

Human Health and Nutritional Value of Walnut and Evaluation of its Sensory, Peroxidase and Acid

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Abstract

Sensory evolution of walnut fruit sere testes by groups of assessors some lecturer in my department whom they have perfectly experience of this purpose. Acid value and Peroxidase value are tested to illustrate change in oiliness and changing in the taste, flavor, odor, texture and kernel color and to notice the differences among two storage condition in two different temperature (4°C, 25°C), in zero time after 18months of storage visual properties of kernel walnuts there were some properties evaluated in walnut (appearance of kernel, to assess its flavor, bitterness, astringency, texture, crispness and oiliness. Visual appearance of Kernel of walnuts was evaluated similarly by both groups of assessors. However, each group of assessors had quite different perceptions for tasting internal traits of the kernels. In the present study useful data of sensory characteristics of walnut fruits were obtained.

Keywords: Sensory evaluation, walnut, *Juglansregia L.*, storage temperature appearance of kernel, Peroxidase value a, Fungal cell.

Introduction

Walnuts edible nuts produced by walnut trees are well appreciated because they have many properties which became it importance in nutritional value enriched with unsaturated fat (linoleic, oleic acid). Vinson (2012)¹. They also contain other several beneficial components like plant protein (e.g. arginine, leucine), carbohydrates (e.g. dietary fiber), vitamins (e.g. vitamin A, E), important substances, minerals (magnesium, potassium, phosphorus, sulphur, copper, iron, plant sterols, phytochemicals (phenolic acids, flavonoids, etc.)². Especially pellicle substance a thin cover that surrounds kernel, was found as the most

important source of walnut phenolic, although it only represents 5% of the fruit weight³. Lipid oxidation is one important indicator for the walnut quality we can depend on in the evaluation of walnut that's mean when the quality of walnut deteriorate were the oil of it exposed to oxidation and its effect on changing in taste, flavor, odor has received a great deal of attention because its associations are undesirable for human health and it contributes to a decrease in the nutritional value of walnut. Lipid oxidation is well known as the main cause of quality deterioration during the processing or storage of lipid-rich food². The nut oil is used in several type meals of human consuming food, in the preparation of mayonnaises in salads and in several type of frying. However it is recommended not to use walnut oil in frying because high temperatures ought to make some toxic compounds and may lose its nutritional qualities of walnut. The oil-in- water (O/W) food emulsions are the basis of many food products walnut one of these product and their properties define food quality to a great extent. This study aims at determining the influence of various storage conditions on some properties in walnut (*Juglansregia L.*).

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Material & Method

Storage conditions for samples The samples of the walnuts (2000 g) used in this work were collected in September (2016-2017) from Tawella - Hawraman which located in –Kurdstanreiogn there are two according to (ACOC 2000) condition of storage at (4°C, 25°C after 18 months) at zero time also, walnuts are prepared for peroxidase value and acid value using standard method³, after extraction of oil by soxlet the testes walnut was evaluated for taste, rancidity, color, bitterness and flavor. Oil extraction was first step the oil of walnut was extracted after that determination of peroxidase value and H Value was determined. walnuts was preserved in 2-3 kg was and saved in a plastic Ziploc, kept in a fridge (4 °C) until used and another sample saved at room temperature at 25 °C, all tests of sensory evolution tests done in zero time also.

Chemical Analysis

Peroxide Value (PV).

Oil Extraction and Peroxide Analysis:

Extraction of oil is the first step in determination of Peroxidase and Acid value.

