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Obtaining Ozonated Hazelnut Oil and Determination of the Chemical and Physcical Properties

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Abstract : Hazelnuts are an extremely important agricultural product in the world. In this study, for the first time, ozonized hazelnut oil was obtained in appropriate optimization and the use area of ozone was combined with an important product such as hazelnuts. For this purpose, natural hazelnut oil was obtained by cold pressing method (55-60˚C) without any refining and temperature exposure in this study. Natural hazelnut oil with hexan was obtained by adding hexan under the condition of natural hazelnut oil (50˚C, 1000 rpm, 24 hours). Ozonization was applied for 110 minutes in the flow of ozone gas at 7-8 flows. The physical and chemical properties of 5 different oil samples were determined in total. As a result, in paralel with the ozonization process; density, viscosity, peroxide value, moisture content increased, while iodine value naturally decreased. The fracture index, on the other hand, was almost no different. In paralel with the ozonization process, the concentration of vitamin E and insatiable fattyacids was also observed to decrease. In order for the shelf life to be long, extra vitamin E should be added to prevent the formation of radicals in ozone oil contents; storage conditions were found to be 4°C or lower.

Keywords: Ozonation process, Peroxide value, Iodine value, Vitamin E

Introduction

Hazelnut is the homeland of Anatolia, the first in the world hazelnut production and trade of Turkey was started. Turkey last 5 years 70% of world hazelnut production 'has a share. Subsequently, as the most important region in the world hazelnut production in Italy, it has come to America and Spain. Approximately 534 000 tonnes of annual production of 136,000 million tons, with exports of our country and provides income for 400 thousand million US dollars (Özdemir&Akıncı, 2004).Very similar to the chemical composition of olive oil (Zabaras & Gordon 2004) in hazelnut oil consumption is increasing in recent years. Hazelnut oil has a high amount (82-84%) comprises oleic acid. (Lôpez-Diez et al., 2003). Subsequently, linoleic (9-11%), palmitic (4%), stearic acid (1.5 to 2.3%) to come. The food in the house, hazelnut oil, for frying and salad are used instead of other vegetable oils (Alasalvar et al.,2003).

Ozone (O_3), was discovered in 19^{th} century as inorganic gas which consist of three oxygen atoms (Paulesu et al., 1991). In the early 1950's, the United States began using ozonated oil as a disinfectant in wound cleanup. The ozone's solubility in water is 10 times higher than oxygen , dissolves rapidly in pure water and reacts instantly with organic and inorganic molecules dissolved in biological fluids (Lezcano et al., 2000 and Pai et al., 2004). Plants applying ozonated oils and obtaining one of the most commonly performed method of ozone treatment is easy. The most widely used at this point ozonated oil is olive oil. Ozonated olive oil is antiseptic and

regenerative properties, thanks to the ozonide formation of acting more on long-term biological substances, the ozone solution is much more active (Uysal 2014).

Ozonated olive oil leaves the active oxygen penetrates the tissue thereby increases the blood flow in this area, activates metabolic processes, accelerates the granulation and epithelialization in pathological region. Ozone (O_3), which provide pure oxygen needs of the tissues and cells, is the most effective substance in nature that destroys germs and toxins. Ozonated olive oil and cream helps to soothe rapidly absorbed in the regions where the waist and knee pain. When applied to the face and neck tissue by stimulating the cells expand, it helps to remove wrinkles. Ozone treatment and biological activity of fat made in many academic studies available. (Bocci et al., 2009 and Valacchi et al., 2005)

For this purpose, in this study, ozonized hazelnut oil was obtained from hazelnut oil, as is the case with ozonated olive oil, which has a great use in the medical-cosmetic field and still has an important place in ozone treatments that continue to increase. In order to make a comparison, the same processes were applied to the natural hazelnut oil obtained by cold pressing in a similar way to olive oil without any refining and exposure to heat. Obtained ozonated oils; Physical and chemical analyzes were carried out.

MATERIAL AND METHODS

The Experimental Oils

For ozonation process, refined hazelnut oil, unrefined cold-pressed (50-60ºC in press), hazelnut oil and by extraction (hexane, 50 ° C 'at 1000 rpm, 24 hours) was obtained un refined hazelnut oil. Natural hazelnut oils obtained from cold press were ozonated for 7-8 flow rates for 110 minutes and ozonated hazelnut oils were obtained under optimum conditions.

Physical Analyzes

Properties such as density, viscosity, refractive index and percent moisture content of ozonated hazelnut oil were studied as physical analyses. All of the samples physcial analysis results are shown as Table 1.

Table 1. Physical analysis results of samples

Samples	Density (g/ml,25 °C)	Viscosity (cpt,25 °C)	Refractive index(nD,20 °C)	% Humidity (105 °C)
3	0,914	65,00	1,470350	0,11
4	0,919	86,25	1,470270	0,38
1	0,916	86,88	1,469230	0,71
2	0,925	92,0	1.477132	1,35
5	0,917	64,50	1,468880	0,20

Samples were given to a syringe Anton Paar DMA 38 instrument. About three minutes until the point where the density of the fixed values were recorded of the totally 5 samples. Density measurement process 25 ° C were performed. Anton Paar Abbemut 350 insrument for determined of refractive index. Temperature 25 ° C stabilized in the system.

Brook field viscometer with small sample adapter using spindle No. 21, made 3 min. 30 sec. 6 measured at 80 rpm, on 6 Average results and measured viscosity with 30 ml volume for the samples. Mettler Toledo Halogen Moisture analyzer was used by meausrement of humidty. 105ºC temperature setting device, the timer is set to 2 minutes. The sample pan is placed in a balanced way to put the sample into the device. After the device is reset balance added up to about one gram sample pan and spread on the analysis starts. The obtained value is stored in 2 minutes.

Chemical Analysis

For the chemical characterization of ozonated hazelnut oil, 2 different chemical analyzes that should be evaluated in oil samples were carried out. The measurement of both peroxide and iodine values was carried out with a different procedure and titrimetric method. Peroxide and iodine values are as shown in Table 2.

Table 2. Hazelnut oil values of peroxide and iodine

Samples	Peroxide Value ($mEqO_2/kg$)	Iodine Value
3	3.67	85,13
4	58.89	52,52
1	168,70	68,81
2	301,78	53,94
5	22.58	63,18

Conclusion

Ozonated oils obtained by different routes at different times in the same conditions, the samples were obtained. The obtained oil with of ozonized; physical and chemical were analyzed. As a result of ozonation, the double bonded fatty acids in the oil content were broken down. As can be seen from the values shown in Table 1, ozonation of double bonds significantly increased the density and increased the viscosity accordingly. While the density of refined, unozonated hazelnut oil was 0.914, the highest density value was found to be 0.925 in hexane ozonated hazelnut oil. While the viscosity of refined hazelnut oil was determined as 65.00, the highest viscosity value was recorded as 92 in ozonated hazelnut oil with boiler. Peroxide formation increased due to the active oxygen that occurred with ozonation, and the peroxide value was determined at very high levels as shown in Table 2. The most important value showing that ozonation has taken place is iodine. As shown in Table 2, the iodine value of all ozonated samples decreased. At the same time, the decrease in the iodine value indicates that the number of double bonds decreases.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPHELS journal belongs to the authors.

Acknowledgements or Notes

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