P-21. Discrimination of olive oil varieties by ESI-IMS: a step forward in food authentication

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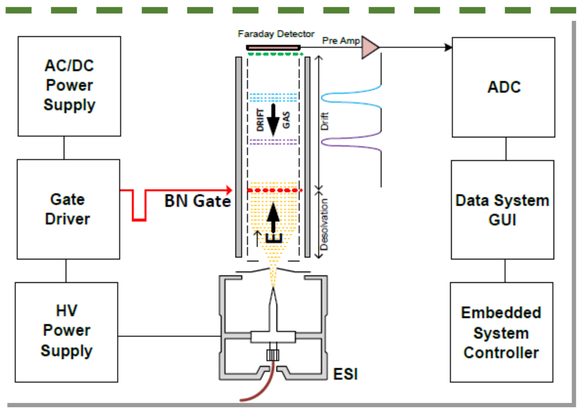
Abstract

In the constant search for simple methodologies to avoid food quality fraud, the use of electrospray ion mobility spectrometry coupled to electrospray ionization (ESI-IMS) has been employed for the first time for the analysis of non-volatile chemicals (phenolics compounds among others) to discriminate into extra virgin (EVOO), virgin (AOV) and lampante (AOL) oil categories by a simple liquid-liquid extraction (LLE) in combination with multivariate statistical methods. The instrument has been designed thanks to the Innolivar project.

Introduction



ESI-IMS: without chromatographic column separation

Analysis of the liquid fraction of the oil: "Electronic Mouth"

Material and methods

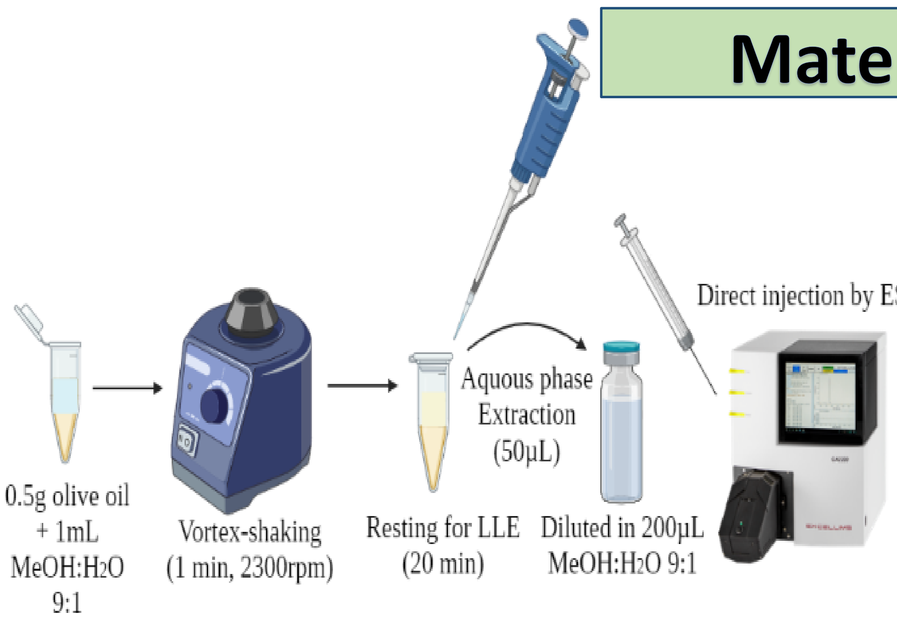


Figure 1. Overall analytical approach for every olive-oil sample extraction prior to injection by ESI-IMS

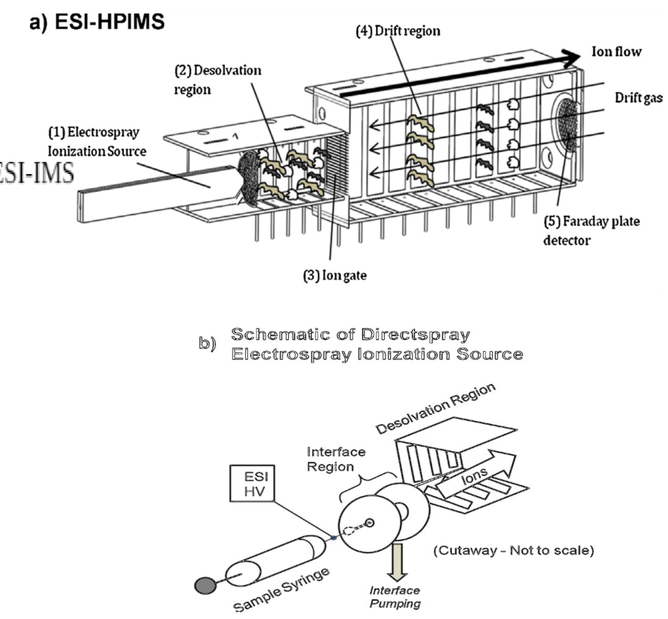
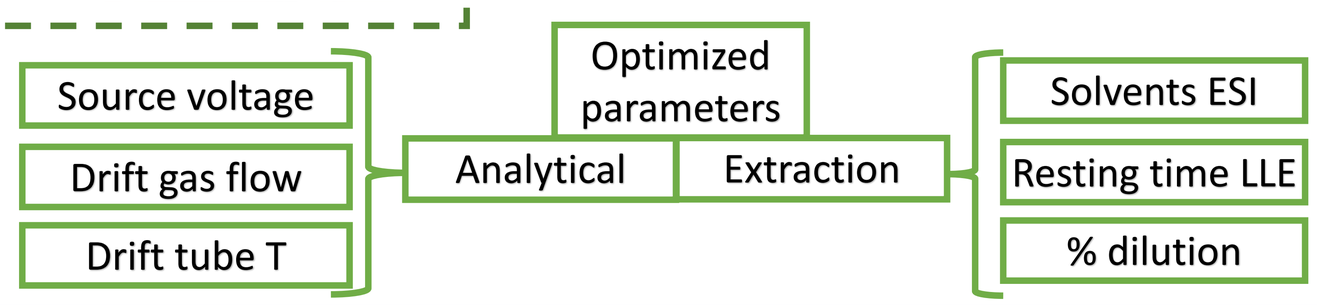


