THE STUDY OF SYNERGY BETWEEN β,β-CAROTENE AND TOCOPHEROLS IN THE PHOTOXIDATION PROCESS OF FATTY ACIDS

B. SMYK

University of Warmia and Mazury, Olsztyn, Poland

There are controversial opinions about the synergy between the major antioxidants in plant oils: tocopherols and carotenoids.

The aim of this study was to clarify the synergism between α, γ, and δ-tocopherols and β,β-carotene.

The stock solution was prepared by adding an extract of chlorophylls from spinach to the bleached borage oil. Chlorophylls were used to produce singlet oxygen which can interacts with fatty acids. Samples with tocopherols, β,β-carotene and mixture of tocopherols and β,β-carotene were prepared from the stock solution. Each sample was illuminated within 20 hours by 150 W ozone free xenon lamp through 600 nm cut-off filter.

Absorption and fluorescence spectra showed that oxidized fatty acids form new absorption bands with maxima at 234 nm and 270 nm. The first band can be connected with oxidized dienes and the second one with oxidized trienes. Therefore, this spectral range was used to monitor process of oxidation. Both antioxidants inhibited oxidation of fatty acids. However, β,β-carotene was much more effective inhibitor which is in good agreement with literature date. β,β-Carotene seems to be more effective singlet oxygen quencher than tocopherols. From among tocopherols, α-tocopherol showed the greatest inhibition. These results suggest that there is no synergy between β,β-carotene and tocopherols. Moreover, there were no inhibition effects for γ- and δ-tocopherols. Instead, an inhibition effect of β,β-carotene decreased after addition of α-tocopherol. On the other hand, fluorescence spectra of all tocopherols showed decreasing intensity the effect being the largest for α-tocopherol. This phenomenon can be attributed to antioxidant action of tocopherols.

The obtained results suggest that in the photooxidation process tocopherols do not augment the inhibitory effect of β,β-carotene and can even decrease it.