Antioxidant activity of Tunisian Pumpkin by-products: A Response Surface Methodology Approach

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Abstract

Pumpkin is a winter squash cultivar that is round with smooth, slightly ribbed skin and is most commonly dark yellow to orange. This fruit has been ranked among the most consumed foods in the world. Actually, the world consumption of pumpkins and squash represents 602 kilos per second, with a world production of 26 million tons per year. Usually, only the flesh of this fruit is consumed, which induces a massive amount of unused biomass. The valorisation of its by-products would be interesting in the circular economy in food industries. In this context, the present study aims to optimize the extraction of antioxidants from pumpkin by-products (*Cucurbita maxima* var. karkoubi, Tunisian variety) using an experimental design as to intensify their phenolic composition and to increase their antioxidant capacity. The response surface methodology approach using the D-optimal design appropriately estimated the optimized values for the extraction parameters: solvent concentration, time, and temperature. The antioxidant potential was evaluated by measuring the phenolic compounds content and the antiradical efficiency. Different combinations of extraction factors were tested in order to obtain the optimal bioactive substances yield/efficacy. After performing the statistical analysis, the optimal parameters for extracting antioxidants from the seeds were: 10% alcohol for 23 min and at 55°C and the peels in 13% alcohol at 43°C for 47 min. The contents of phenolic compounds were comprised between 13 and 18 mg EAG/g DW for the seeds and peels, respectively. DPPH radical inhibition percentages obtained were close to 100% at 1 mg/ml. These results confirm the nutritional potential of these co-products and explain the convergence in their valuation in several areas.