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EVALUATION OF THE ANTIOXIDANT ACTIVITY OF EXTRACTS OBTAINED FORM CHERRY SEEDS

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Abstract

Annual cherry production in Portugal is around 19,000 tonnes, in an area of about 6,450 ha and covering about 11,100 farms, concentrated in some northern and central interior territories. It is also in these regions that in recent decades there has been a significant increase in farms specialized in the production of cherry, using new cultivars and new technologies in a business production model. Apart from being consumed in fresh form, cherries are used for many food preparations, like sweets, jellies or confectionary. In the plants that transform cherries, a significant amount of cherry seeds (also called cherry pits) is generated as residue or waste. The possible usage of these residues as raw material for extraction of compounds with antioxidant properties is beneficial in term of economic value as well as environmental impact. Hence, the objective of this work was to obtain extract rich in compounds with antioxidant activity from cherry seeds.

The cherry seeds were obtained from a local waste management company, Nutrofertil, located in Tondela, in the district of Viseu (Portugal). They were grinded and then submitted to extraction procedures testing different operating conditions: magnetic stirrer versus ultrasound, different solvents (methanol, ethanol, water) and temperatures (from 35 to 80 ^{0}C). For the obtained extracts antioxidant activity was evaluated through spectrophotometric methods, using the DPPH (2,2-diphenyl-1-picrylhydrazyl) and ABTS (2,2′ -azino-di-(3-ethylbenzthiazoline sulfonic acid)) radicals, and also the Ferric Reducing Antioxidant Power Assay (FRAP). All measurements were replicated at least trice, and were expressed as mg Trolox equivalents per gram (mg TE/g).

The results obtained for the different experimental conditions indicated that least efficient extractions at ambient temperature were obtained with methanol using magnetic stirrer and with water using ultrasounds, for which the antioxidant activities measured by the DPPH method were 0.26 and 0.33 mg TE/g and by the ABTS method were 0.82 and 0.86 mg TE/g, respectively. Most efficient methods were water : ethanol (at 50% concentration) and water (100%), using magnetic stirrer in both cases. Highest antioxidant activity was obtained for water : ethanol by the DPPH method (0.72 mg TE/g) and for water (10%) by the ABTS method (1.25 mg TE/g). Tests with different concentrations for the aqueous solutions of ethanol and at different temperatures revealed that with increasing concentration of water the antioxidant diminished, from 0.62 to 0.27 mg TE/g at 35 ^{0}C using the DPPH method.

Additionally, the variation in temperature allowed reaching a maximum extraction of compounds with antioxidant activity at 70 ^{0}C and decreasing thereafter. The maximum values obtained were registered at 70 ^{0}C for all cases and were 0.74 mg TE/g for the water : ethanol 50 : 50 (v/v) by the DPPH method, 2.16 mg TE/g for the water : ethanol 60 : 40 (v/v) by the ABTS method and 3.43 mg TE/g for the water : ethanol 60 : 40 (v/v) by the FRAP method. The results obtained by the different methods were concordant in terms of the observed trends but giving different values of the measured antioxidant activity, which is a common characteristic observed in these types of evaluation techniques.

This research allowed establishing some operational conditions that should be selected in order to maximize the extraction of compounds with antioxidant activity from cherry seeds. The use of ultrasounds was not found beneficial and the magnetic stirrer technique revealed to be more useful. Also the use of methanol was not found suitable, which is a good point given that this solvent is more pollutant and has more problems of toxicity. With respect to temperature, it was found that temperatures higher than 70 ^{0}C are not beneficial because they induce the degradation of some bioactive compounds thus reducing the antioxidant activity of thee extracts.

Keywords: *Extraction, Cherry, DPPH method, ABTS method, FRAP method, Optimization.*