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Singlet oxygen effect on lipid oxidation in the presence and absence of synthetic/natural antioxidants, using sheep erythrocyte hemoglobin

Mahdi Hajimohammadi,*[a] Fatemeh Sheikh Mahboobi [a]

[a]*Department of Inorganic Chemistry, Faculty of Chemistry, Kharazmi University, Tehran, Iran*

[*]*E-mail: hajimohammadi@khu.ac.ir*

Photooxidation of lipids is an undesirable chemical process in which essential fatty acids are converted into peroxides with singlet oxygen ($^1O_2$), which causes oxidative spoilage of meat products [1-3]. Erythrocytes are used as a model for lipid oxidation because residual blood can enhance lipid oxidation upon hemolysis and release of hemoglobin [3]. This study aims at investigation of $^1O_2$ effect on lipid oxidation in erythrocyte model and oleic acid. In this study, hydroalcoholic extracts of Turmeric (Curcuma longa L.) and Cumin (Cuminum cyminum L.) were used as natural antioxidants. Butyl hydroxytoluene (BHT) was used as a synthetic antioxidant and sodium azide (NaN_3) was applied as a well-known singlet oxygen scavenger. The generation or inhibition of $^1O_2$ and peroxide products in the sheep blood erythrocyte and oleic acid in the presence of Rose Bengal photosensitizer, light and various antioxidants were obtained by ^1H NMR spectroscopy, UV-Vis spectroscopy, TBARS assay and iodometric titration. The antioxidant results showed that NaN_3,turmeric, cumin, and BHT were able to prevent the photooxidation of lipids into peroxide products in sheep erythrocyte model, 100%, 70.93%, 62.26%, and 51.92%, respectively. Meanwhile, these inhibition values in the photocatalytic conversion of oleic acid to peroxide products were obtained as 100%, 71.10%, 46.63% and 24.08%, respectively. These results declared that the two methods have a positive correlation for invistigation of lipids and fatty acids phootooxidation.

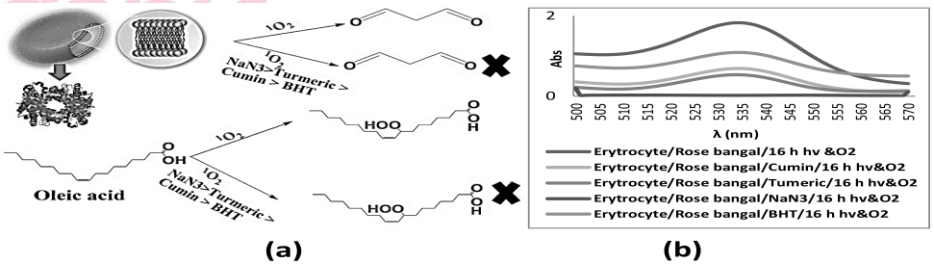


Fig.1 (a) Erythrocyte and oleic acid photooxygenation in the presence and absence of synthetic/natural antioxidants. (b) UV-Vis spectra of (a) based on TBARS method

Keywords: Hemoglobin, lipid oxidation, singlet oxygen, antioxidants

References

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