When free iodine released was titrated with a sodium thiosulfate solution until its yellow color disappeared. In this state, 0.5 ml starch solution (1% w/w) was added and titration was continued until the blue disappeared. The Peroxide value is expressed in mill equivalents of peroxide oxygen per kilogram of oil and calculated by the following equation:

$$\text{Peroxide value} = V \cdot N \cdot 1000 / W$$

Where: V is volume of applied sodium thiosulfate, N is the normality of thiosulfate and W is the oil weight. Peroxide value and Acid value was evaluated after, 4 °C and 25°C after 18 months also in zero time

Free fatty acid and acid value: This test is used as an index of freshness of walnut and quality of it, Acid value of fat is equal milligram of potassium hydroxide or sodium hydroxide required to neutralize 1gm of fat. A.V. is determined in one gram of fat samples of each treatments should be homogenized with 25 ml of absolute alcohol and 0.1 ml of phenolphthalein solution (%1) as an indicator and titrated to a pink end point (which persisted for 15 minutes) with 0.1N potassium hydroxide solution (KOH). Results were expressed

as gram of oleic acid/100 gm of fat according. Free fatty acid is the acid value was measured according to Modified (AOAC, 2000/940.28) Samples titrated with NaOH 0.1 N.

The FFA and Av was calculated according to the following formula (Eqs. 7 & 8)

$$\% \text{FFA as Oleic acid} = (\text{ml NaOH} \times \text{Normality}) / (\text{sample weight} / \text{g}) \times 100$$

$$\text{Acid value (mg KOH/G oil)} = \text{FFA} \times 1.99$$

Form for sensory evaluation:

Experimental design and statistical analysis:

The data were statistically analyzed using (ANOVA) test

$$\text{Iodine value (mg}^{-100}\text{g)}$$

The iodine value is the important method which indicated quality and stability of walnut during storage means after a period of storage in two difference temperature it is define as a number of grams of iodine absorbed per 100 gram of the fat. Iodine value of the walnut kernels from experiment no. The experiment was determined according to Wij's method³. Wij's Iodine value was performed by Hannus method, according to STAS 145/19-67. The iodine value was calculated by subtracting the sample titre value from the blank titre values as per the given formula:

Iodine Value

$$= (\text{Blank titre} - \text{sample titre} \times \text{Normality of Na}_2\text{S}_2\text{O}_3 \times 12.69 \text{ (mg}^{-100}\text{)}) / \text{Weight of sample (g)}$$

Mechanical drying of kernel walnut at 40 and 45°C: Mechanical drying of whole walnuts was carried out in a cabinet dryer using hot air as drying medium. The dryer had the facility to regulate the air temperature (± 3 C). Two drying temperature.

Fungal Walnut content after storage and Drying in two different degrees: Walnut samples tested after storage and drying Fungal content for 18 months in two different temperature (4°C, 25 °C) to inspection of fungal cell which can grow or survive in storage walnut samples and observe these fungal cells ability to produce of Mycotoxins. after incubation samples in (Potato dextrose broth PDA) 20 g weight of each samples (shell, kernel) at 140 rpm, 28 °C for 48 hours

after making spore suspension of each samples after that inoculating 5µl of each samples on PDA Potato dextrose agar in striking method and incubated them in incubator for 7 days at 28 °C Result and Discussion:

Walnut oil is unstable during storage and exposed to some changing in physical and chemical properties this reason due to of its rich in mono and polyunsaturated acids. It is important to know the factors which determine its quality .Oil stability and quality depends on its chemical composition, one of the most important especially the content of unsaturated fatty acids, as well as the managing storage condition. During storage there are various physical, chemical and enzymatic changes that influence the quality of the walnut oil ⁴.

The results showed that the described model for peroxide index, weight loss, and color, sensory evaluation is significant (p < 0.001), so that increase of temperature causes the peroxide value, color, and weight loss to increase and it reduces the overall acceptability

of walnut kernels. increase and resulted in lower overall acceptability of the walnuts. Storage condition caused the peroxide value to decrease, but did not significantly affect other indices (p ≥ 0.05). Mold and yeast were not significantly found in any samples. walnuts include and temperature of 4 °C,25 °C.

Primary oxidative rancidity is a good indicator for the rancidity of walnut it defined as milli-equivalents of peroxide per kilo gram of oils (Buransompob et al,2003) there was no detection of peroxidase value for walnut during both condition of storage (4°C,25°C) it was in standard range due to the amount of antioxidant which available in walnuts poly –phenol,low temperature and absence of oxygen are another reason cause to remain oxidation in the standard range ⁵ mentioned that amount of tocopherol to USFA are important factors to oxidation of oil .On the study of ⁶ found conceders that strong temperature has more influence on oxidation than oxygen .