Figure 2. (a) Diagram of the electrospray ionisation-high performance ion mobility spectrometry (ESI-HPIMS) instrument (b) Directspray ESI source for direct ESI from a gas-tight syringe).



Results

Table 1. Operating conditions for olive oil sample analysis by ESI-IMS.

ESI-IMS working conditions	
Source voltage	1800 V
Gate voltage	200 V
Gate pulse width	100 µs
Drift gas flow	1.38 L min^{-1}
Exhaust pump flow	1.06 L min^{-1}
Gas inlet temperature	180 ºC
Drift tube temperature	180 ºC

Table 2. Optimised extraction conditions for olive oil sample treatment.

Parameter	Optimal conditions
Electrospray solution	methanol:water 9:1 (v/v)
Stirring time	1 min (vortex)
Phase-separation time	20 min
Dilution factor	1:5

Table 3. Success rate for classification of olive oil categories by different PCA models for 142 samples subject to analysis.

Proposed model	Success rate (n=142)
Binary (EVOO vs non-EVOO)	90% (80% EVOO, 98% non-EVOO)
Binary (LOO vs non-LOO)	87% (74% LOO, 95% non-LOO)
Ternary (EVOO vs VOO vs LOO)	76% (72% LOO, 53% VOO, 95% EVOO)

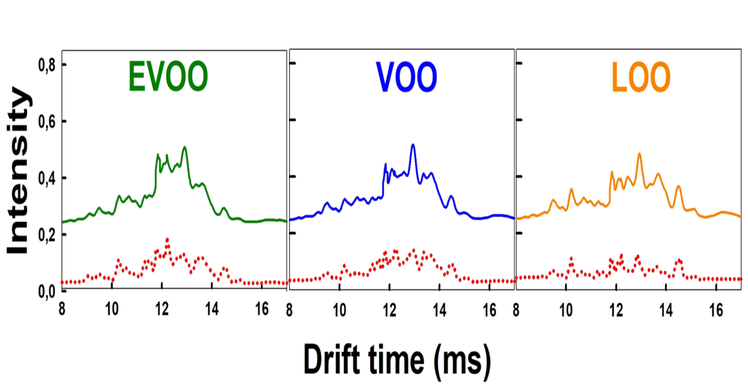


Figure 3. Mean ESI-IMS spectrum with its standard deviation for each olive oil category.

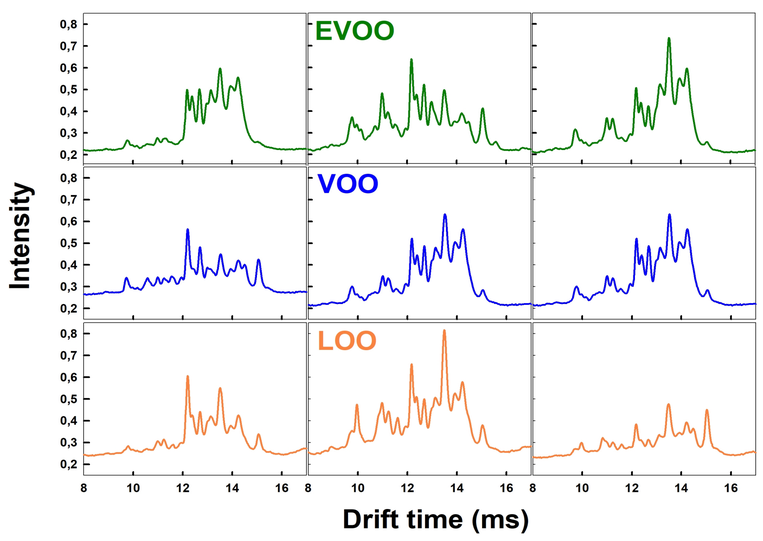


Figure 4. Individual ESI-IMS spectra for three different samples of EVOO, VOO and LOO.

Conclusions

This study reports for the first time the use of ESI-IMS for the creation of distinctive profiles between LOO, VOO and EVOO olive oil categories complemented with chemometric treatments for their confirmation.

This research will allow a step forward in the authentication of olive oil using reliable, cost-effective and complementary analytical methodologies to the professional tasting panel.

Bibliography

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