

SUNFLOWER OIL OXYDATION INTO FORCED THERMAL PROCESSES

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The work investigated the processes that take place during the forced thermal oxidation of sunflower oil. The results obtained in the study showed a major impact of thermo-oxidation (90 ± 2 °C).

The supplied air with a speed of $8 \div 10$ L h⁻¹ for 50 hours) influences physico-chemical indicators of the studied oil. Acidity index of fresh sunflower oil increased 13.7-fold, with a value of 2.46 mg KOH/g⁻¹ fat for thermo-oxidized oil compared to the initial value of 0.188 mg KOH g⁻¹ fat. Thermo-oxidation of sunflower oil caused a significant decrease in the saponification index, which indicates a significant increase in degree of polymerization and leads to an increase in the viscosity of the studied sunflower oil.

To highlight the impact of heat treatments, the analysis was performed by IR spectroscopy and possible mechanisms of forced oxidation of unsaturated fatty acids under the influence of thermal factor were analyzed. It was established that the application treatment favored both the formation of carbonyl secondary compounds and simultaneous formation of hydroperoxides and triglycerides containing hydroxylated groups. Accumulation of hydroperoxides and triacylglycerides that have hydroxyl functions facilitated the course of polymerization reactions, which are to increase the viscosity of thermo-oxidized sunflower oil. Formation during thermo-oxidation of trans-isomers of polyunsaturated acids led to the appearance of the group = CH, with deformation vibration band at 966 cm⁻¹ in the spectrum of thermo-oxidized oil. Simultaneously, there was a slight reduction in the intensity of the deformation vibration of the group = CH, with band at 1098 cm⁻¹ at the respective cis isomer of polyunsaturated acids.

Keywords: sunflower oil, thermal oxidation, IR spectroscopy, peroxide index, acidity index, epoxides, isomers of trans and cis fatty acids.

Acknowledgments: This work was performed under the National Research Project Nr. 20.80009.5007.04.