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Field of application

Quality characteristics of traced extra virgin olive oils by means of the sensory profile technique (ISO 13299:03; COI/T20/Doc.22) applied in a competition

Objectives There are some different objectives due to different steps of the project from the rating to the chemometrics investigation inside the chemical and physical characteristics. Rating method: using a normalized method in order to perform a sensory profile of the extra virgin olive oils for the determination of the quality score in a traditional competition. The common methodologies used in a competition are outside any possible sensory analysis rule and are affected by subjectivity and experience of the judges (no statistical control). **Chemical analysis:** improving the SPME/GC-MS methodology for the characterization of the aroma profile of the oils. **Chemometric investigations:** searching the relationships among sensory and chemical characteristics of the oils related to the geographical origin and cultivar.

EXPERIMENTAL

Samples: extra virgin olive oils (EVOO) were obtained in all the five provinces of Campania (Italy): Naples, Salerno, Caserta, Avellino and Benevento. They were certified according to the (ISO 22.005:07 standard).

Procedure: 1. Panel selection and training: 24 trained judges (Reg. 2568:91) were selected to create two panels of ten judges (with 4 rotating judges). The training was based on tasting reference samples selected to emphasize the main characteristic of the descriptors used in the sensory card.
 2. Preparation of the sensory card and the randomization plans: the sensory card was created in general way to describe extra virgin olive oils in their macro characteristics. There are not particular or specific descriptors, but only generic useful sensory variables are used to quantify the perception of all sampled extra virgin olive oils.

3. Determination of the sensory profile: all the samples were evaluated by the two panels according to the randomization plans. All sample were tasted by eight different judges in order to optimize the evaluation of repeatability and the dispersion of the response.

4. Data control: all sensory card were digitalized in an electronic table (MS Excel).
 5. Computation: the simple sensory profile does not allow to determine a rating scale of the analyzed samples, so a global qualitative index must be computed from the original quantitative sensory profile through the qualitative characteristics curves.

5.1 Determination of sensory profile statistics (mean, median, standard deviation, CV) and control of precision in the panel (repeatability) and among the two panels (reproducibility).

5.2 Qualitative transformation: the quantitative sensory profile was transformed into a qualitative profile by means of qualitative characteristics curves. Each curve represents the relation between the quantitative descriptor and the overall preference estimated by a series of consumer's tests of acceptability of various extra virgin olive oils. The perception preference of bitter is related with its intensity by means a parabolic curve. The bitter taste is accepted under certain concentration. Over this concentration bitter is rejected. Differently, the fruity perception preference is growing with the concentration of the 'fruity' flavour. The computation are a simple IF-THEN cycle applied to a quantitative sensory profile.

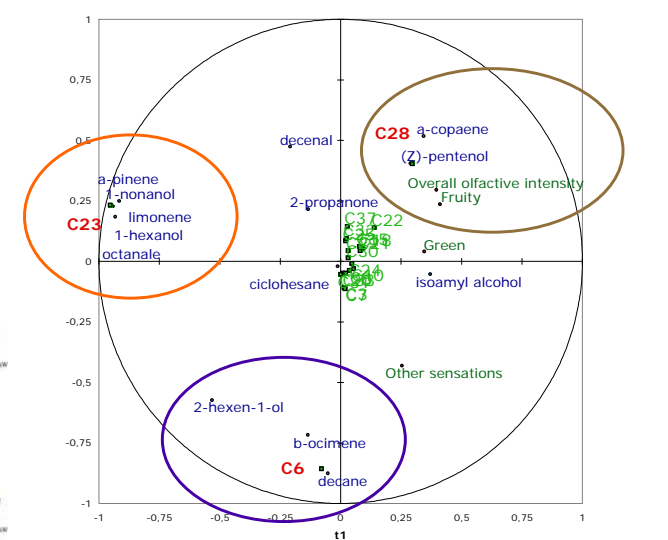
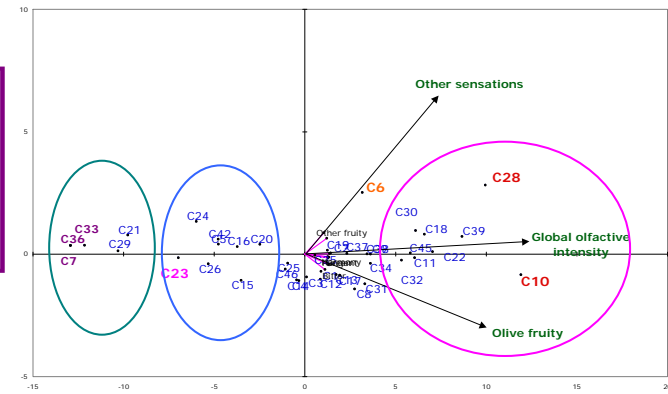
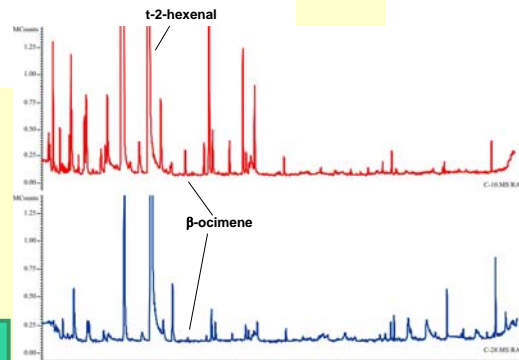
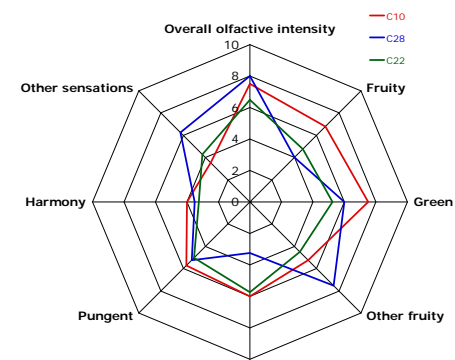
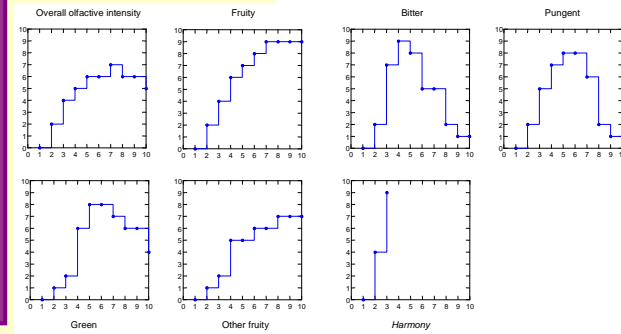
5.3 Computation of global qualitative index (IVG): the matrix of qualitative sensory profile represents the qualitative profiles of preference distributed on the descriptors. We need a synthetic index describing the quality of sensory perception of oils in order to compare all extra virgin olive oils qualitative profile. The most representative index to describe all qualitative profile is the linear combination of sensory variables weighted by the first eigenvector extracted from the COV or COR matrix of the original qualitative raw data. This is true because the first eigenvector, linked with the highest eigenvalue represents the direction of maximum dispersion of the data in the multidimensional hyperspace of descriptors.

