

Antioxidant Potential of Sunflower Seed Cake Extract in Stabilization of Soybean Oil

Authors : Ivanor Zardo, Fernanda Walper Da Cunha, Júlia Sarkis, Ligia Damasceno Ferreira Marczak

Abstract : Lipid oxidation is one of the most important deteriorating processes in oil industry, resulting in the losses of nutritional value of oils as well as changes in color, flavor and other physiological properties. Autoxidation of lipids occurs naturally between molecular oxygen and the unsaturation of fatty acids, forming fat-free radicals, peroxide free radicals and hydroperoxides. In order to avoid the lipid oxidation in vegetable oils, synthetic antioxidants such as butylated hydroxyanisole (BHA), butylated hydroxytoluene (BHT) and tertiary butyl hydro-quinone (TBHQ) are commonly used. However, the use of synthetic antioxidants has been associated with several health side effects and toxicity. The use of natural antioxidants as stabilizers of vegetable oils is being suggested as a sustainable alternative to synthetic antioxidants. The alternative that has been studied is the use of natural extracts obtained mainly from fruits, vegetables and seeds, which have a well-known antioxidant activity related mainly to the presence of phenolic compounds. The sunflower seed cake is rich in phenolic compounds (1.4% of the total mass), being the chlorogenic acid the major constituent. The aim of this study was to evaluate the in vitro application of the phenolic extract obtained from the sunflower seed cake as a retarder of the lipid oxidation reaction in soybean oil and to compare the results with a synthetic antioxidant. For this, the soybean oil, provided from the industry without any addition of antioxidants, was subjected to an accelerated storage test for 17 days at 65 °C. Six samples with different treatments were submitted to the test: control sample, without any addition of antioxidants; 100 ppm of synthetic antioxidant BHT; mixture of 50 ppm of BHT and 50 ppm of phenolic compounds; and 100, 500 and 1200 ppm of phenolic compounds. The phenolic compounds concentration in the extract was expressed in gallic acid equivalents. To evaluate the oxidative changes of the samples, aliquots were collected after 0, 3, 6, 10 and 17 days and analyzed for the peroxide, diene and triene conjugate values. The soybean oil sample initially had a peroxide content of 2.01 ± 0.27 meq of oxygen/kg of oil. On the third day of the treatment, only the samples treated with 100, 500 and 1200 ppm of phenolic compounds showed a considerable oxidation retard compared to the control sample. On the sixth day of the treatment, the samples presented a considerable increase in the peroxide value (higher than 13.57 meq/kg), and the higher the concentration of phenolic compounds, the lower the peroxide value verified. From the tenth day on, the samples had a very high peroxide value (higher than 55.39 meq/kg), where only the sample containing 1200 ppm of phenolic compounds presented significant oxidation retard. The samples containing the phenolic extract were more efficient to avoid the formation of the primary oxidation products, indicating effectiveness to retard the reaction. Similar results were observed for dienes and trienes. Based on the results, phenolic compounds, especially chlorogenic acid (the major phenolic compound of sunflower seed cake), can be considered as a potential partial or even total substitute for synthetic antioxidants.

Keywords : chlorogenic acid, natural antioxidant, vegetables oil deterioration, waste valorization

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