Study of the Light Influence on the Walnuts Oil Quality

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Short Research Article	

ABSTRACT

This paper represents a statistical processing of experimental studies on the influence of light on the quality of nut oil (*Juglans regia* L). The conformity of nut oil Calaras and Kogalniceanu, harvested in 2013 and 2015, was analyzed in the Republic of Moldova. The objective of this study was to determine effect of storage conditions (stored at light and dark) on the stability of walnut oil during storage by measuring the Peroxide Values (PV), Acid values (AV), Kinetic Study of Lypid Peroxidation A (PV), Reichert Meissl Number, Polenske Number, Specific Gravity and Refractive Index. The nut oil was obtained by cold pressing in the Department of Food Technology, TUM scientific laboratory, the storage time of nut oil samples in the dark and the light was 6 months, tempering 20-22ºC. The monitoring of the physicochemical indicators was carried out for 2 years in the Institutional project no. 11.817.04.40 Elaboration of methods for the walnut lipids protection (*Juglans regia* L.) of oxidative degradation, 2012-2014 and project no. 15.817.02.30A Methodological and technical elaboration for the modernization of the walnut processing technology (*Juglans regia L.*) with the use of biologically active components in functional food «NUCALIM-PROBIO» 2015-2018. It has been established that light is a determining factor in the quality of walnut oil at storage.

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1. INTRODUCTION

Walnut oil is high in omega-3 fats, which have been linked to a variety of health benefits, including reducing the risk of dementia and heart disease [1,2]. Medical studies show that it is a rich source of ellagic acid, an antioxidant that is known to detoxify elements that could trigger cancer. Walnut oil is also rich in melatonin, copper and manganese - all of which are key elements in regulating our body's metabolism [1, 3,4]. The problem associated with incorporating polyunsaturated lipids into food is their high susceptibility to oxidation [5,6].

Lipid oxidation has received a great deal of attention because its implications are undesirable for human health and it contributes to a decrease in the nutritional value of food. Lipid oxidation is well known as the main cause of quality deterioration during the processing or storage of lipid-rich food [7,8,9].

There are few published studies on the stability of walnut oil during storage [10], although there have been studies about the oxidative stability of other edible oils such as olive oil. Stability in these other oils are affected by the fatty acid composition and the anti-oxidant content [9,11, 12].

Lipid oxidation causes rancidity that leads to loss of shelf life, product nutrition, and ultimately, saleable product and profits [9,13,14]. Strategies to postpone lipid oxidation are needed for both economic and consumer health, particularly because the healthier unsaturated fats are at greater risk for oxidation then saturated fats [15, 16]. Degradation of the unstable primary oxidation products, hydroperoxides, leads to the formation of a variety of volatile compounds, such as aldehydes, ketones, hydrocarbons, alcohols, acid compounds and furans. Formed secondary products with low threshold values are responsible for the off-flavors development [17, 18].

2. MATERIALS AND METHODS

2.1 Sample and Storage Condition

The walnuts oil has been obtained by cold pressing (t=18…20°C) of walnuts varieties Calaras and Kogâlniceanu, harvested in 2013 and 2015. Procedures of walnut oil obtaining in laboratory conditions were following: *crushing the walnuts → kernels elimination → kernels grinding → pressing→ oil separation → oil packing and storage*.

The storage conditions for walnut oil were at light and at dark, ambient temperature (25ºC).

2.2 Physical Analysis

Oil density was determined by pycnometry method, according to STAS 145-67 [19].

Refractive index –Using the RL 3 refractometer, according to STAS 145-67 [19].

Peroxide value (PV): Peroxide value was determined by official method Cd 8-53 and recommended practices of the American Oil Chemists Society (AOAC, 1997) [20,21]. This method determines iodine liberated from potassium iodide by the peroxides present in the oil:

$$PV(meg/kg) = \frac{(S-B) \times N \times 1000}{m} \qquad (1)$$

where: B is the volume (mL) of titrant for blank, S is the volume (mL) of titrant for sample, N is the normality of $Na_2S_2O_3$ solution (0.1mol equi/L), and m is the weight (g) of oil sample.

Results were expressed as milliequivqlents of oxygen per kilograme of oil (meq. Oxigen/kg of oil) .

Fatty acid values (FFA): FFA was analyzed by official method Ab 5-49 and recommended practices of the American Oil Chemists Society (AOAC, 1997) [20]. FFA was a quantitative determination of fatty acids in oil by titration against a standardized alkali solution (NaOH) as follows:

$$FFA \ (Oleic \ acid \ g/100g) = \frac{V \times N_1 \times 28,2}{m}; \qquad (2)$$

where: *V* is the titration of sample (mL), and N_1 is the normality of NaOH solution.

Kinetic Study of Lypid Peroxidation of the walnuts oil: A change in the quality of lipids be mesured by the appearance or disappearance of one or more indices, symbolized by A (PV) [22]; the rate of apperance or disappearance of A can be represend by the Equation (3).