

Response of a hybrid array of voltammetric sensors towards the polyphenolic fraction of extra virgin olive oils. Evaluation of the Capability of Discrimination and Prediction

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Abstract

Phenolic compounds are natural antioxidants that play an important role in the quality of olive oils. The antioxidant activity is correlated to the oxidation level, the bitterness, the astringency and the pungency of oils. Phenolic compounds possess a rich electrochemical behaviour that can be used to characterise the phenolic fraction by electrochemical methods. Electronic tongues have been widely used for the analysis of complex liquids formed by potentiometric electrodes [1].

An electronic tongue based on voltammetric electrodes has been successfully used to analyse the phenolic fraction of extra virgin olive oils. Voltammetric electrodes modified with electroactive materials have shown a complex response with a high degree of cross-selectivity. The reason is that the electrochemical response of the electrodes is related not only to the redox activity of the phenolic fraction under study, but also with the electrochemical behaviour of the electroactive material that in turn, is influenced by the nature of the studied solution [2].

The array of electrodes has been used to analyse olive oils with different phenolic content. It has demonstrated a good-quality ability in discriminating and recognising among the phenolic extracts. The first three components of the Principal Component Analysis explain the 44% , 18% and 15% of the captured information. The clusters corresponding to the six olive oil extracts are well separated from each other. The relative positions of the clusters are related to the polyphenolic value, the Bitterness Index obtained by chemical analysis, and with the degree of bitterness scored by the panel of experts. Both the calibration and the validation values obtained by using Partial Least Squares (PLS2) regression method, indicate a good-quality model performance (slope near 1, off set near 0 and large correlation between sensors and categorized variables).

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References

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