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# Using of Gel Extracted From Flax Seeds to Preserve The Quality Characteristics of Ground Beef Patties Stored in The Freezer

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**Abstract**. The current study aimed to use flaxseed gel at concentrations of,0.5% ,0.10 % and 0.15 % each in preserving beef meat by freezing at a temperature of -18°C. The chemical composition of the gel and chemical tests were conducted that included the peroxide number, the percentage of free fatty acids, and microbial tests. Which included the total a count of bacteria and Psychrophilic bacteria. The results showed a significant decrease in the values of peroxide and free fatty acids for meat samples treated with all concentrations of flaxseed gel. Compared to the control treatment, which exceeded the standard limits after 30 days of preservation While the processed meat tablets remained within the limits of the standard specification for freeze preservation during 120 days of preservation.. A significant decrease ($p < 0.05$) was also observed in the numbers of total bacteria and psychrophilic bacteria when meat was treated with flaxseed gel of different concentrations compared to the control treatment. The T2 treatment may be superior in reducing the numbers of bacteria compared to the rest of the treatments. The fourth and third treatments were superior in terms of general acceptance compared to the control treatment after 4 months of freezing.

**Highlights**:

1. Preservation: Flaxseed gel effectively reduces peroxide, fatty acids, and bacteria.
2. Testing: Significant bacterial reduction observed with 0.15% concentration in frozen meat.
3. Results: Treated meat remains acceptable for 120 days, surpassing control quality.

**Keywords**: flax seeds, beef, anti microbial, beef freeze, , antioxidant.

## Introduction

Meat is of high nutritional value becauseeconsider a major source of balanced essential amino acids that the human body needs to build its tissues. It is also a major source of B complex vitamins and mineral elements, the most important of which is iron (1).Because of the biological nature and chemical of meat and its products, they are subject to damage during storage as a result of bacterial growth and fat oxidation, which are the main factors affecting the quality of reducing and food its vitality Fat oxidation

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leads to a deterioration in the flavor, texture and taste of meat and its displayed products, which leads to a short shelf life (2). Some studies have shown concern about the presence of carcinogenic compounds in synthetic preservativesThere is also a reason to prevent the growth of microorganisms in plants and use their extracts to preserve food (3).An example is flaxseed, which is classified as an important functional food due to its high content of fatty acids Alphalinolenic acid (ALA), dietary fiber, flax compounds lignans, flavonoids, phenol acids, and good quality protein. The seeds are distinguished from other grains and oilseeds by their rich content of vegetable gel or mucilage found in the outer layers of the seed. The gel returns to the part of the seed. Soluble dietary fiber (4). In recent years, natural additives of plant origin have been searched for because they possess both antioxidant and antimicrobial activity, which work to maintain the quality of meat and prevent economic loss (5). Therefore, the current study aimed to add some functional foods, such as flaxseed gel, to improve some of the characteristics of frozen preserved beef tablets and increase the storage period.

# Methods

Linumusitatissimum L. flax seeds were obtained from local markets in Basra The seeds were ground using an electric grinder fat removed, and the gel was extracted according to the method of (6) with boiling water at 100°C for 30 minutes Ratio(40:1) w/v Keep the gel in a box until use.

**The meat:**

Beef veal meat and fat were obtained from the animal field / University of Basra and placed in refrigerated and sterilized containers afterthe fat has been removed from the outer layer thatcovering the piece of meat, it was ground using an electric grinder.

The experimental parameters were divided as :

1. The first treatment as a control group without adding any extracts (T1).
2. The second treatment, add 0.5% flax seed gel (T2).
3. The third treatment, add 0.10% flax seed gel (T3).
4. The fourth treatment: add 0.15% flax seed gel (T4)

made tablets weighting 50 grams per tablet and kept them frozen at a temperature of -18°C. Measurements were taken every 30 days for a period of 4 months,

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and chemical and microbiological tests were conducted on the meat during the different preservation periods.

**Chemical tests:**

**Peroxide value**

According to (7) method, the peroxide number was determined and the equation:

$$\text{Peroxide value} = \frac{(Na_2S_3O_4 \text{ ml} \times C \times 1000)}{(\text{Wt.of Sample, gm})}$$

**Free Fatty Acids (FFA)**

(FFA) were estimated based on the method of ( 8) and according to the equation:

$$(\text{FFA}) \ \% = \frac{\text{Titration } (M-N) \times C \times 282 \times 100}{1000 \times \text{Wt of Sample, gm}}$$

M = number of milliliters of KOH swabbed with the fat or oil sample.

N = number of milliliters of KOH swabbed with the plank sample.

282 = molecular weight of oleic acid

**Microbiological tests**

Samples of meat were taken and a bacteriological tests were conducted on it, which included the the numbers of psychrophilic bacteria and total bacterial count (TPC)

**Sensory tests**

By cutting the meat discs into small pieces from each treatment, approximately 3 cm3,Sensory evaluation of the samples was conducted by a number of experts in this field to evaluate the samples based on colour, tenderness, flavour, overall and juiciness acceptability. acceptability) according to the 9-point grading scale (Form 1), and according to the method of (9).

