
# Evaluation of the active ingredients of green walnut husks in prolonging the shelf life of table cream compared to artificial antioxidants

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## Abstract

The study was conducted in the laboratories of the Department of Food Sciences at the College of Agriculture and Forestry, University of Mosul - with the aim of using green walnut husk extracts to prolong the shelf life of table cream, with addition rates (zero, 100 ppm, 200 ppm) in addition to comparison with the industrial antioxidant BHT (Butylated hydroxytoluene). with an addition rate (100-200 ppm) and a comparison sample without addition. Refrigerated storage of cream at 5 ± 1°C for a storage period of (1, 7, 14) days. The results of extracts from green walnut husks to cream stored in cold storage at addition rates of 100 and 200 ppm improved the chemical properties of the cream as it reduced the peroxide number and acidity number. This effect increased with the increase in the added concentration compared to the standard sample and the sample to which BHT was added. Adding green walnut husk extracts in the proportions mentioned previously limited the activity of total microorganisms and lipolytic and proteolytic bacteria in the cream during the storage period compared with the samples to which BHT was added and the standard sample. The best sensory evaluation was obtained for samples to which green walnut husk extracts were added during refrigerated storage compared to the standard sample and the sample to which they were added.

Keywords: walnut husks, antioxidants, table cream, sensory evaluation, peroxide number.
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## Introduction

Plants are rich resources of bioactive phenolic substances. They can be used in various fields such as antioxidants, antimicrobials, anti-inflammatories, antitumor, antivirals, painkillers, and antipyretics [1]. Due to the importance of phenolic compounds and their good effect on human health, many researches have been conducted so far in order to manufacture various compounds from natural compounds and use them as natural preservatives [2].

Walnuts are grown mainly for their fruits and wood to a lesser degree; other parts (hard shell, green husk) are produced as waste. The main products of walnuts are fruits with husks and cores because of their nutritional value [3]. However, green walnut peel is also an important part of the fruit due to its high content of phenolic compounds. Walnuts are large deciduous trees belonging to the family Juglandaceae, and are arguably native to some countries of the Balkan Peninsula and Central Asia [4] The green husk is a fleshy outermost layer surrounding the walnut husk [5]. Crusts are therefore produced in large quantities, and their poor disposal leads to pollution of the environment. However, they are a natural source of bioactive compounds, which can be used for a variety of purposes [6].

Synthetic antioxidants are widely used in the food industry, because they give better results as an antioxidant and their prices are low. Synthetic antioxidants inhibit oxidation, maintain food stability, and prolong the shelf life of foods. However, excessive and improper addition of synthetic antioxidants can harm human health. Several synthetic antioxidants that are widely used in food include Butylated hydroxyanisole (BHA), Butylated hydroxytoluene (BHT) and Tert-Butylhydroquinone (TBHQ) [7].

Cream is an important product for dairy, and it is a traditional but luxurious product that is still quite fine. It is easily used in many forms and for a variety of purposes. For example, it is a raw material for making table butter and for preparing margarine(Ghee), or free fat. It is also used as an ingredient in sweet and savory dishes, such as creamy ice creams, custard soups and cakes. Cream is a concentrated emulsifier of milk fat globules found in skimmed milk, separated from milk either by gravity or by centrifugal force [8].

## Materials and Methods

### Walnut husks:

Walnut husks were obtained from Dohuk forests and the husks were dried at a temperature of 50c for 24 hours and the husks were ground to the required smoothness (40-60 mesh) and then stored in closed bags and kept on freezing -18m until chemical analyzes were carried out on them.

### Cream:

The cream was obtained using cow's milk and the milk was sorted to obtain the cream and the fat percentage was from 22-26%. The milk was sorted by the sorting method using a laboratory sorter.

Phenolic extracts were added to the resulting cream by the method of sorting and according to the coefficients.

### Preparation of the extract for the husks of green walnuts:

The extraction process was carried out according to the method described by [9] using methanol and a sonication water bath device.

