

**THE INFLUENCE OF SOME TREATMENTS ON
THE ANTIOXIDANT STABILITY IN CERTAIN
EDIBLE OILS**

By

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B.Sc. Agric. Sc. (Food Tech.), Fac. Agric. Ain Shams University, 2002

M.Sc. Agric. Sc. (Food Sci. and Tech.), Fac. Agric. Ain Shams Univ., 2010

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ABSTRACT

Wael Abd El-Fatah Abd El-Hamied: The Influence of Some Treatments on the Antioxidant Stability in Certain Edible Oils. Unpublished Ph.D. Dissertation, Department of Food Science, Faculty of Agriculture, Ain Shams University, 2020.

This study was designed to investigate the influence of refining steps i.e. degumming-neutralization, bleaching, polishing and deodorization of corn, sunflower and soybean oils on stability of various types of natural antioxidants containing these oils, such as tocopherols, phytosterols, polyphenols, chlorophylls, carotenoids and coenzyme Q₁₀; also, the fat-soluble vitamins; besides, the physical and chemical properties and fatty acid composition of the tested oils.

The refining process caused more significant changes in the chemical properties of the studied oils than the physical properties, which showed no or little changes, excluding the significant reduction of the yellow and red color. The free fatty acids, peroxide value, and the ultraviolet absorption at 232 nm and 270 were significantly reduced during the refining process. Also, significant decreases in the polyunsaturated linoleic and linolenic acids, together with palmitic acid, coupled with significant increases in saturated stearic and arachidic acids were taken place. A significant increase was happened too in trans fatty acids through the refining steps, especially deodorization.

Concerning the bioactive components, the total phytosterols were the most abundant in the crude tested oils; the content of α -tocopherols came in the second order. However, these oils contained an inconsiderable concentration of coenzyme Q₁₀ and polyphenols. The flavonoids and color pigments, i.e. carotenoids and chlorophylls, their levels were negligible. The industrial refining processes of oils caused a removal and alteration in these compounds; affecting their quality and oxidative stability. During refining, the loss in phytosterols content in oils was around 21%, while in α -tocopherol was between 11.91 and 22.44% of the initial values. The highest losses were taken place in flavonoids;

they significantly reduced by a percentage around 90%. Also β -carotenes, chlorophylls, polyphenols and coenzyme Q₁₀ were progressively lost. It was found that the deodorization step intensively diminished all the studied antioxidants, followed by degumming-neutralization, then bleaching and polishing steps. The refining process caused also considerable losses in fat soluble vitamins containing the tested oils, the percentages of losses varied according to the kind of oil. The major loss in corn oil was obtained in vit. K, followed by vit. E, then vit. D₃ and vit. A. While, in sunflower and soybean oils, the main loss was happened in vit. D₃, followed by vit. K., vit. A, then vit. E. The most of losses in all these vitamins were taken place through deodorization step, followed by degumming-neutralization, and then bleaching of oils.

Oils oxidative stability measured as induction period in hrs, was gradually decreased and reached its minimal times often polishing step, subsequently, it turns to increase often deodorization step. However, the oxidative activities of oils were decreased step by step during refining till reached their lowest values through deodorization. Therefore, in this study, natural antioxidants were extracted from some agro-food industrial wastes, such as, deodorizer distillate of oils, tomato peels, olive pomace and mango seed kernel. Each of the obtained extracts was added to the refined sunflower oil at different levels to investigate the suitable concentration that equal in its effect to BHT at 200 ppm, in improving the oxidative stability of the oil, and compensate the loss of its natural antioxidant. It was found that adding 400, 200, 400 and 200 ppm, from the alone respective wastes natural antioxidant extracts, were the best concentrations.

The impact of three extraction systems; i.e. by press and 2- as well as 3-phase oxidative stability and antioxidant activity of the obtained oils was performed. The nicest extraction system was by the 2-phase decanters that produced superior quality of extra virgin olive oil.

Keywords: Refining, degumming-neutralization, bleaching, polishing, deodorization, corn oil, sunflower oil, soybean oil, phytosterols, tocopherols, phenols, flavonoids, β -carotenes, chlorophylls, coenzyme Q₁₀, fat-soluble vitamins, antioxidants, oxidative stability, deodorizer distillates, tomato peels, olive pomace, mango seed kernel, extra virgin olive oil, extraction systems of olive oil.

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