Changes on the volatile compounds and sensory profile of premium monovarietal extra virgin olive oil under different storage conditions

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Background

Premium extra virgin olive oil (EVOO) is characterized by its unique sensory characteristics, which are related to its high quality. Storage time and conditions can affect the stability of premium EVOOs, reducing their quality and thus affecting their organoleptic characteristics. Due to their high value it is important to store these oils under conditions which will maintain their initial quality characteristics.

Aims

✓ To assess the effect of different storage conditions on the sensory and volatile profile of Premium EVOOs during 24 months.
✓ To identify the volatile compounds responsible of the changes on specific sensory notes.

Experimental design

✓ 4 monovarietal premium EVOOs combining 2 harvesting dates and 2 varieties:
  - Early harvest Picual (EP)
  - Late harvest Picual (LP)
  - Early harvest Arbequina (EA)
  - Late harvest Arbequina (LA)

✓ Storage conditions
✓ Headspace composition ➔ air/nitrogen
✓ Storage temperature ➔ room temperature (22°C)/4°C /-20°C
✓ Freezing speed ➔ slow (regular freezing at -20°C)/fast (nitrogen bath)
✓ Time ➔ 6, 12 and 24 months

Methods

✓ The volatile profile was determined by HS-SPME-GC/MS according to Vichi et al.1
✓ The sensory analysis was carried out by the Catalan Official Olive Oil Panel according to the official method of the Comission Regulation.2
✓ Statistical analysis: An exploration of the data was carried out with principal component analysis (PCA). One way multifactorial ANOVA was used to assess the influence of the storage conditions. Scheffé’s test was used to compare the means. Partial least square (PLS) regression was applied to explore the relationship between each single sensory attribute and the volatile profile.

Results

1) Evolution of sensory and volatile profiles

✓ According to the ANOVA test (p<0.05)
✓ Headspace composition does not influence any of the studied parameters.
✓ Time and storage temperature affect significantly some of the parameters, which can be classified as:
  - Volatiles and sensory attributes that are not affected by time nor temperature
  - Volatiles and sensory attributes that significantly increase over time
  - Volatiles and sensory attributes that significantly decrease over time

✓ Degree of change of volatiles and sensory notes
  - By temperature
    1. -20°C ➔ 4°C ➔ 22°C
  - By freezing speed
    1. slow ➔ fast

✓ The behavior of each sensory and volatile attribute, according to the storage time and conditions, is shown in fig. 1a and 1b.

Fig. 1a. PCA scores and loadings scatter plots of the arbequina

Fig. 1b. PCA scores and loadings scatter plots of the picual oil

2) Volatiles related to sensory notes affected by storage

As shown in PLS regressions, specific sensory notes of Premium oils can be predicted by the volatile profile (fig. 2). Volatiles with the highest regression coefficients are detailed.

Fig. 2. PLS regressions of fruity, green, ripe fruity and artichoke attributes

FRUITY

GREEN

% RIPE FRUITY

% ARTICHOKE

Conclusions

✓ Some volatile compounds and sensory attributes can be better preserved over time by decreasing storage temperature, regardless of headspace composition.
✓ Compared to the regular freezing (S), fast freezing does not improve the preservation of the oil sensory characteristics.
✓ Some volatile compounds and sensory attributes are only influenced by time, which makes them suitable indicators of freshness.
✓ The green, fruity, ripe fruity and artichoke sensory notes can be predicted based on the volatile profile.

References


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