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ENZYME-ASSISTED AQUEOUS EXTRACTION OF EXTRACTED OLIVE POMACE

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Abstract

Olive oil industry generates every year important amounts of residues such as extracted olive pomace (EOP), which is the residual solid from the olive pomace oil industry pomace after pomace oil extraction. It has about 10% moisture and contains little pieces of pulp, skin, seed, and stone [1]. EOP has a high-calorific value and nowadays, it is used as fuel in domestic heating systems or in small industries although the emission of particles and hazardous gases during its combustion constitutes an environmental problem [2]. According to the composition of EOP in carbohydrates and antioxidant compounds, its valorization as feedstock for biorefinery can be considered an interesting alternative which allows the production of bioenergy and bioactive compounds.

Nowadays, the interest of food industry for replacing synthetic antioxidants by natural antioxidants is increasing [3]. Nevertheless, the extraction of phenolic compounds from biomass using aqueous or organic solvents is not easy. The use of chemicals can improve the extractability but these treatments are not desired at industrial scale because the degradation is not selective to the phenolic linkages. Nevertheless, the utilization of hydrolytic enzymes can help to overcome these inconveniences because they are capable of degrading the cell wall that acts as a barrier and hinders the extraction of phenolic compounds [4]. However, no study has been reported on the utilization of enzymes to improve the extraction of phenolic compounds from EOP. The objective of this research was to assess the utilization of combined enzymes in the extraction of antioxidant compounds from EOP. Aqueous extraction using CellicCtec-2, Viscozyme L, and β-glucosidase was investigated using 5% and 15% (w/v) solid loading. The extraction was performed at 45ºC for 48 h in a shaking incubator (150 rpm).

The aqueous extracts were characterized regarding the content of total phenols and flavonoids. In addition, their antioxidant activity was determined by the 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radical and the ferric reducing antioxidant power (FRAP) assays. The influence of the solid loading, the time of extraction as well as different multi-enzyme blends on the extraction yield, phenolic compounds content and antioxidant activity of the extracts was evaluated. As example, Figure 1 shows the content of total phenolic compounds determined in the different enzymatic extracts from EOP. Gallic acid was used as standard and the results were expressed as mg of gallic acid equivalents (GAE)/g of dry EOP.

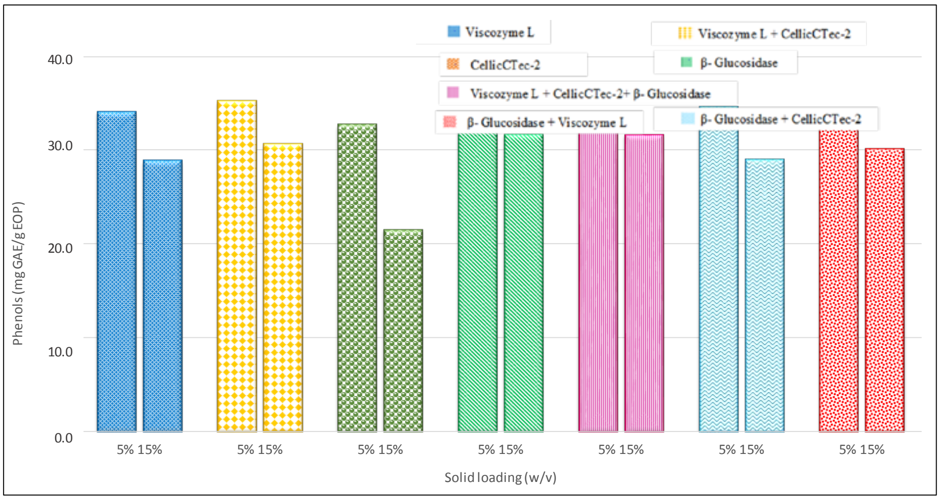

Figure 1. Total phenolic compounds determined in the enzyme-assisted extracts of EOP.

In general, the solid loading used in the enzyme-assisted extraction showed a negative influence on the phenolic compounds content of the resulting extract. The highest content of phenols, 38 mg GAE/g EOP, was determined in the extract resulting from the extraction at 5% solids with Viscozyme L and CellicCTec-2. Nevertheless, no significant differences were determined in the different enzymes blends used in this research. It is worth also highlighting that the main bioactive compounds identified in all the aqueous extracts from EOP were hydroxytyrosol and tyrosol. These phenolic compounds have been reported with potential health benefits and consequently their extraction from EOP before the bioconversion of their carbohydrates into ethanol or xylitol can be a promising option in the biorefinery context.

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