Prepare a solution of plant extract by dissolving 1 g of the extract into a beaker of 100 ml and completing it to the mark of 100 and preparing concentrations of 100 and 200 parts per million

- First Treatment: Standard Sample Control Sample Without Addition.
- The second treatment: Adding green walnut peel extracts, the percentage of addition is 100 and 200 parts per million.
- Fourth treatment: Adding industrial antioxidants (BHT), the ratio of addition is 100 and 200 parts per million.

The cream was stored at refrigerator temperature for 14days until chemical,

bacteriological and sensory tests were carried out.

**Chemical Analysis:**

1. Estimation of the pyroxide number (pov): The pyroxide number was estimated according to the method mentioned in[10] by dissolving 5 g of cream in 30 ml of solvent (60%acetic acid and 40%chloroform)), then adding 0.5 ml of saturated potassium iodide solution, mixing the mixture well and after two minutes, adding with continuous stirring 30 ml of distilled water and 0.5 ml of starch solution, concentrate 1%, and swabbing the form with 0.01 standard of sodium thiosulfate solution, with severe shaking during the swabbing process. The pyroxide number was calculated based on the number of ml equivalent of sodium thiosulfate per 1000g fat:

$$\text{Peroxide values (ml caffeine/ kg fat)} = \frac{\text{Number of milliliters of sodium thiosulfate x titer of sodium thiosulfate}}{\text{Fat Weight (g)}} \times 1000$$

2. Measurement of fat pH (adv) Acid Degree Value: The level of free fatty acids was expressed as free fatty acids released by the hydrolysis of fat by the method of Frankel and [11]. 25g of the cream sample was added to a test tube containing 5 ml of ethyl alcohol with a concentration of 95% Equivalent. The tube was sealed by a sealer lined with PTFE and severely shaken for one minute, then added to it 7.5 ml of a mixture of 40% ethyl ether and 60% oil effect and again shaken for one minute. The tube offered a centrifuge of 1500cycles per minute for three minutes using a centrifuge. Then 5ml of the upper ether layer was withdrawn and added to a beaker containing 15ml of ethyl alcohol 95% containing five drops from 1% of the equivalent Phenofthyl alcohol to the pink color. Then the tube was flushed with PBOX 0.025 and the pH was calculated:

$$\text{Lipid pH (adv)} = \frac{\text{Base size consumed in debugging with sample – Base size consumed in debugging with plaque) x Standard}}{\text{sample Weight (g)}} \times 100$$

**Microbial measurements:**

**1. Total bacterial count**

Using Nutrient Agar, the numbers of colony-forming bacteria per ml of cream were calculated. The dilution tubing method was used, where 1 mL of diluted sample is transferred to a sterile petri dish by repeating each dilution, then 10-15 mL of dissolved medium is cooled to a temperature of 44-46°C. On each dish, the dish was poured in a circular motion several times to ensure that the sample was homogeneous with the medium and the dishes were left until the medium hardened, then they were incubated upside down in the incubator at a temperature of 37 ° C for 48 hours. After the incubation period, the total number of each repetition of the sample was calculated, and the number of colonies was extracted and multiplied by the dilution inverse to calculate the total number of bacteria in 1 ml of the sample and record the result in a unit (cell / 1 ml [12]

**2. Lipolytic bacterial count:**

Oil agar medium (5% olive oil + Nutrient agar) is used to pollinate the medium and then incubate it with a degree of (30c) for a period of (3 days). The positive result appears after adding drops of a saturated solution of copper sulfate on the developing colonies and leaving it for about (10 minutes) and then washing it with water to remove the excess solution. The decomposition of the fat appears as a bluish-green area as a result of the formation of unsoluble copper salts of fatty acids formed from the decomposition of the fat. Tween 80 [12] can also be used.

**3. Number of microorganisms analyzed for casein:**

Milk agar medium (30% milk + Nutrient agar) is used to pollinate the medium and then incubate it with a degree of (30c) for a period of (5 days). The positive result appears as a transparent area around the developing colonies.