6. Ordering of IVG scores: ordering the IVG scores gives the classifications of samples and the relative rating requested. It is possible to rate oils using the current sensory profile methodology (ISO 13299:03; COI/T20/Doc.22).

7. SPME extraction and GC/MS analysis

The SPME analysis was carried out with a dynamic method. Briefly, 5 g of virgin olive oil were placed into a 20 mL vial and into a water bath at 40°C where the oil was maintained under nitrogen flow. After 15 min of fibre conditioning at 270°C, the SPME (fibre) was exposed for 15 min to the sample headspace and immediately desorbed into the gas chromatograph injector. Identification of compounds was performed by gas chromatography coupled to ion trap spectrometry using a Finnigan MAT, (San José, CA, USA). Analytes were separated on a Supelcowax-10 (Supelco, Bellefonte, PA, USA) (30 m x 0.25 mm ID, 0.25 mm film thickness) capillary column. The column temperature was maintained at 40°C for 10 min, increased to 150 at 3°C/min, then to 250°C at 10 °C/min, and held for 5 min. The injector temperature was 270°C and the desorption time of the fibre into the injector port was fixed at 2 min. Helium was used as the carrier gas at a linear velocity of 31.8 cm/s. The temperature of the ion source was 175°C and the transfer line was 280°C. Electron impact mass spectra were recorded at 70 eV ionization energy, 4 scan/sec. The GC/MS analysis in the complete scanning mode (SCAN) within a range of 40-300 m/z mass range, was performed to allow the identification of the compounds. The mass spectra and retention times were compared with those of standard compounds and the mass spectra library (NIST/02).

sample	cultivar	country	province	cluster	subcluster
1	ibrali	Benevento	BENEVENTO	M	x
6	ibrali	Marea Labronese	NAPOLI	M	x
7	albicorno	Piano	SALERNO	M	Percolation
8	fronino	Campagna	SALERNO	M	x
10	fronino	Biancafiara	SALERNO	S-M	x
15	ibrali	Marea Labronese	NAPOLI	M	x
16	ortico	Piano	BENEVENTO	S-M	x
20	fronino	Bicciano	SALERNO	S-M	x
21	subilla	Casalvolino	SALERNO	M	Percolation
22	ortico	San Lorenzo Maggiore	BENEVENTO	S-M	x
23	fronino	Montecorone Paganico	SALERNO	M	x
24	fronino teceno	Campagna	SALERNO	S	x
25	fronino	Santi	SALERNO	M	x
26	ibrali	Marea Labronese	NAPOLI	M	x
29	ortico	Vibonati	SALERNO	S-M	x
30	ortico/ortico	San Lupo	BENEVENTO	S-M	x
31	fronino	Piano	SALERNO	M	Percolation
32	ortico	Piano	BENEVENTO	S-M	x
33	ortico	Campagna	SALERNO	S-M	x
37	fronino and others	Aiano	SALERNO	S-M	x



CONCLUSIONS

- small producers were involved in a communication and scientific project
- the overall quality level of EVOOs obtained from local cultivars was monitored with high resolution chromatographic techniques
- application of a scientific procedure in a olive oil competition
- local cultivars such as minucciola gave an EVOO with a strong balsamic flavour
- terpenes were detected in EVOO with a 'balsamic' flavour