

# HS-GC-IMS SCREENING METHOD TO SUPPORT THE VIRGIN OLIVE OILS PANEL TEST: AN INTER-LABORATORY STUDY



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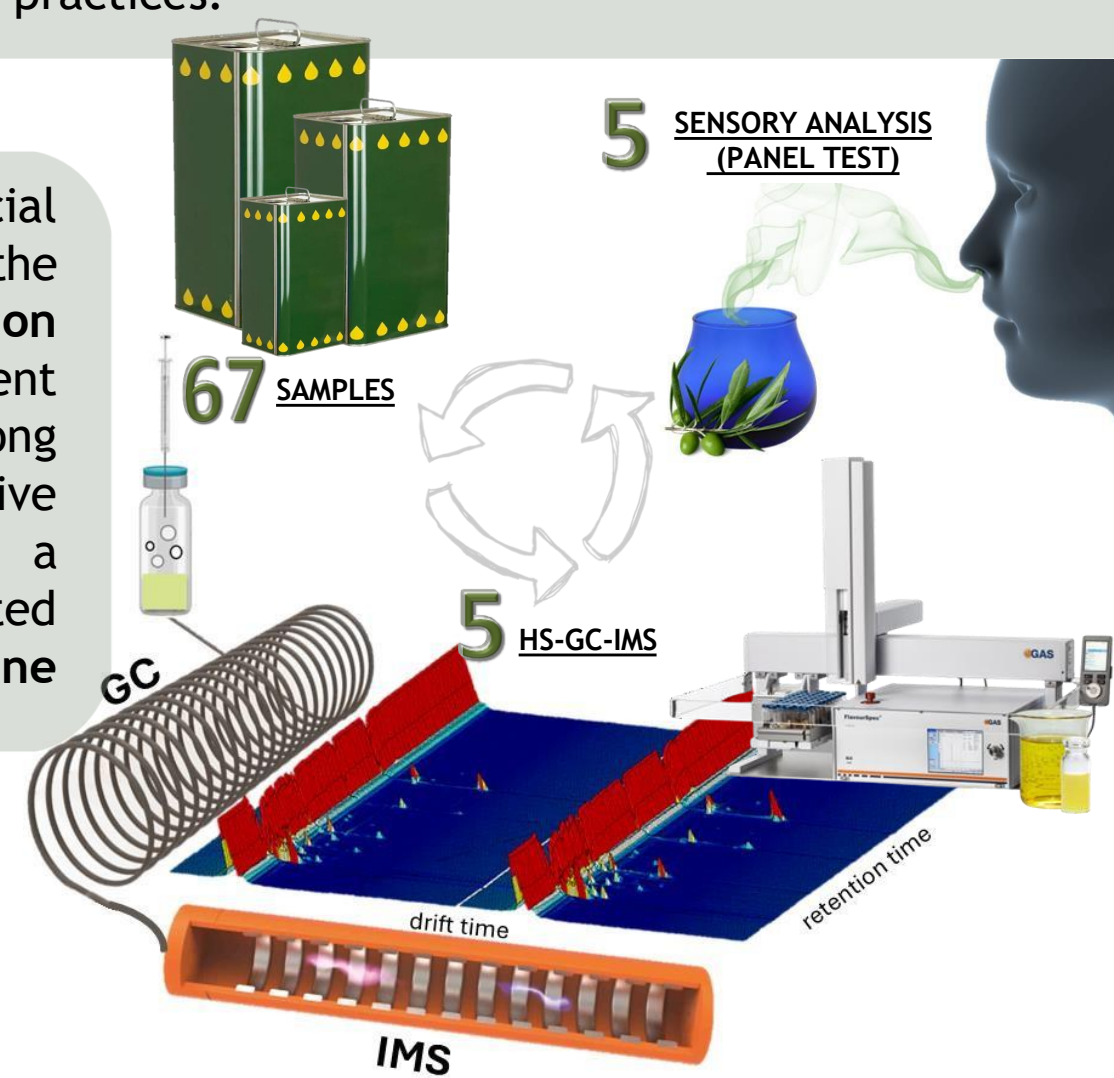
## INTRODUCTION



For **extra virgin olive oils**, it is crucial to ensure the **authenticity** of the declared and labelled commercial category. Olive oil companies, as well as quality control public and private laboratories, are often requested to rapidly assess the **quality** and **purity** of extra virgin olive oils. In this framework, a screening method based on gas chromatography coupled with ion mobility spectrometry (HS-GC-IMS) for the analysis of **volatile compounds** can be useful to support the virgin olive oils (VOOs) sensory analysis (**Panel test**). This instrumental approach can contribute to improve the overall **efficiency of official quality and purity controls** in the olive oil sector, thus protecting the consumer from the related common fraudulent practices.

