

عنوان مقاله:

Comparative Study on Ultraviolet Irradiation of Epoxidized and Non-Epoxidized Sunflower, Soybean, and Olive Oil

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خلاصه مقاله:

The degree of photochemical cleavage of epoxidized and non-epoxidized oils of sunflower (*Helianthus annuus*), soybean (*Glycine max*), and olive (*Olea europaea*) exposed to ۱۰۰۰ watts ultraviolet light (UV) at different times were studied using iodine value and infrared spectroscopy. The epoxidation was conducted with a mole ratio of ۱:۰.۵:۲ for the oil, hydrogen peroxide and formic acid, respectively, for ۶ hours at ۵۰ °C. The oxirane oxygen content and their percentages of conversion to epoxides for the oils were: sunflower oil (۶.۷۵, ۸۹.۵۲ ± ۰.۲۵%), soybean oil (۷.۱۰, ۹۵.۹۵ ± ۰.۳۳%), and olive oil (۴.۲۵, ۸۴.۸۹ ± ۰.۱۸%), respectively. The results showed that the difference in oxirane oxygen content between sunflower and soybean oils corroborate the slight increases in iodine value of the irradiated oils. The oxirane oxygen content of epoxidized olive oil established the baseline value for monounsaturated oils. The results for the UV irradiation showed that after twelve hours of irradiation, the iodine value increased for non-epoxidized sunflower oil and non-epoxidized soybean oil, while it decreased for non-epoxidized olive oil. However, the iodine values of epoxidized sunflower oil and epoxidized soybean oil increased, while the epoxidized olive oil decreased. It was suggested that the increases observed in the iodine values for non-epoxidized and epoxidized sunflower and soybean oils were as a result of molecular rearrangement of the alkene functional groups and cyclization of the cleaved epoxides residues after irradiation due largely to multiple bond effect. This effect is more marked in sunflower oil with ۶۳% polyunsaturated fatty acid content, than in soybean oil with ۶۱% polyunsaturated fatty acid content. This result corroborates the C-H deformation vibration at ۱۳۷۹ cm^{-۱} as evidences of cyclized products. The monounsaturated olive oil characterized by a marked reduction in iodine value for both the non-epoxidized and epoxidized oils indicated marked reduction in unsaturation as it has only one double bond per molecular chain. Thus, the possibility of molecular rearrangement or cyclization of epoxidized residues is unlikely as shown by the results. Hence, the monounsaturated olive oil produced more stable cleaved products as evidenced by a marked reduction in the iodine value of the products.

کلمات کلیدی:

Epoxidized Non, epoxidized UV irradiation Sunflower oil Soybean oil Olive oil

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