Sensory evaluation form:

Table (1): Sensory evaluation of Hawraman walnut in shell and kernel before and after storage for 18 months.

No.	Color 20	Taste 40 Mark			Texture 20 Mark			Odor & Flavor or Off Flavor	Total Score
		Sweetness	Bitterness	Assurgency	Chewing	Crispy	Oiliness		
1									

Table (1) Show sensory evolution of walnuts (Hawraman walnut (Kernel, shell+ kernel) of walnuts in (zero time, after 18 months of storage in both different temperature (4°C,25°C). This form for evaluating the properties of walnut after 18 months of storage in two difference temperature (4°C,25°C)

Means of 10 panelists Standard Error: 8.199.

* Means having the same letter in the same section are not significantly different at *p*>0.05 .

Table (2) illustrated the sensory evolution of walnut from Hawramman (Shell+kernel and kernel) before and after storage for both condition of storage the walnut kept good quality properties before storage in two temperature of storage after 18 months there were significant differences between both condition of storage

. Both of method kept quality properties, however their qualities reduced during 18 months of storage. There is some factors which affected of the very little difference among them before and after storage period due to the some reasons, first reason: high anti –oxidant capacity of walnut, second reason is low temperature of storage,last reason is lack of light in storage condition. Generally, Kernel color of walnuts have best quality properties there is no significant change than the whole walnut quality after storage they have beast quality in period of storage under both condition of temperature (4°C & 25°C) have best properties (Christopoulos and Tsantili, 2012) considered that respiration of kernel walnut is higher that in shell walnut at cool temperature shell is another protector for the walnuts is prevent the browning of kernel.

Table 2. Fisher (LSD) / Analysis of the differences between groups with a confidence range of 95.00 %:

Color	Taste	Texture	Flavor
18.1	35.3	16.6	17.1
16.2	34.9	16.2	14.3
18.1	35.3	16.6	17.1
15.4	34.1	15.6	15.7

LSD 1.62, * Means having the same letter in the same section are not significantly different at $p > 0.05$

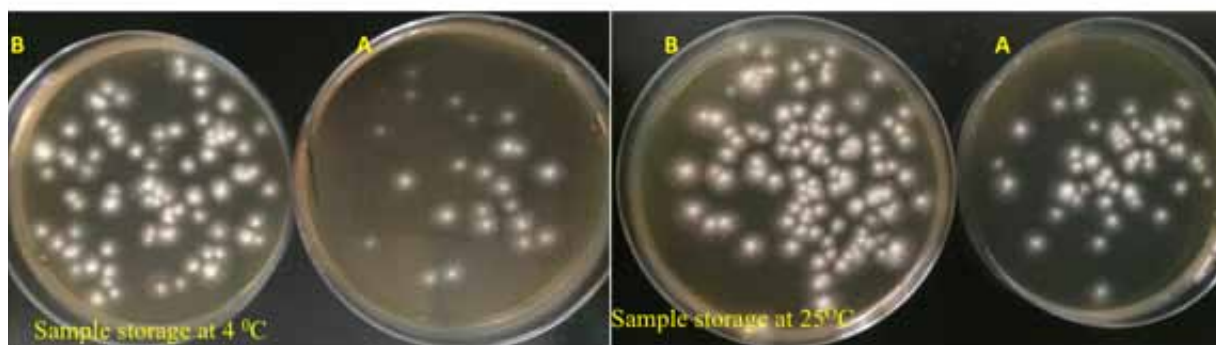
Changes in PV at 6 months of storage at +20oC - 22°C are shown in Figure 3.: After 18 months of storage, the walnut oil peroxide index values in temperature 4°C have raised more, as compared with the values registered in the 25°C.

