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POSSIBLE EFFECTS OF CULTIVAR, GEOGRAPHICAL ORIGIN AND TECHNOLOGY ON THE SECOIRIDOID CONTENT OF ITALIAN EXTRA-VIRGIN OLIVE OILS (EVOOs): AN INVESTIGATION BASED ON LIQUID CHROMATOGRAPHY WITH ELECTROSPRAY IONIZATION AND FOURIER TRANSFORM MASS SPECTROMETRY

C. De Ceglie¹, R. Abbattista¹, I. Losito^{1,2}, A. Castellaneta¹, C.D. Calvano^{2,3}, F. Palmisano^{1,2}, T.R.I. Cataldi^{1,2}

¹*Dipartimento di Chimica, Università degli Studi di Bari Aldo Moro, Bari, Italy*

²*Centro di ricerca interdipartimentale SMART, Università degli Studi di Bari Aldo Moro, Bari, Italy*

³*Dipartimento di Farmacia-Scienze del Farmaco, Università degli Studi di Bari Aldo Moro, Bari, Italy*

Secoiridoids represent the main class of phenolic compounds found in olive (*O. europaea*) leaves and drupes and have raised a significant research interest in recent years due to their antioxidant, anti-inflammatory and anti-carcinogenic effects [1]. Four main secoiridoids are transferred into the olive oil upon drupe crushing, namely, oleuropein and ligstroside aglycones, resulting from the hydrolysis of the corresponding glycosides (found in olive drupes and leaves) catalyzed by a β -glucosidase, and oleacin and oleocanthal, generated upon aglycone decarboxymethylation catalyzed by the synergic action of a methylesterase and a decarboxylase [2]. Therefore, the secoiridoid content of extra-virgin olive oil (EVOO) is generated by a wide number of factors and processes, such as olive cultivar, ripening stage and geographical origin, agronomic practices and oil production technology. Due to genetic factors that regulate the expression of phenolic compounds, some olive cultivars are richer in secoiridoids than others (even if the ripening stage is the same) and these differences are reproduced in olive oils. Furthermore, the same cultivar grown in different regions of the same country may show differences in phenolic composition related to biotic and abiotic effects (i.e., soil characteristics, precipitation, temperature, humidity). In addition, technology and especially the type of horizontal centrifugation used for olive oil extraction, affects secoiridoids quantity and, consequently, the nutritional and sensory properties of the final product [2].

A higher content of phenolic compounds, including secoiridoids, has been often reported for EVOO obtained by two-phase centrifugation (i.e. not implying water addition), compared to three-phase centrifugation, even if only a few studies have been focused on the effect of centrifugation on the secoiridoid contents [2]. In the context of a national research project on olive oil (VIOLIN, *Valorization of Italian OLive products through INnovative analytical tools*) an investigation of the main sources of variability affecting the secoiridoids abundance in olive oils has been recently undertaken in our laboratory, involving a relevant number of

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samples from different Italian regions, differing also for the horizontal centrifugation approach.

Secoiridoids were extracted in duplicate from EVOO samples using a CH₃OH/H₂O 60:40 (v/v) mixture, following the protocol reported by Vichi *et al.* [3], with some modifications. Each extract was then analyzed by RPLC-ESI-FTMS, using a hybrid quadrupole-Orbitrap mass spectrometer. Quantitative data relevant to the four main secoiridoids, expressed as chromatographic peak areas normalized to that of oleuropein, added to oil extracts as internal standard, were subsequently subjected to chemometrics, namely, Cluster Analysis (CA) and Principal Component Analysis (PCA). As an example, the bidimensional scatterplot obtained for the first two principal components in the case of olive oils belonging to the 2016-2017 campaign is reported in Figure 1. As apparent, oil samples were generally separated in terms of the adopted horizontal centrifugation, with some exceptions, that could be explained considering other features, like cultivar or region. Further examples of the chemometrics-based evaluation of the effects of production features on the secoiridoid content of olive oil will be provided during the present communication.

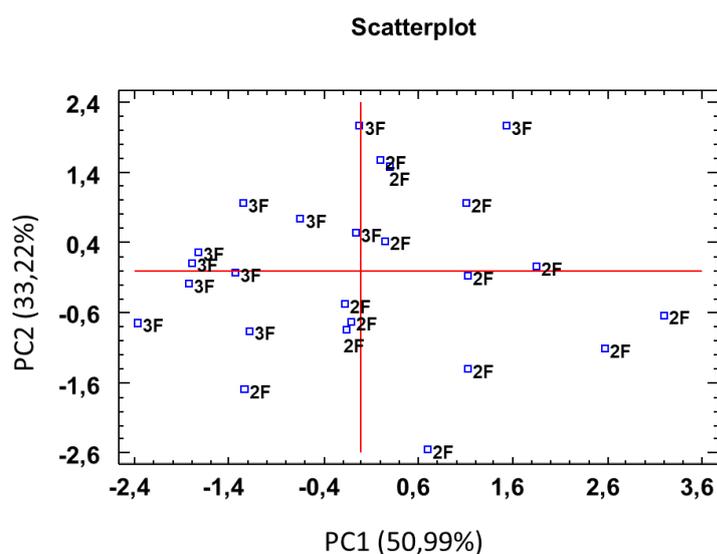


Figure 1. Scatterplot referred to the first two components (PC1 and PC2) obtained after PCA on normalized XIC peak areas of oleuropein aglycone, ligstroside aglycone, oleacin and oleocanthal, resulting from the LC-ESI-FTMS analysis of 25 Italian extra-virgin olive oils produced using three- (3F) or two-phase (2F) decanters.

References

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