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HYDROTHERMAL PRETREATMENT OF SPENT COFFEE AND SILVERSKIN FOR POLYPHENOLS RECOVERY

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Coffee is one of the most consumed beverages around the world. As a consequence of this big market, huge amounts of residues are also generated every year as a result of the coffee beans processing. Spent coffee grounds (SCG, Figure 1a), for example, are obtained in significant amounts during the process for instant coffee elaboration, and is also obtained in large amounts in restaurants, bars and cafeterias; while coffee silverskin (CS, Figure 1b) is the main residue obtained during the beans roasting step [1].



Figure 1: Spent coffee grounds (a) and coffee silverskin (b).

Interest in reusing these residues has increased in the last years for economic and environmental concerns. Additionally, such coffee wastes contain in their composition several compounds of interest for application in food, cosmetic and pharmaceutical areas [1]. The presence of polyphenols (PP) in SCG and CS has been reported in several studies, and some technologies have also been proposed for the recovery of these compounds from such coffee residues, among of which the use of organic solvents is usually proposed due to their efficient extraction capacity. However, the use of organic solvents generates a toxic effluent that needs to be treated before discharging to the environment. As an alternative to avoid this problem, the present study evaluated the possibility of recovering PP by hydrothermal pretreatment of SCG and CS. By using this strategy, the residues are submitted to a reaction using only water as extraction solvent under higher temperature conditions than those usually employed for extraction with organic solvents, and the use of these toxic chemicals is avoided.

The hydrothermal pretreatment of SCG and CS consisted in using 20 mL of distilled water to each gram of residue, and the reactions were maintained at 120 °C during 20 min. The total amount of PP in the extracts was quantified as gallic acid equivalents (GAE). The extracts produced under these conditions contained 32.9 mg GAE/g SCG and 19.2 mg GAE/g CS, among of which, flavonoids corresponded to 25% and 14% of the total PP in SCG and CS, respectively. These results were higher than the amounts recovered in previous studies using organic solvents (methanol and ethanol) as extraction agent [2, 3]. It was then concluded that is possible to use a hydrothermal pretreatment to efficiently recover PP from coffee wastes. Further studies will be focused on the selection of the extraction conditions that maximize the recovery results.

[1] Mussatto SI, Machado EMS, Martins S, Teixeira JA (2011). Production, composition and application of coffee and its industrial residues. *Food and Bioprocess Technology*, 4, 661-672.

[2] Mussatto SI, Ballesteros LF, Martins S, Teixeira JA (2011). Extraction of antioxidant phenolic compounds from spent coffee grounds. *Separation and Purification Technology*, 83, 173-179.

[3] Ballesteros LF, Teixeira JA, Mussatto SI (2014). Selection of the solvent and extraction conditions for maximum recovery of antioxidant phenolic compounds from coffee silverskin. *Food and Bioprocess Technology*, 7, 1322-1332.