EFFECT OF ADDING HERBS AND SPICES EXTRACTS ON THE OXIDATION OF SUNFLOWER OIL

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ABSTRACT

Background: The addition of natural additives with antioxidant properties to vegetable oils constitutes an innovative strategy for the development of healthier and more stable food products. Objectives: the present study aims to investigate the effects of incorporating extracts of rosemary (*Rosmarinus officinalis* L.), clove (*Syzygium aromaticum*), oregano (*Origanum vulgare*) and curcumin (*Curcuma longa* L.) on the oxidative stability of sunflower oil, with emphasis on conditions that simulate the frying process. Methods: the extracts were obtained by cold extraction and evaluated for their antioxidant potential, by determining the total content of phenolic compounds, using the Folin-Ciocalteu method, their profile by High Performance Liquid Chromatography and the antioxidant capacity, by the DPPH free radical capture method. The oxidative stability of the oil added to the 1000 mg.kg^{-1} of extracts was measured by the Rancimat and PetroOxy methods, by Thermogravimetry (TG) and Fourier Transform Infrared Spectroscopy (FTIR). The synthetic antioxidant TBHQ was used as a positive control and the oil without additive was used as a negative control. Sunflower oils enriched with extracts were subjected to immersion frying at 180 ± 5 ºC, for a continuous period of 90 min. Results and discussion: the total phenolic content varied significantly among the extracts analyzed, with the clove extract presenting the highest concentration, 102.00 ± 2.53 mgGAE/g. The other extracts exhibited lower phenolic contents, ranging from 44 ± 0.66 to 61 ± 4.09 mg of GAE/g. Antioxidant activity confirmed that clove extract had the highest free radical scavenging capacity, with an EC50 value of 16.60 µg/mL. In contrast, curcumin showed the lowest antioxidant activity (47.81 µg/mL), showing that not all extracts have the same effectiveness in preventing oxidation. HPLC analysis revealed that rosemary and oregano extracts contained significant concentrations of rosmarinic acid, while clove extract was particularly rich in eugenol, highlighting the presence of specific bioactive compounds in each extract. In the oxidative stability tests of the oil carried out by the Rancimat and PetroOxy methods, the oil added rosemary extract stood out for the significant increase in the induction period (IP) of 68.18% and 47.06%, respectively, about the oil added with TBHQ. The oils added with curcumin and clove extracts showed low thermal stability, quickly losing their beneficial compounds when subjected to heating at 100 °C and 55 °C, respectively, which limits their application in high-temperature processes, such as frying. During the frying tests, there was a decrease in the bands at 1653 cm^{-1} and 3008 cm^{-1}, indicating the breaking of olefinic double bonds and the consumption of hydroperoxides to form secondary oxidation products. The oil with clove extract showed a more pronounced degree of degradation, with a significant increase in the bands at 930 cm^{-1}, suggesting a more intense isomerization process, due to the low thermal stability of eugenol. Oregano extracts delayed the formation of trans bonds, indicating better oxidative stability compared to oil without additives. Conclusion: Incorporating of sunflower oil extracts is a viable strategy, since the extracts help in the stability of the oil.