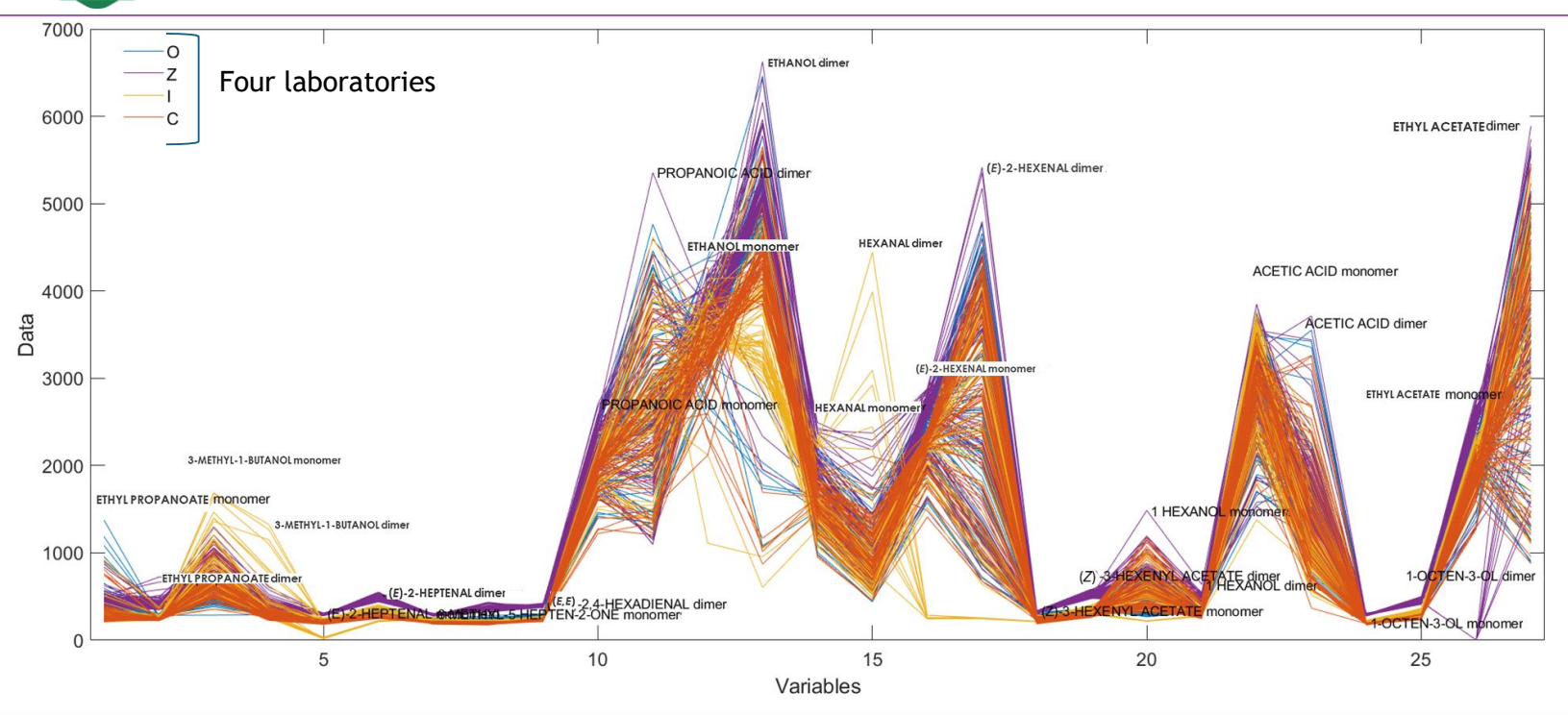
## MATERIALS AND METHODS

A set of **67 commercial VOOs** were **sensory assessed** by five professional and official Italian panels, then classified, through the adoption of a **decision tree** based on the agreement among them, into a commercial category. Moreover, the **volatile fraction** of these oils was analysed in **five laboratories** by HS-GC-IMS. Principal component analysis (PCA) was used to explore the quality grade agreement of the samples among laboratories. The results were elaborated for each laboratory using its respective dataset to determine the possible definition of a **joint calibration** based on a **common dataset**. In particular, the commercial categories of each oil were predicted based on volatile compounds data using **PLS-DA models**, with a focus on **borderline samples** between the extra virgin and virgin commercial categories.



