

Author's Accepted Manuscript

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PII: S0039-9140(18)30108-5
DOI: <https://doi.org/10.1016/j.talanta.2018.01.096>
Reference: TAL18319

To appear in: *Talanta*

Received date: 24 November 2017
Revised date: 25 January 2018
Accepted date: 31 January 2018

Cite this article as: Susanna Buratti, Cristina Malegori, Simona Benedetti, Paolo Oliveri and Gabriella Giovanelli, E-nose, e-tongue and e-eye for edible olive oil characterisation and shelf life assessment: a powerful data fusion approach, *Talanta*, <https://doi.org/10.1016/j.talanta.2018.01.096>

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E-nose, e-tongue and e-eye for edible olive oil characterisation and shelf life assessment: a powerful data fusion approach

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ABSTRACT

The aim of this work was to investigate the applicability of e-senses (electronic nose, electronic tongue and electronic eye) for the characterization of edible olive oils (extra virgin, olive and pomace) and for the assessment of extra virgin olive oil and olive oil quality decay during storage at different temperatures. In order to obtain a complete description of oil samples, physico-chemical analyses on quality and nutritional parameters were also performed. Data were processed by PCA and a targeted data processing flow-sheet has been applied to physico-chemical and e-senses dataset starting from data pre-processing introducing an innovative normalization method, called t0 centering.

On e-senses data a powerful mid-level data fusion approach has been employed to extract relevant information from different analytical sources combining their individual contributions.

On physico-chemical data, an alternative approach for grouping extra virgin olive oil and olive oil samples on the basis of their freshness was applied and two classes were identified: fresh and oxidized.

A k-NN classification rule was developed to test the performance of e-senses to classify samples in the two classes of freshness and the average value of correctly classified samples was 94%.

Results demonstrated that the combined application of e-senses and the innovative data processing strategy allows to characterize edible olive oils of different categories on the basis of their sensorial properties and also to follow the evolution during storage of extra-virgin olive oil and olive oil sensorial properties thus assessing the quality decay of oils.

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