**Sensory evaluation: Evaluation by a number of department teachers of food science according to the method described by [13].**

**Results and Discussion**

The peroxide value: Dietary rancidity is defined as food spoilage due to the oxidation of fats, especially unsaturated fatty acids, resulting in the formation of unpleasant flavors, odors, and harmful compounds. This process is characterized by the breakdown of fats and oils into fatty acids and other oxidizing products that are responsible for the negative effect of rancidity [14]. Fat oxidation can occur during manufacturing processes and storage [15]. The main effects of fat oxidation on food are changes in color and texture and the appearance of a rotten taste and smell, which reduces shelf life and causes consumer rejection [16]. Furthermore, fat oxidation and rancidity are problematic in the food industry, as they are directly responsible for increasing food waste and economic losses [17]. A wide range of antioxidants are used to prevent food spoiling, which can be synthetic or natural [16]. Walnut greens have a very high antioxidant and polyphenol content Juglone, the most important phenolic compound in dandruff, is. Juglone derivatives are also present and it is an antioxidant compound that is essential in walnut husks [6].

Tables (1) and (2) indicate the change in the pov value of the cream samples in the standard sample and the added cream to which the extracts of green walnut husks 100 parts per million and the other treatment 200 parts per million and the added cream with industrial antioxidants BHT at a concentration of 100 parts per million and 200 parts per million during storage at a refrigerator temperature of 5±1 ° C for 14 days. It was noted from the results that there were no differences in the initial pov values for all treatments immediately after manufacture, which amounted to 5.0 mm equivalent /1 kg cream. This value conforms to the Iraqi specification for cream (2005), which states that the pov value should not exceed 10 mm equivalent/1kg cream. After 7 days of

storage at a refrigerator temperature of 5ºC, there was a clear increase in the pov value in the standard treatment cream (20.33 mEq/1kg cream), but we note an increase in the peroxide value in the green walnut husk sample (8.10 mEq /1kg cream) during the first week within the standard limits of the Iraqi specifications and industrial antioxidants BHT. The value was (9.27 mEq/1kg cream) within the standard specifications. On the 14th day, the value of peroxide rose to 38.10 mEq/1kg cream for the standard sample, and this is unacceptable; because it is higher than the limits of the standard specifications. The samples of green walnut husks were 11.77 mEq/1 kg cream, which was also higher than the standard specifications. As for the samples added to BHT, they increased too much and exceeded the permissible limits of the standard specifications. As we can see from Table (1), there was an increase in the value of peroxide for the standard sample with an increase in the duration of storage. This is due to the non-addition of any antioxidant, while the addition of natural extracts exceeded the industrial antioxidant when using the same concentrations. It is also noted that the change in the peroxide number decreases with the increased concentration of added extracts. We note from Table (2) that the coefficients of green walnut husks were resistant to the development of the peroxide number, and this indicates something about the high value of phenolic compounds and antioxidants for extracts**.**

Table (1) : The effect of green walnut husk extracts and BHT on the peroxide number mEq $O_2$/kg fat of the cream stored refrigerated for 14 days and the concentration of 100 parts per million .

| Treatments | Periods (Day) | | |
|---|---|---|---|
| | 1 day | 7 days | 14 days |
| Comparison Sample | 0.46 ± 5.45 A | 0.36 ± 20.33 A | A 0.46 ± 38.10 |
| Green walnut husks | 0.46 ± 5.45 A | 0.52 ± 8.10 B | 0.27 ± 11.77 C |
| BHT | 0.46 ± 5.45 A | 0.20 ± 9.27 B | 0.36 ± 23.17 B |

Horizontally different letters for each column indicate significant differences at a probability level ($a \leq 0.05$).

Table (2) The effect of walnut husk extracts and BHT on the number of peroxide mEq $O_2$/kg fat for cold-stored cream for 14 days and the concentration of 200 ppm

| Treatments | Periods (Day) | | |
|---|---|---|---|
| | 1 day | 7 days | 14 days |
| Comparison Sample | 0.67 ± 5.53 A | 0.72 ± 19.23 A | A 1.13 ± 28.57 |
| Green walnut husks | 0.67 ± 5.53 A | 0.31 ± 6.90 B | 0.41 ± 9.70 B |
| BHT | 0.67 ± 5.53 A | 0.28 ± 9.07 B | 0.73 ± 18.67 A |

**Measuring fat pH (Acid degree value):**

This method is one of the common methods of fat acidity adv One of the very sensitive methods in estimating the volatile free fatty acids Acids Fatty Free Chain Short (FFA) resulting from the hydrolysis of milk fat by the lipase enzyme naturally present in milk, or cold-loving bacteria lipases, which are responsible for the rancid flavor in milk and its products, such as cream, butter, and cheese. Therefore, we use plant extracts to obtain natural preservatives that are harmless to health and have a preserving effect on products.

