Accepted Manuscript

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PII: S0308-8146(16)30197-2
DOI: http://dx.doi.org/10.1016/j.foodchem.2016.02.038
Reference: FOCH 18758

To appear in: *Food Chemistry*

Received Date: 2 November 2015
Revised Date: 11 January 2016
Accepted Date: 4 February 2016

Please cite this article as: Borràs, E., Ferré, J., Boqué, R., Mestres, M., Aceña, L., Calvo, A., Busto, O., Olive oil sensory defects classification with data fusion of instrumental techniques and multivariate analysis (PLS-DA), *Food Chemistry* (2016), doi: http://dx.doi.org/10.1016/j.foodchem.2016.02.038

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Olive oil sensory defects classification with data fusion of instrumental techniques and multivariate analysis (PLS-DA)

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Abstract

Three instrumental techniques, headspace-mass spectrometry (HS-MS), mid-infrared spectroscopy (MIR) and UV-visible spectrophotometry (UV-vis), have been combined to classify virgin olive oil samples based on the presence or absence of sensory defects. The reference sensory values were provided by an official taste panel. Different data fusion strategies were studied to improve the discrimination capability compared to using each instrumental technique individually. A general model was applied to discriminate high-quality *non-defective* olive oils (extra-virgin) and the lowest-quality olive oils considered *non-edible* (lampante). A specific identification of key off-flavours, such as musty, winey, fusty and rancid, was also studied. The data fusion of the three techniques improved the classification results in most of the cases. Low-level data fusion was the best strategy to discriminate musty, winey and fusty defects, using HS-MS, MIR and UV-vis, and the rancid defect using only HS-MS and MIR. The mid-level data fusion approach using partial least squares-discriminant analysis (PLS-DA) scores was found to be the best strategy for *defective vs non-defective* and *edible vs non-edible* oil discrimination. However, the data fusion did not sufficiently improve the results obtained by a single technique (HS-MS) to classify *non-defective* classes. These results indicate that instrumental data fusion can be useful for the identification of sensory defects in virgin olive oils.

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