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## Inorganic Components and Redox Behaviour as “Fingerprint” Of Italian Extravirgin Oil

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High quality olive oil, virgin and in particular extra virgin olive oil, are appreciated by consumers for both health benefits and pleasant flavour. Italy is by far the first country in Europe in terms of number of Protected Designation of Origin (PDO) oils, which usually relates consumers to a warm feeling of tradition, and thus to higher quality standards. Quality control issues are mainly related to a lack of sufficiently-powerful analytical methods, but also to a non objective classification of olive oil (OO), in particular related to the distinction between virgin oil (VO) and extra-virgin oil (EVOO). To support and reinforce the promotion, the valorisation of PDOs has also been suggested to increase the competitiveness of a country like Italy at international level. To modify such a scenario a strong scientific background is required, to emphasize all the different aspects related to high-added-value EVOO, such as quality, authenticity, and health benefits. This work is focused on target chemicals with high information valence in the direction of authentication, safety and product valorization by a detailed characterization of quali-quantitative inorganic profiling in EVOOs coming from different Italian regions<sup>1</sup>. The presence of metals in edible oils may be due to different factors: the metals can be incorporated into the oil from the soil or be introduced during the manufacturing of the foodstuff. Therefore, it can be assumed that the trace elemental distribution in olive oils varies according to their origin and then it can be supposed that a suitable statistical treatment on trace element data could allow a geographical characterization of different OOs. The total element content has been determined after pretreatment by acid digestion. An experimental design has been performed to optimize the conditions for the sample pretreatment, since a great variability was initially observed among the replicates for the same oil. When accepted value of relative standard deviations (< 10%) were obtained, a certified material and ten EVOOs from different Italian regions were analysed. The concentration of the inorganic elements at trace and ultra-trace levels using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES) has been determined<sup>2</sup>. Moreover, electrochemical properties of EVOOs have been investigated by voltammetry. For this purpose, carbon paste electrodes (CPE) were made mixing graphite powder and an aliquot of each sample; then, square-wave-voltammetry profile was registered for each CPE in a 0.1 M HCl solution. The features observed in the voltammograms reflect the reactions of electroactive compounds (such as polyphenols), which are present in the virgin olive oils mixed with the carbon paste matrix. For this reason, the voltammetric responses of the electrodes are specific for each type of oil<sup>3</sup>. Finally, chemometric treatments of the results were performed to assess the possibility to distinguish the region of provenience of each EVOO on the base of metal content and/or current registered during voltammetric analysis.

### References

1. Angioni A. et al.; *Food Chemistry*, 2006, 99, 525.
2. Llorent-Martínez E.J. et al.; *Food Chemistry*, 2011, 127, 1257.
3. Apetrei C. et al.; *Sensors and Actuators B*, 2007, 121, 567.