Therefore, this method was used to estimate the pH of cream fat, determine the degree of acceptance by the consumer and be in conformity with the specifications and reject them when they do not conform to the specifications, and the standard specifications should not exceed 2 mEq per 100g of fat and reject the sample if the value is greater than that. We note in the standard sample that the acidity was within the permissible limits in both treatments, and we note on the seventh day that the acidity increased, but it was within the permissible limits, and that the development of acidity is due to the absence of any antihistamines that prevent the enzyme lipase and the link to fat and increase the acidity number, and that the high acidity is due to the decomposition of short-chain fatty acids and caproids .

As for the treatments to which plant extracts were added, we note that they were resistant to high acidity, which is evidence of the ability of these extracts to inhibit the enzyme lipase and when it reaches the fat, so rancidity does not occur. As for BHT, its addition did not inhibit the enzyme lipase, as it is only an antioxidant, not an inhibitor of microorganisms, unlike extracts, as it is an inhibitor of microorganisms as well as an inhibitor of the enzyme lipase, so the percentage of the enzyme lipase increased and the acidity rose and rose above the prescribed limits, and therefore the samples are rejected.

Table (3) The effect of green walnut husk extracts and BHT on the pH of 100 ppm.

| Treatments | Periods (Day) | | |
|---|---|---|---|
| | 1 day | 7 days | 14 days |
| Comparison Sample | 0.63A ± 0.09 | 1.60A ± 0.06 | 2.47A 12 |
| Green walnut husks | 0.63A ± 0.09 | 0.73B ± 0.09 | 1.53B ± 0.09 |
| BHT | 0.63A ± 0.09 | 1.43A ± 0.09 | 2.63A ± 0.09 |

Horizontally different letters for each column indicate significant differences at a probability level ($a \leq 0.05$).

Table (4) The effect of green walnut husk extracts and BHT on the pH of 200 ppm.

| Treatments | Periods (Day) | | |
|---|---|---|---|
| | 1 day | 7 days | 14 days |
| Comparison Sample | 0.63A ± 0.07 | 1.53a ± 0.03 | 2.50A ± 0.06 |
| Green walnut husks | 0.63A ± 0.07 | 0.67B ± 0.09 | 1.20b ± 0.06 |
| BHT | 0.63A ± 0.07 | 1.50A ± 0.06 | 2.40A ± 0.06 |

**Total Bacteria Count.**

Tables (5) and (6) show that the total numbers of bacteria in the cream treated with green walnut husk extracts and the BHT add 100 and 200 mg /ml and stored by Refrigerator for 14 days. The total number of bacteria is observed at the age of (2.73 x $10^4$) days, and this percentage rises in the comparison sample to reach (5.27 x $10^4$ and 6.88 x $10^4$) cells/ ml at the end of the storage period. While it was noted that the addition of green walnut husk extract in concentrations of 100 and 200 ppm decreased the numbers compared to the comparison sample 4.57 and 4.12 x10 $^4$ cells / ml, respectively. In general, these numbers include the allowed numbers within the Iraqi standard specifications, which determined the good quality of the cream to be about 1 × 10 $^4$ cells / ml, while the acceptable quality is 3× 10 $^4$ cells / ml. As for the coefficients for which BHT was added as an industrial antioxidant at concentrations (100 and 200 ppm), its effect on the growth of microorganisms was limited. This is in line with (Okur 2022). Adding green walnut extract to the curd product led to prolonging the shelf life, and improved the sensory qualities of the product. This was confirmed by [18]. Green walnut peels are rich in ascorbic acid and tannin gum, alkaloids, and gelatin inhibiting fungi and microorganisms.

[19] found that walnut husk extracts in Kajab had an effect in stopping the growth of microorganisms. [20] also noted that the use of walnut husks is important as a food additive as an antioxidant and preservative. Also [21] used walnut husk extract as a meat preservative.

