

The effect of Ozone, Air and Nitrogen on the Oxidative Stability of Plant Oils during Storage

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Ozone (O_3) is a gas with a high oxidation potential, used in food processing and as a sanitizing agent. Besides, O_3 has been detected in elevated concentrations in the atmosphere of urban areas due to the increase of human activities related to economic development.

Cold pressed flaxseed and rapeseed oils and refined rapeseed oil were saturated with three different gases: ozone, nitrogen and air. Oil samples (100 mL) were placed in 200 mL flask and purged under a flow of 90 mL/min for 2 hours. After purging all flasks were closed and stored at 60°C for 6 days. Analysis of peroxide value (PV), acid value (AV), fatty acid composition and the content of sterols were carried out every day.

After 6 days of storage, the peroxide number was the lowest for cold-pressed rapeseed oil regardless of the gas used. It was the highest for oils stored in ozone and ranged from 61 to 76 meq O_2 /kg, follow by air with 64-70 meq O_2 /kg and at last by nitrogen with 33-73 meq O_2 /kg. Acid value of flaxseed oil was 1.6 mg KOH/g and after 6 days it increased to 2.2 mg KOH/g regardless of the atmosphere of storage. AV in both rapeseed oils was unchanged after storage. Ozonation did not affect the percentage composition of fatty acids in the stored oils, as well as other gases. The greatest degradation of plant sterols occurred in refined rapeseed oil and was 48% after storage in ozone, 0.8% in air and 2.6% in nitrogen. In the other oils, sterol degradation ranged from 0 to 2.8%.

The composition of vegetable oils, especially their antioxidant content, has an important influence on their stability during storage. Ozone has a particularly detrimental effect on the levels of plant sterols, which are considered to be bioactive compounds and have positive effects on the human body.