The FFA (free fatty acid) is the common test usually judged for the Hydrolytic rancidity which it is caused by rancidity of walnuts

Iodine Value: The possible for development of and off-flavor in walnut products high in lipids is a function of the level of available unsaturated fatty acids. With a period of storage, degree of unsaturation in fatty acids

decline as a result of autoxidation. Therefore, a measure of unsaturation was a good indicator of probable to develop rancidity in walnuts. Therefore, an experiment to study influence of drying method, drying and storage conditions on iodine value was taken up in the present investigation. There was significant influence of drying administrations on mean iodine value of walnut samples. Drying method are aimed to relieve factors that may increase rancidity during storage. However, in the study their influence on degree of unsaturation in fatty acids appears to be limited. This is due to inferior levels of fatty acids available in the initial stages under drying and storage under two different degree of temperature.

Figure(1) Fungal cell content after storage at two different temperature (4 ,25 °C) after 18 months



A: after storage
B: before storage

Microbial content after drying and storage for 18 months: After storage for 18 months there were tested power plate method technique used after incubation samples (Shell +kernel and kernel)in PDB (Potato

dextrose broth) put samples in flasks and incubation them for 72 hours at 28°C at 150 rpm .after growth of Fungal cell I ml of liquid poured on PDA(Potato dextrose Agar or PDA Sabaroud dextrose agar) used striking

method Technique for power plating after that incubated at 28°C for 7 days in incubator next step inspection of plates to observe growths of colony on PDA agar. after inoculating fungal cell suspension 10^4 cell on Sabaroud dextrose agar and incubation for 5 days .this method is agree with (Tooraj Mehdizadeh et., al 2019).In Table (4) shows the effect of 18 months of storage at 4°C on the levels and mold and counts in the experimental Walnuts.

The mold counts in the walnuts ranged from 96×10 to 102×10 CFU. After 18 months of storage at 4°C, Storing Walnuts at a low temperature (refrigeration) reduces fungal cell growth levels and mold counts for 18 months. 18 months of storage at 4°C and could not be considered safe from any fungal growth although it better than storage at 25°C

Table (4): Fungal cell content after storage in two different temperature (4°C, 25°C) after 18 months of storage

Storage at 4°C 10 ⁴ Before After	Storage at 4°C 10 ⁵ Before After	Storage at 25°C 10 ⁴ Before After	Storage at 25°C 10 ⁵ Before After
111×10 ⁴ 110×10 ⁴	114×10 ⁵ 96×10 ⁵	102×10 ⁴ 98×10 ⁴	122×10 ⁵ 102×10 ⁵
138×10 ⁴ 126×10 ⁴	107×10 ⁵ 95×10 ⁵	109×10 ⁴ 96×10 ⁴	118×10 ⁵ 104×10 ⁵

This finding is in line with the results obtained by Amnah M.A, Alsuhaibani 2018., who reported that the length of storage time of nuts significantly affects the walnut properties .The results of the present study can be used to guide and educate consumers on the risks associated with nut consumption should they become contaminated. Based on this evaluation of fungal growth levels and mold and yeast counts, nut quality depends on both the storage period (3 or 6 months) and the temperature at which they are stored. The rates of aflatoxin contamination in different nuts should not be neglected. This study indicated that there is considerable variation in the change in properties which tested in this study including color taste appearance crispy, stringency and bitterness of the (shell+ kernel and kernel). This study showed that storing nuts at low temperature (refrigeration) can be beneficial for reducing the presence of the mold and yeast counts for 18 months, allowing the total aflatoxin levels in the samples to remain below the permissible limits of the EU, Iranian and Australian/ New Zealand food standard codes, which have set a maximum aflatoxin limit of 15 µg/kg for nuts.

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Conflict of Interest: None to declare.

Ethical Clearance: All experimental protocols were approved under the Department of Food science & Quality control College of Agriculture, University of Sulaimani, Kurdistan Region, Iraq, Iraq and all

experiments were carried out in accordance with approved guidelines.

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