Table (5 and 6) shows the microbial numbers of $2\times10^4$ cells/g cream samples, which are within the allowed microbial limits and according to the Iraqi standard specifications, and the good quality of the cream, as the total microbial number was determined by $1\times10^4$ cells / g for the good quality of the cream and $3\times10^4$ cells / g for the acceptable quality. We note from the table that the majority of the microbial types present at this temperature are of the psychrophilic type that grows at temperatures ranging from 0-27 m and Psychrotrophs, which grow at temperatures ranging from 0-45 m, including Pseudomonas (Because the cream is stored at the temperature of the refrigerator, the psychrophilic bacteria are likely to grow. We note from the comparison sample that the numbers rose during the first week and were higher than the acceptable numbers within the standard specifications. As for plant extracts, they neutralized the growth of total organisms, and thus we note that these extracts have an effect against the growth of bacteria and are also natural antioxidants.

Table(5) The total number of bacteria / g in the cream added to the extracts of walnut husks and BHT at a concentration of 100 parts per million

| Treatments | Total number of cells /g (100)parts | | |
|---|---|---|---|
| | Duration of storage day | | |
| | 1 | 7 | 14 |
| Comparison Sample | $2.37x10^4$ | $5.45x10^4$ | $6.45x10^4$ |
| Walnuts | $2.37x10^4$ | $4.83x10^4$ | $4.75x10^4$ |
| BHT | $2.37x10^4$ | $5.63x10^4$ | $5.17x10^4$ |

The table represents an average of/3 replicate

Table(6) The total number of bacteria cell / g in the cream added to the extracts of walnut husks and BHT at a concentration of 200 parts per million

| Treatments | Total number of cells /g (200parts) | | |
|---|---|---|---|
| | Duration of storage day | | |
| | 1 | 7 | 14 |
| Comparison Sample | $2.37x10^4$ | $6.88x10^4$ | $7.18x10^4$ |
| Walnuts | $2.37x10^4$ | $4.34x10^4$ | $4.12x10^4$ |
| BHT | $2.37x10^4$ | $6.1x10^4$ | $5.77x10^4$ |

**Lipolytic bacteria:**

It is noted from Tables No. (7) and (8) the effect of adding phenolic compounds extracted from green walnut husks in concentrations of 100 ppm and 200 ppm. The moral increase in the number of lipolytic bacteria for the comparison sample is noted during the refrigerated storage. The numbers were from $3\times 10^2$ cells / ml for concentrations 100 and 200 mg / ml. The numbers increase at the end of the storage period to reach ($5.86 \times 10^2$ and $6.42 \times 10^2$ cells / ml) respectively for concentrations 100 ppm and 200 ppm, respectively. The two tables also appear when adding phenolic extracts of green walnut husks and for both concentrations, as the numbers of lipolytic bacteria reach ($4.12\times 10^2$ and $3.5 \times 10^2$) cells / ml respectively. This decrease in the numbers of bacteria is due to the inhibitory effect of phenolic compounds on the growth of microorganisms through the destruction of the cell membrane. The results agreed [22]. It was also noted in the two tables that the addition of BHT at a concentration of (200 ppm) as an industrial antioxidant did not affect the inhibition of microorganisms.

[23] indicated that the use of extracts for walnut husks reduced the number of Staphylococcus aureus bacteria. (Yang et al., 2019) proved that the green husk extract has an effect on the bacteria (*Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus, Candida albicans*).

[22] proved that Juglone extract has an effect on Pseudomonas bacteria, as it works to break down the plasma cell membrane, and thus inhibit the growth of these bacteria. The lipolytic bacteria present in milk, cream and butter are important as defects in these products develop. It is assumed that rancidity is the most important of these disadvantages, although many lipolytic bacteria also attack non-fat milk components, there may be additional disadvantages. Relatively little attention has been paid to the numbers of lipolytic organisms in various dairy products, because the methods of identifying these organisms have not become as commonly used as the methods of

identifying lipolytic and acid-producing organisms. Loving bacteria may grow at 7°C even though their optimum temperature is higher. Rapid cooling and cold storage of cream helps to grow cold-loving bacteria. Common bacteria become during cold storage of cream, and their external enzymes, particularly protease and lipase, contribute to the damage of dairy products [24].

