EFFECT OF SYNTHETIC ANTIOXIDANTS ON THE OXIDATIVE STABILITY OF COLD PRESSED WALNUT OIL

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Abstract. *Article deals with evaluation of the efficacy of antioxidants on quality indices, related to oxidative stability of walnut oil. Properties of cold pressed walnut oil were monitored under storage conditions of darkness and room temperature over 2 months. A Full Factorial Experiment design, FFE 2^3, was applied to estimate the effects of n-Octyl Gallate (OG), DL-α-Tocopherol (DLTP) and L-Ascorbic Acid 6-Palmitate (AAP). A statistical study of the peroxide contents, p-anisidine index values and UV-Vis spectra of walnut oil added with antioxidants demonstrate increasing of the antioxidant activity in the series of DLTP << AAP < OG. Accordingly to the independent spectral and analytical data, DLTP which has been added in the walnut oil, shows itself as pro-oxidant, rather than antioxidant for this food product, and thus is not suitable for it. The linear regressions demonstrate synergetic super-addition effect of AAP-OG compositions, beneficial for increasing of walnut oil stability by safety amounts of antioxidants. A joint use of these antioxidants in small amounts significantly reduces lipid oxidation and increases the shelf life of walnut oil.*

Keywords: walnut oil, antioxidants, tocopherol, peroxide, p-anisidine, spectra, regression, super-addition

I. Introduction

The cold-pressing procedure involves neither heat nor chemical treatments, and it is becoming an efficient substitute for conventional practices because of consumers' desire for natural and safe food products. The consumption of new and improved products such as cold-pressed vegetable oils containing bioactive substances may improve human health and prevent certain diseases [17].

Over the last few years, increased interest in cold-pressed plant oils has been observed as these oils have better nutritive properties than those after refining. Cold pressing is relative simple and ecological because does not require much energy.

Walnut kernel (*Juglans regia* L.) is highly appreciated nut due to its unique organoleptic characteristics, biological and nutritional value [7]. Walnuts generally contain about 60% of lipids, but these can vary from 52% to 70% depending on the cultivar, location where grown, irrigation rate [13].

Oil extracted from walnuts has significant economical value, technological relevance and medicinal importance for human health, because of essential composition of polyunsaturated fatty acids, especially linoleic (18:2), and linolenic (18:3), bioactive minor components, such as tocopherols and phytosterols. In addition, the ratio of polyunsaturated fatty acids in composition of walnut oil is close to optimum [5, 6, 9, 14].

II. Oxidation stability of walnut oil

However, high levels of polyunsaturated fatty acids make walnut oil prone to oxidation [15]. This may mean that oil has a limited shelf life.

Numerous experiments have been carried out on the oxidation of walnut oil, but problem is far from the solution. Temperature, light, moisture oxygen have been found to be the main contributing factors to oxidation of walnut oil [10, 13, 15, 16].

Oxidation of walnut lipids is associated with the appearance of unpleasant odors and tastes. Tocopherol isomers provide some protection against oxidation. Cold pressed walnut oil from the dried kernels has a strong and distinctive walnut taste and fragrance. It is generally used as a flavoring for baked goods and for some sauces. It can provide a bold flavor to salad dressing or it can be added to mildly flavored oils to create a subtle taste [8, 11].

However, the addition of this type of oil in processed food is not usual due to its low stability. The oxidative stabilization of walnut oil is imperative to determine the feasibility of bringing it into commercial production [12]. To avoid this stability problem, our research group [3] and Calvoa et al [4] obtained preliminary data regarding the possibility of introducing the walnut oil to processed food in microencapsulated form. As result of these researches, walnut oil was protected while food processing and was released in digestive system after consumption of foods, containing microcapsules. Tsamouris et al [18] extracted and analyzed total lipids of walnut oil by high performance thin-layer chromatography (HPTLC)/FID and gas chromatography coupled with mass-spectrometry (GC-MS). Unsaturated fatty acids were found as high as 85%. On the base of this data, researchers decided to prepare liposomes, which were characterized as new formulations. As authors