Development of an antioxidant food packaging film by supercritical solvent impregnation of olive leaf extract

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1. Introduction – The preservation of food is one of the main concerns of food industry, and finding alternatives to substitute the chemical additives is one of their highest challenges, due to the growing concern of population in consuming chemical-free foods. The active packaging is one of the most innovative techniques used with this aim. One of the procedures to carry them out is supercritical solvent impregnation (SSI). It is a green technique that used supercritical CO2 to introduce an active substance into a polymer matrix. When using natural extracts agricultural by-products, the technique obtain an added value. The olive leaf extract (OLE) has a high antioxidant activity due to its phenol compounds, among which oleuropein is the main one. The aim of the research is to use an olive leaf extract (OLE) as active substance to obtain films with antioxidant properties that could be applied in the preservation of food.

2. Experimental – Firstly, an antioxidant OLE was obtained by Enhanced Solvent Extraction (ESE) using scCO2+Ethanol (1:1) at 120 bar and 80 ºC. Afterwards, that extract was used as active substance in supercritical impregnation. 15 mL of extract were used to carry out an impregnation on a 500 mL-vessel at 400 bar and 35 ºC with a depressurization rate of 100 bar/min. One of the most important variables on impregnation process is the time required for the substance to react with the matrix. In order to optimize the oleuropein content and antioxidant activity on impregnated matrices, 5 and 30 min and 1, 2, 5 and 22 h of impregnation were established as the conditions under study. The identification and quantification of oleuropein and total phenols were analysed by UPLC-QTOF-MS-ESI, while antioxidant activity was studied by the reaction of impregnated films with 2,2-diphenyl-1-picrylhydrazyl reagent (DPPH assay).

3. Results and Discussion – The antioxidant extract obtained by ESE showed a total phenol content of 7% (w/v) of the total dry weight of the extract, being oleuropein the mayor compound (77% w/v). The AAI of the OLE using the kinetic DPPH assay describe the extract obtained as “moderate antioxidant” following the Scherer et al. classification [1]. Impregnated films with that extract showed the higher antioxidant activity after 1 h of impregnation, achieving 279,8 ± 46 %I/100 mg film. Although the total phenol content did not vary substantially among conditions, the oleuropein content showed its maximum equally at 1 h of impregnation, achieving 101 ± 3,9 µg of oleuropein impregnated on the whole film.

4. Conclusions –Although the impregnation process offer low impregnation yields (0,53±0,02 % of the inicial oleuropein content on the vessel) the antioxidant activity is high enough to provide food packaging films that can interfere on the food preservation.

5. References [1] R. Scherer, H.T. Godoy, Antioxidant activity index (AAI) by the 2,2-diphenyl-1-picrylhydrazyl method, Food Chemistry, 112 (2009) p. 654-658.