## RESULTS

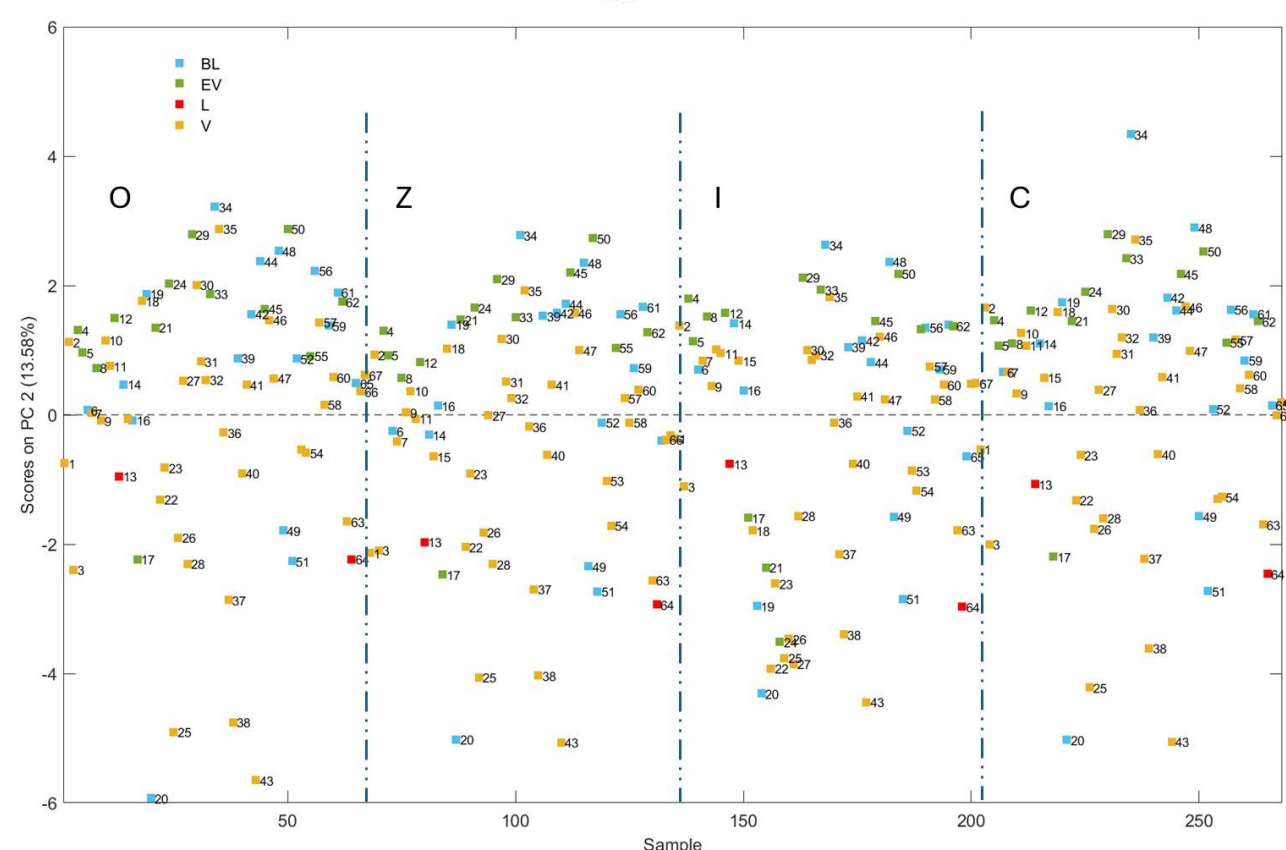
Analysis of 13 additional samples is ongoing



**Figure 1** - The volatile marker data (monomers and dimers) obtained from the comparison of 67 samples among four\* selected laboratories involved in the trial.

MODELS EV vs noEV					MODELS V vs noV				
SENSORY ANALYSIS	O	Z	I	C	SENSORY ANALYSIS	O	Z	I	C
V	noEV	noEV	noEV	noEV	V	V	V	V	V
EV	EV	EV	EV	EV	EV	noV	noV	noV	noV
BL	noEV	noEV	noEV	noEV	BL	V	V	V	V

**Figure 3** - Comparison of predictive results among the four labs using two preliminary PLS-DA models (EV vs noEV; V vs noV). The estimated commercial categories were also compared with sensory results established by the decision tree application (3 representative samples out of 67).



**Figure 2** - Scores on PC2 obtained from 67 samples analysed among four\* selected laboratories trial. The quality grades were color-coded differently (BL=borderline; EV=extra virgin; L=lampante; V=virgin). \*one lab, involved in the prediction of the category, cannot be aligned with the other due to the use of a GC-IMS of a previous generation

## CONCLUSIONS

- 👉 **Satisfactory agreement** among the different predictive models on the estimated quality grades in the inter-laboratory study.
- 👉 **Harmonized chemometric predictive models** will be available for each lab involved in this trial.
- 👉 **The dataset** will be implemented in the coming months to make the estimation models even more robust.
- 👉 **A common calibration model** for all the labs will be developed considering the **intrinsic variability** within the instruments. This will allow to **standardize and harmonize the results**, leading to greater consistency.

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