Recovery of residual oil and phenolic compounds from olive mill wastes derived from II-phase extraction process

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Keywords: Pretreatment of OMW, Recovery of residual oil, Extraction of phenolic compounds
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Olive oil extraction, with a history of over 7,000 years, is one of the most traditional agricultural industries in the Mediterranean region and has a significant role in local and national economies. Its consumption increases rapidly worldwide, due to its high dietetic and nutritional value. In 2012, EU Committee published a list of permitted health claims made on foods as per which olive oil polyphenols contribute to the protection of blood lipids from oxidative stress. Olive oil contributes around 15% share of the world oil trade, on the commercial product value basis. At the same time, comparing its price with other vegetable oils is 2–5 fold higher, depending on the origin, category/type of oil, and the harvesting period of the olive fruits (Ghanbari et al., 2012). Alongside, olive mill solid wastes (OMSW) and effluents (OMW) from olive oil extraction remain the main environmental issue caused during the extraction process of edible olive oil, which may be performed in three different ways: press extraction, two phase centrifugal extraction and three phase centrifugal extraction. The environmental impact of 1 m3 of OMW is equal to 100–200 m^3 of domestic liquid wastes. For the treatment of OMW several processes have been studied, resulting in organic load decrease and toxicity abatement (Paraskeva and Diamadopoulos, 2006). The obtained OMSW is utilized in pomace processing industries for the extraction of olive stone oil and the production of solid biofuels. After the extraction, the residual solids (olive stones and dried olive pulp) are used as biofuel (e.g., pellets), or as animal feed. Furthermore, it may be used for the production of fertilizer through a composting process (Vlyssides et al., 2015, 2016).

The wide recognition of olive oil polyphenols (e.g. tyrosol, hydroxytyrosol, oleuropein and oleocanthal) aroused the interest of the scientific community in this area and established a scope for the developing of a commercial activity around the olive oil by-products (Beauchamp et al., 2005). Thus, many processes have been studied for the extraction of these high value compounds from olive mill wastes. These include: resin chromatography, microfiltration, ultrafiltration, nanofiltration and reverse osmosis, solid-liquid, or liquid-liquid solvent extractions (Lozano-Sanchez et al., 2014). However more research is needed, in order to obtain pure polyphenols from olive mill wastes which will have potential uses in the pharmaceutical and nutraceutical industry (Ghanbari et al., 2012).

The aim of this study is to present a feasible and cost effective method for the extraction of phenolic compounds from the OMSW of a two-phase olive mill. During this integrated treatment, residual olive oil is separated from the OMW, phenolic content is extracted and finally the remaining stream can be used in a co-composting production process. A fully factorial design has been carried out so as to indicate the most critical factors for optimizing both oil and phenolic compounds extraction. Antioxidants were analysed both quantitative and qualitative.

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