

# Application of a lab-made electronic nose as a tool to assess extra virgin olive oil sensory category

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## Introduction

Olive oils assessed by a sensory panel in a national contest and split according to the perceived intensity of the fruitiness sensation: ripe fruitiness, green delicate, green medium and green.

However, sensory analysis comprises known limitations, namely, the scarcity of trained panelists, the human intrinsic subjectivity and the limited number of samples evaluated per day.

An alternative/complementary strategy could be the use of **electronic sensing devices (e.g., electronic nose, E-nose)** as a pre-assessment tool, which may reduce the initial number of oils to be evaluated.

## Material and methods

① 0.5 mL of each olive oil was inserted into a 25 mL glass vial and placed in the sampling chamber at 28 °C for 13 min, allowing to generate a gas phase representative of the sample.

② After cleaning the sensors surfaces using an air flow, the gas headspace was pumped into the E-nose detection chamber, where it interacted with nine MOS sensors for 2.5 min.

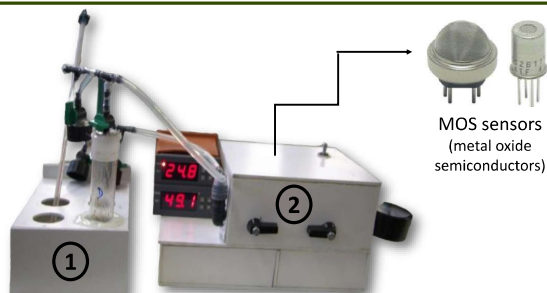


Figure 1: Lab-made E-nose.

③ Resistance signals recorded (data logger) and pre-treated using six feature extraction methods: last response point, integral of the response curve, maximum response point, minimum response point, sum of the response curve, and mean of the response curve.

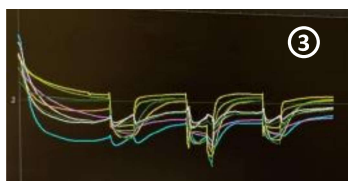


Figure 2: E-nose-MOS signals (software gas 9 real).

## Results and discussion

### Linear discriminant analysis (LDA)

E-nose allowed discriminating oils according to the **four fruitiness intensity groups**, with sensitivities of:

- Training: 100% (Figure 3A)
- Leave-one-out cross-validation: 73% (misclassifications between green delicate and green médium samples)

The E-nose sensitivity increased when only **three groups were considered** (ripe fruitiness, green delicate+green médium, and green intense):

- Training: 100% (Figure 3B)
- Leave-one-out cross-validation: 92%

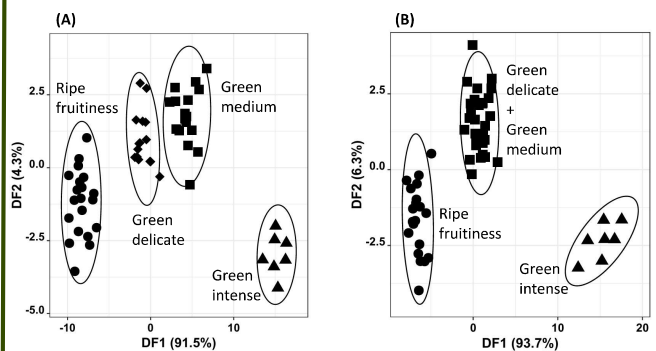


Figure 3: E-nose-LDA-SA model performance (training) regarding the supervised linear discrimination of EVOOs according to the sensory grade groups.

## Conclusion

- ✓ The E-nose is a fast, cost-effective, and non-invasive accurate tool for olive oil sensory classification.
- ✓ The E-nose could be implemented as a routine complementary tool helping reducing the number of olive oils evaluated by trained panelists.

## Acknowledgements and Funding

The authors are grateful to the Foundation for Science and Technology (FCT, Portugal) for financial support by national funds FCT/MCTES (PIDDAC) to CIMO (UIDB/00690/2020, <https://doi.org/10.54499/UIDB/00690/2020>; <https://doi.org/10.54499/UIDP/00690/2020>), and to CEB (UIDB/04469/2020) units, as well as to the Associate Laboratory SusTEC (LA/P/0007/2020). National funding by FCT through the institutional scientific employment program-contract is acknowledged by Nuno Rodrigues. Nuno Ferreiro acknowledges the Ph.D. research grant (2022.10072.BD) provided by FCT.