Steric Hindrance Effect on the Oxidation of Lipids

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ABSTRACT

Soybean oil and its methyl esters were separately autoxidized at 37°C and photooxidized at 4°C. Peroxide value and UV233nm absorbance were used as oxidation indices for those reactions. Results showed that, during autoxidation, the oxidation rates of the methyl esters were higher than those of the soybean oil. However, as for photooxidation, the oxidation rates of soybean oil and its methyl esters were both rapid and showed no significant difference. The monohydroperoxides formed in the initial stage of autoxidation of soybean oil (POV=4.10) and its methyl esters (POV=3.97) were analyzed by static headspace GC. Results indicated that the hydroperoxy group on the monohydroperoxide molecule from autoxidized soybean oil was located at the methyl end of the molecule, while that from the soybean oil methyl esters were not found. When comparing the monohydroperoxides of more autoxidized of soybean oil (POV=13.57) and its methyl esters (POV=12.66), there were no significant difference between both. This again indicated that the fatty acids on the triacylglycerol molecule exhibited the steric hindrance effect during initial stage of autoxidation. It is found, from analyzing the monohydrooperoxides formed in the initial stage of photooxidation of soybean oil (POV=3.37) and its methyl esters (POV=4.75), that the amount of both the hexanal from linoleic acid and propanal from linolenic acid of soybean oil were greater than those of its methyl esters. However, as for more photooxidation, there was no significant difference between soybean oil (POV=15.92) and its methyl esters (POV=16.77). This also again indicated that the fatty acids on the triacylglycerol molecules exhibited the steric hindrance effect during initial stage of photooxidaton .

Keywords : Autoxidation ; Photooxidation ; Soybean oil ; Steric hindrance ; hydroperoxide

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