From the table, we note that the comparison sample increased the numbers of lipolytic bacteria from $3\times10^2$ to $6.42\times10^2$ on the fourteenth day. The reason is the absence and presence of a substance that inhibits the growth of these organisms, and that most of the cold-loving microorganisms are of the lipolytic type, and we note the high rate of bacterial cell / g. When using plant extracts, we note that the growth of walnut husk extract is stopped because it contains inhibitory substances for the growth of lipolytic microorganisms. As for BHT, we notice high bacterial growth and the reason is antioxidants and not an inhibitor of bacterial growth.

Table(7) Lipolytic bacteria cell / g in cream with nut husk extracts and BHT at a concentration of 100 parts per million

| Treatments | Lipolytic bacteria Cell /g (100ppm) | | |
|---|---|---|---|
| | Duration of storage day | | |
| | 1 | 7 | 14 |
| Comparison Sample | $3x10^2$ | $5.86x10^2$ | $6.42x10^2$ |
| Walnuts | $3x10^2$ | $4.75x10^2$ | $4.12x10^2$ |
| BHT | $3x10^2$ | $6.44x10^2$ | $6.11x10^2$ |

Table(8) Lipolytic bacteria Cell / g in cream with nut husk extracts and BHT at a concentration of 200 parts per million

| Treatments | Fat analyzer cell /g (200mg) | | |
|---|---|---|---|
| | Duration of storage day | | |
| | 1 | 7 | 14 |
| Comparison Sample | $3x10^2$ | $6.04x10^2$ | $6.34x10^2$ |
| Walnuts | $3x10^2$ | $4.21x10^2$ | $3.5x10^2$ |
| BHT | $3x10^2$ | $6.34x10^2$ | $5.64x10^2$ |

**Proteolytic bacteria:**

Tables (9) and (10) show the effect of adding phenolic compounds extracted from green walnut husks in ratios of 100 and 200 ppm. It is noted that the number of proteolytic bacteria and the control sample increases during cold storage, as the numbers rise from $2\times 10^2$ by the age of one day to reach ($8.36 \times 10^2$ and $9.36\times 10^2$) for concentrations of 100 mg / ml and 200 mg / ml, respectively. While the addition of phenolic extracts to the husks of green walnuts reached the numbers of proteolytic bacteria at the end of the storage period ($4.79x\ 10^2$ and $3.45\ x\ 10^2$) cells / ml, respectively. The addition of BHT in concentrations of 100 and 200 ppm and as an antioxidant did not affect the inhibition of microorganisms.

Table(9) Proteolytic bacteria cell / g in cream with nut husk extracts and BHT at a concentration of 100 parts per million

| Treatments | Protein analyzer cell /g (100) | | |
|---|---|---|---|
| | Duration of storage day | | |
| | 1 | 7 | 14 |
| Comparison Sample | $2x10^2$ | $7.86x10^2$ | $8.36x10^2$ |
| Walnuts | $2x10^2$ | $5.2x10^2$ | $4.79x10^2$ |
| BHT | $2x10^2$ | $7.2x10^2$ | $6.25x10^2$ |

Table(10) Proteolytic Bacteria Proteolytic Bacteria Cell / g in cream with nut husk extracts and BHT at a concentration of 200 ppm

| Treatments | Proteolytic Cell /g 200 ppm | | |
|---|---|---|---|
| | Duration of storage day | | |
| | 1 | 7 | 14 |
| Comparison Sample | $2x10^2$ | $8.92x10^2$ | $9.36x10^2$ |
| Walnuts | $2x10^2$ | $3.8x10^2$ | $3.45x10^2$ |
| BHT | $2x10^2$ | $7.2x10^2$ | $6.25x10^2$ |

