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"Youth Scientific Achievements to the 21st Century Nutrition Problem Solution"

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It was considered the problems of improving existing and creating new energy and resource saving technologies for food production based on modern physical and chemical methods, the use of unconventional raw materials, modern technological and energy saving equipment, improve of efficiency of the enterprises, and also the students research work results for improve quality training of future professionals of the food industry.

The publication is intended for young scientists and researchers who are engaged in definite problems in the food science and industry.

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34. Investigation of chemical transformations in corn oil during the heat treatment

Yuliya Korobka, Svitlana Kovaleva

National University of Food Technologies, Kyiv, Ukraine

Introduction. Most vegetable fats (oils) are characterized by a high content of unsaturated fatty acid esters that causes their high ability to oxidize and polymerize. The speed of these processes increases significantly when the oils are heated. Oxidation of fats leads to their darkening and odor.

Materials and methods. Refined corn oil for the brand "Kama", heat treatment of a sample of oil at a temperature of 235 °C. Monitoring of changes in chemical transformations in oil by the NMR ¹H spectroscopy.

Results. The effect of prolonged heat treatment at the temperature close to the smoke point on the chemical resistance of the "Kama" refined corn oil was studied. Heat treatment of the oil sample was carried out in a steel container for cooking at a temperature of 235 ° C with continuous stirring for 2 hours and contact with air. ¹H NMR spectra of the sample were recorded at 30 min intervals from the beginning of the experiment. The fatty acid composition of corn oil is dominated by di-unsaturated acids (about 60%), which is consistent with the literature.

As evidenced by the gradual decrease in the area of CH₂ signal groups of the bis-allyl fragment of the carbonic skeleton (at 2.77 ppm) during the experiment, the residues of the unsaturated acids undergo the largest changes during heat treatment. Conversions involving the hydrogen atoms of vinyl and allyl groups occur to a lesser extent, as evidenced by a slower decrease in the integral intensities of the corresponding signals at 5.33 ppm and 2.31 ppm (Fig. 1).

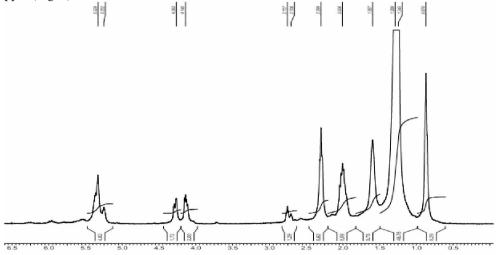


Fig. 1. NMR spectrum of ¹H corn oil sample after 120 min heating at 235 ° C

Conclusions. During the heat treatment at 235 °C, the native structure of the corn oil triglycerides is destroyed. The rate of irreversible processes and the decomposition degree of triglycerides increase over time. The most sensitive moiety in corn oil triglyceride molecules is the bis-allyl group of -CH2- polyunsaturated fatty acids, represented mainly by linoleic esters.

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