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# Volatile profile and sensory evaluation of cold-pressed sunflower oils

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## Introduction

Traditional Balkain cuisine, as well as the other cuisines of South-East European countries, includes sunflower oil as the most used cold-pressed and refined oil for cooking and frying.

## Materials and methods

The extraction of free volatiles was performed by application of solid phase microextraction in head-space mode (HS-SPME). Regarding selection of the fibers, the 50/30 µm Carbowax-Divinylbenzene-Polydimethylsiloxan (CRB-DVB-PDMS) fiber was more sensitive than the 85 µm polyacrylate fiber. The volatile compounds of cold-pressed sunflower oils were analyzed using a HP 6890 GC equipped with a single quad Mass Spectrometer (MS) HP5973 and HP Carbowax cross-linked fused-silica capillary column (i.d. = 0.25 mm, length = 60 m, film thickness = 0.25 µm). The interface temperature was 280°C; Injector and detector temperatures were set at 260°C, respectively. According to the standards for sensory evaluation of the working grope of Dr. Mathäus et al., the assessment a scale from 0 (not detectable) to 5 (very strongly perceivable at the level of saturation) was used. Virgin sunflower oil produced from the dehulled seeds with high-quality had very pleasent 'sunflower seed-like', 'nutty' and sometimes 'fruity' taste. However, very frequent unpleasant sensory attributes are described as 'rancid', sour 'fusty' or 'musty'. These attributes should not be present in virgin sunflower oil with high quality because the presence of these attributes indicates to failures during storage of the raw material (fusty, musty), during processing (roasty, burnt) or during storage of the oil (rancid).

| Sample | α-pinene | Limonene | β-pinene | α-phellandrene | Camphene |
|---|---|---|---|---|---|
| sunflower oil 1 | 50.73±1.31 | 1.05±0.03 | 1.73±0.31 | 1.90±0.10 | 2.35±0.80 |
| sunflower oil 2 | 98.93±0.31 | 1.29±0.08 | 2.93±0.08 | 2.40±0.10 | 2.64±0.09 |
| sunflower oil 3 | **227.01±11.63** | 2.54±0.01 | 3.86±0.62 | 1.19±0.23 | 1.17±0.12 |
| sunflower oil 4 | 51.46±0.12 | 0.73±0.13 | 3.51±0.29 | 1.61±0.02 | 1.80±0.01 |
| sunflower oil 5 | 52.96±0.78 | 0.59±0.01 | 1.86±0.09 | 1.71±0.02 | 1.13±0.06 |
| sunflower oil 6 | 37.31±1.28 | 0.88±0.04 | 2.60±0.01 | 2.33±0.02 | 2.64±0.03 |
| sunflower oil 7 | **13.39±0.14** | 0.61±0.03 | **0.53±0.01** | 1.60±0.02 | 1.37±0.02 |
| sunflower oil 8 | 90.99±1.85 | 1.01±0.02 | 8.10±0.18 | **4.97±0.13** | **5.54±0.10** |
| sunflower oil 9 | **16.92±0.63** | 1.07±0.04 | 2.34±0.05 | 1.37±0.05 | **7.06±0.08** |
| sunflower oil 10 | 54.15±0.98 | 0.88±0.03 | 4.38±0.03 | 1.58±0.01 | 1.48±0.01 |
| sunflower oil 11 | 36.13±0.90 | 0.74±0.00 | 2.22±0.00 | 1.13±0.00 | 1.58±0.00 |
| sunflower oil 12 | 40.37±0.91 | 0.71±0.00 | 1.84±0.02 | 0.88±0.00 | 1.52±0.00 |
| sunflower oil 13 | 38.39±1.15 | 0.71±0.00 | 1.90±0.01 | 1.08±0.01 | 1.51±0.02 |
| sunflower oil 14 | **4.82±0.45** | **0.42±0.00** | **0.30±0.01** | **0.04±0.00** | **0.62±0.04** |
| sunflower oil 15 | 52.47±0.27 | 0.70±0.01 | 3.13±0.04 | 2.17±0.00 | 2.93±0.00 |
| sunflower oil 16 | 52.58±0.58 | 1.09±0.02 | 5.09±0.05 | **3.51±0.06** | **4.69±0.09** |

| | Sunflower seed like | Nutty | Fruity, Sweet | Woody like | Astringent | Bitter | Rancid | Sour |
|---|---|---|---|---|---|---|---|---|
| Sunflower oil 1 | 3 | 1 | 2 | 0 | 0 | 0 | 0 | 0 |
| Sunflower oil 2 | 2 | 2 | 2 | 1 | 0 | 0 | 0 | 0 |
| Sunflower oil 3 | 2 | 1 | 1 | 3 | 0 | 0 | 0 | 0 |
| Sunflower oil 4 | 3 | 1 | 1 | 4 | 3 | 2 | 0 | 0 |
| Sunflower oil 5 | **3** | **2** | **2** | **2** | **1** | **1** | **0** | **0** |
| Sunflower oil 6 | 2 | 1 | 2 | 1 | 1 | 0 | 0 | 0 |
| Sunflower oil 7 | 2 | 1 | 2 | 1 | 1 | 0 | 0 | 0 |
| Sunflower oil 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Sunflower oil 9 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Sunflower oil 10 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 |
| Sunflower oil 11 | 0 | 0 | 0 | 1 | 1 | 2 | 1 | 0 |
| Sunflower oil12 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sunflower oil 13 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sunflower oil 14 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 0 |
| Sunflower oil 15 | 0 | 0 | 0 | 2 | 2 | 4 | 0 | 4 |
| Sunflower oil 16 | 1 | 1 | 0 | 3 | 2 | 3 | 0 | 0 |

## Results and discussion

Regarding the bitter taste of the sunflower oil, samples from sunflower oil 15 and 16 had the highest grades (3 and 4) and very sour taste for sunflower oil 15. The strong sour taste cannot be result of the concentration of monoterpenes because the terpenic profile of these oils is very similar to profile of other oils which taste is not described as very sour. The best sensory appreciation of sunflower oil 1, 5 and 6with higher concentration of β-pinene (3.51±0.20 ppm) which is not aroma active. However, these oils had grade of 3 for 'sunflower seed like' and 4 for 'woody like'

## Conclusion

The results from our study lead us to conclude that β-pinene cannot contribute in overall flavour and the smell of sunflower oils.
α-phellandrene has much higher odor potential with threshold in air in the range between 40-93 ng/L and its presence in the oils indicated potent 'fresh', 'citrus' and 'floral' smell and taste.

## References:

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