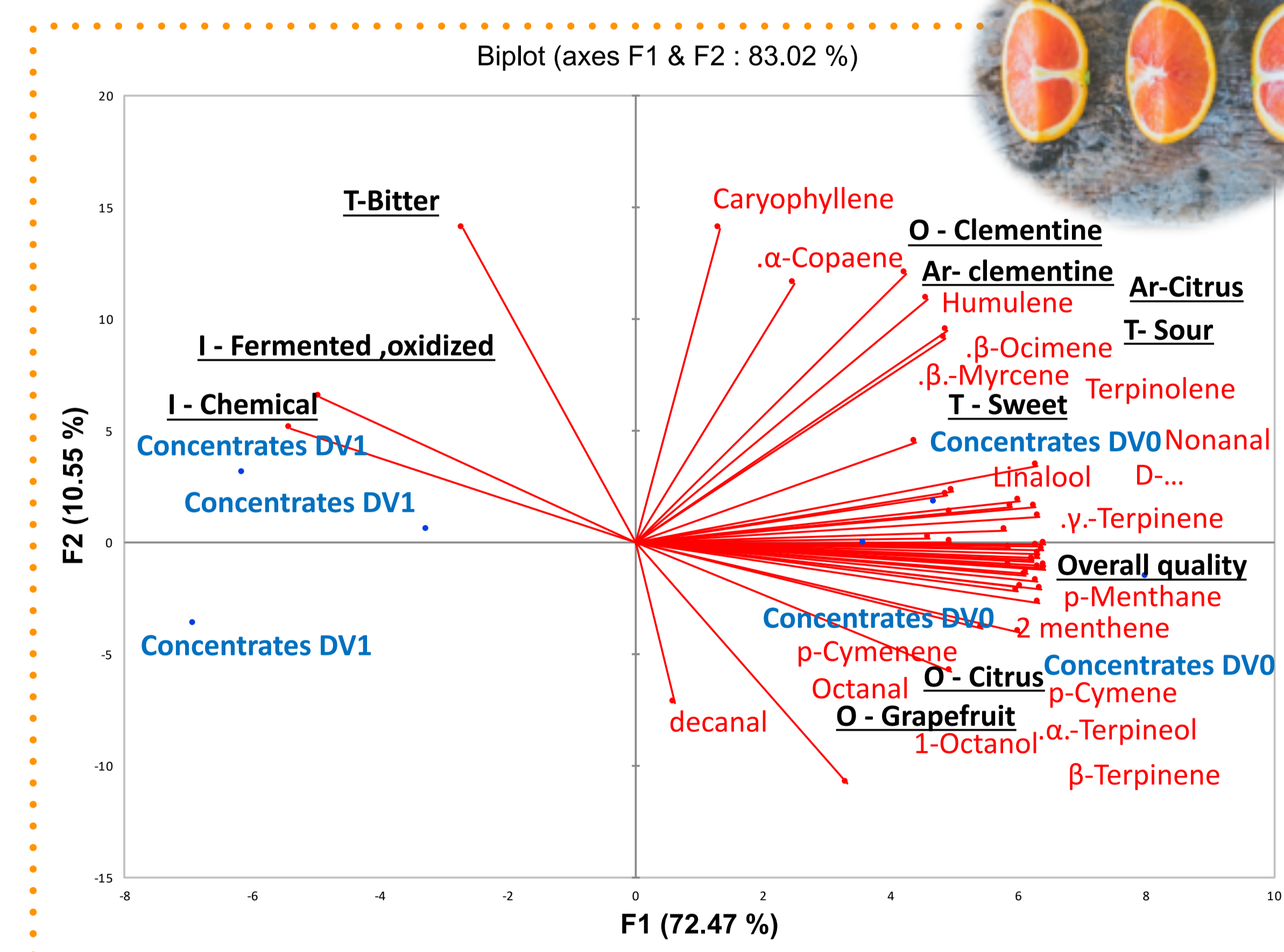
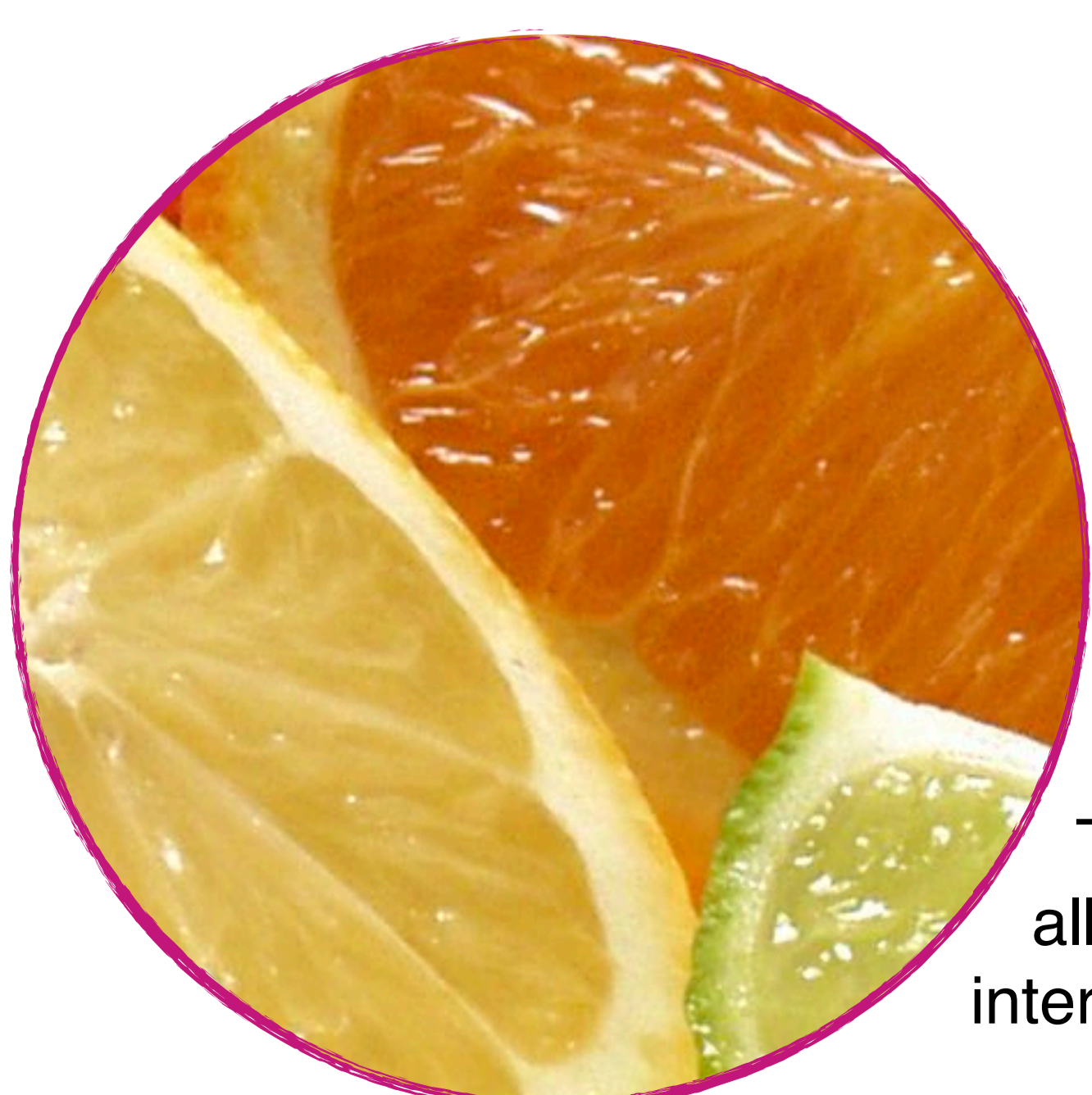


Figure 4. PCA of sensory analysis and volatile compounds on citrus concentrates products.

Conclusion

The sensory results were consistent with those obtained in the analysis of volatile compounds. In conclusion, diafiltration step strongly impaired the nice flavor of citrus of the product.

These results showed that CMF without diafiltration allows to produce a citrus concentrate with very interesting nutritional and organoleptic qualities.



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