

## Research Article

# Olive oil enrichment in phenolic compounds during malaxation in the presence of olive leaves or olive mill wastewater extracts

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A combined study was performed to determine the effect of olive leaf aqueous extract (OLE), olive mill wastewater (OMWW) or water addition during the malaxation step on total phenolic content (TPC), antioxidant activity, virgin olive oil composition and quality parameters of olive oil. For these purposes, the Folin-Ciocalteu assay, 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay, and HPLC-ESI-TOF/MS were employed. The experiments were carried out at semi-industrial scale in a cold extraction olive oil mill using olives of Koroneiki cultivar. Olive oil produced by olive paste which was malaxed without adding water, OMWW, or OLE was employed as control. The use of OMWW and OLE allowed obtaining oils with higher significant TPC compared to that malaxed with water (146.2 and 151.8 vs. 132.8  $\mu\text{g Eq GAE/g oil}$ , respectively). The antioxidant activity followed the same trend. The use of OMWW and OLE enabled an oil enrichment in oleuropein derivatives, especially in 3,4-DHPEA-EDA. Despite the fact that acidity and oxidation ( $K_{270}$  and  $K_{232}$  values) were higher in the aforementioned oils compared to the oil extracted with water, all values were under the European Union commission parameters for extra virgin olive oil (EVOO) denomination. However, only the oil extracted using OLE presented slightly higher fruity, bitter, and pungent positive attributes compared to the control and to the oil extracted with water, thus, making OLE a promising by-product for improving olive oils.

**Practical applications:** This research provides new insight for the improvement of olive oil extraction process in order to obtain high-phenol EVOO which could be useful for the olive oil, nutraceuticals, and cosmeceuticals industries. Besides, this study could serve as a starting point for improving the olive oil production process, while reducing the impact of its by-products.

**Keywords:** Malaxation / Olive leaves / Olive mill wastewater / Olive oil enrichment / Phenolic compounds

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