**Sensory Assessment**

Table (11) indicates the sensory evaluation of the addition of plant extracts. The sensory characteristics of any dairy product depend heavily on the quality of the milk used. It is an important axiom in the dairy industry that materials or dairy products cannot be better than the milk they are made from. The quality of milk ingredients and cream is the most important for dairy products because it is the main material in the manufacture of most dairy products. It requires distinguishing milk and cream and dividing them into types (known as taxonomy) into the senses of smell, taste, and sight. Since milk (or cream) is the base material from which all dairy products are made, dairy producers, dairy manufacturers, distributors, and other dairy workers need to be aware of how different milk flavor defects affect the quality of processed The best evaluation of the walnut husk extract gave the best consumer acceptance, as it gave a value of 63 on day 14 compared to the standard sample and the industrial antioxidant, which gave a score of 51 for the standard sample and 57 for the BHT sample. Manufacturing staff should have the ability to detect unwanted flavors in milk and be able to assess or predict their impact on the flavor quality of ready-made dairy products [25]. I divided the sensory evaluation table into five characteristics, including taste and flavor given (45), texture (30), publish ability (10) and color (15). We note from Table (4-15) that the addition of extracts improved the sensory evaluation scores and the best was for oak extracts.

Table(4-19) Sensory evaluation of standard sample coefficients, green walnut husks, oak fruits and BHT.

| Comparison | Final Score | Colour 15 | Deployability 10 | Texture 30 | Taste and flavor 45 | Duration of storage (days) |
|---|---|---|---|---|---|---|
| | 91 | 14 | 9 | 28 | 40 | 1 |
| | 74 | 11 | 6 | 22 | 35 | 7 |
| | 51 | 6 | 5 | 20 | 20 | 14 |
| Walnuts | Final Score | Colour 15 | Deployability 10 | Texture 30 | Taste and flavor 45 | Duration of storage (days) |
| | 90 | 12 | 9 | 28 | 41 | 1 |
| | 76 | 11 | 7 | 23 | 35 | 7 |
| | 63 | 6 | 5 | 22 | 30 | 14 |
| BHT | Final Score | Colour 15 | Deployability 10 | Texture 30 | Taste and flavor 45 | Duration of storage (days) |
| | 89 | 12 | 9 | 28 | 40 | 1 |
| | 76 | 11 | 7 | 21 | 37 | 7 |
| | 57 | 6 | 6 | 20 | 25 | 14 |

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# تقييم المواد الفعالة لقشور الجوز الخضراء في إطالة العمر الخزني لقشدة المائدة مقارنة مع مضادات اكسدة صناعية

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- البحث مستل من اطروحة دكتوراه للباحث الاول.
- تاريخ استلام البحث2023/10/27 وتاريخ قبوله 2023/12/20 .

**الملخص**

اجريت الدراسة في مختبرات قسم علوم الاغذية في كلية الزراعة و الغابات جامعة الموصل – بهدف استخدام مستخلصات قشور الجوز الخضراء في اطالة حفظ قشدة المائدة وبنسب اضافة ( صفر ، 100 جزء بالمليون ، 200 جزء بالمليون ) بالإضافة الى المقارنة مع مانع الاكسدة الصناعي BHT (Butylated hydroxytoluene) وبنسبة اضافة ( 100– 200 جزء بالمليون) وعينة مقارنة بدون اضافة . الخزن المبرد للقشدة على درجة 5 ± 1 م ولمدة خزن ( 1 ، 7 ، 14) يوم. كانت نتائج مستخلصات من قشور الجوز الخضراء الى القشدة المخزنة بالتبريد وبنسب اضافة 100 و200 جزء بالمليون حسن من الصفات الكيماوية للقشدة اذ قلل من رقم البروكسيد ورقم الحموضة وزاد هذا التأثير بارتفاع نسبة التركيز المضاف مقارنة مع العينة القياسية والعينة المضاف لها BHT. اضافة مستخلصات قشور الجوز الخضراء بالنسب المذكورة سابقاً حد من نشاط الاحياء المجهرية الكلية والبكتريا المحللة للدهن والمحللة للبروتين في القشدة من خلال فترة الخزن مقارنة مع العينات المضاف لها BHT والعينة القياسية . تم الحصول على افضل تقييم حسي للعينات المضاف لها مستخلصات قشور الجوز الخضراء خلال الخزن المبرد مقارنة مع العينة القياسية والعينة المضاف لها.

**الكلمات المفتاحية:** قشور الجوز، مضادات اكسدة ، قشدة المائدة ، تقييم حسي ، رقم البيروكسيد.