(Form 1)

**Sensory assessment form**

| Evaluation | degree | Evaluation | degree |
|---|---|---|---|
| Prominent | **9** | medium | **6-5** |
| very good | **8** | popular | **4-3** |
| good | **7** | unacceptable | **2-1** |

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| Sensory qualities | | | | | |
|---|---|---|---|---|---|
| **general admissio** | **Juiciness** | **Tenderness** | **Flavor** | **the color** | **Sample number** |

**Statistical analysis**

A three-factor factorial experiment with a completely randomised design (CRD) was used to statistically analyse the findings. The pre-made statistical software SPSS was used to statistically analyse the data (10). The adjusted least significant difference (R.L.S.D.) was used to compare the outcomes at a 0.05 probability level

# Result and Discussion

Chemical composition of flaxseed gel

The results are shown in Table (1) of the chemical composition of flaxseed gel, as the average moisture content reached 9.6%, protein 10.31%, fat 0.38%, and ash 13.48%, respectively, for flaxseed gel extracted using the boiling water method. This was obtained by ( 11) Almost the same results were obtained when measuring the chemical composition of flax seeds using different methods.

Table (1).Chemical composition of flaxseed gel (%)

| Flax seed gel | Chemical composition % flax seed gel |
|---|---|
| 9.6 | Moistue |
| 10.31 | Protein |
| 0.38 | Fat |
| 3.48 | Ash |

**Peroxide pv**

In the table (2) it is shown the effect of adding flaxseed gel on the (pv) value in meat samples treated and preserved by freeze. Based on the results shown in the table,

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it is notedthat the (pv) has significantly decreased of meat patties treated with plant extracts with increasing freeze storage periods compared to the control sample, which had an average peroxide number value of (7.94) mcf/kg fat At the end of the fourth month, it had exceeded the limits of the standard specification, while the meat samples treated with plant extracts maintained within the permissible limits, as the averages reached (2.59) and (2.53) at treatments T2 and T3,respectively

These results are encouraging for the use of flaxseed gel in preserving meat because of its ability to slow down the occurrence of oxidative rancidity in meat preserved by freezing because it contains antioxidant compounds as a result of the components that the gel contains that possess antioxidant properties, including phenolic compounds and flavonoids) 12).From the results in Table (2), we also note that treatment T2 and T3 were significantly superior in reducing peroxide values compared to the remaining treatments, through the average peroxide number, which reached 2.44 and 2.36 in meat samples treated with flex seed gel extract, respectively.

Table No. (2). The effect of adding flaxseed gel on the peroxide number in freeze-preserved meat patties (mcf/kg fat)

| Average | Storage periods/month | | | | Transactions |
|---|---|---|---|---|---|
| | 4 | 3 | 2 | 1 | |
| 4.88 | 7.94 | 5.88 | 3.39 | 2.31 | T1 |
| 2.44 | 2.59 | 2.57 | 2.34 | 2.23 | T2 |
| 2.36 | 2.53 | 2.48 | 2.29 | 2.26 | T3 |
| 2.48 | 2.65 | 2.58 | 2.41 | 2.28 | T4 |
| 2.43 | 2.57 | 2.53 | 2.34 | 2.29 | Average |

R.L.S.D of transactions 0.53

R.L.S.D for storage periods 0.48

**Free fatty acids:**

In the Table(3)we notice The proportion of FFA in meat treated has significantly decreased ($p < 0.05$), according to the data .with flaxseed gelatin extract compared to the control sample with increased freeze preservation periods .The average percentage of free fatty acids in the control sample reached 1.76 at the end of the fourth month, exceeding the standard specification limits. In contrast, the average percentage of free fatty acids in meat patties treated with concentrations of 5, 10, and 15% reached 0.67.

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(0.57)(0.58)%, respectively, and as a result, it has continued to exist within the allowed ranges .Hydrolytic rancidity was delayed as a result of the gel treatments. The reason for this is attributed to it being a source of chemical compounds that have the ability to limit microbial growth, such as flavonoids and phenolic compounds . Thus, it limits the growth of bacteria that secrete the enzyme lipase, which works to cause hydrolytic rancidity (13 ). The results of the table also showed the superiority of treatments with flaxseed gel in reducing the FFA value for all storage periods. The results also showed a decrease in the percentage of FFA in meat patties made from beef for all treatments.

Table No. (3) The effect of adding flaxseed gel on the percentage of free fatty acids in freeze-preserved meat patties.

| Average | Storage periods/month | | | | Transactions |
|---|---|---|---|---|---|
| | 4 | 3 | 2 | 1 | |
| 0.77 | 1.76 | 0.97 | 0.69 | 0.45 | T1 |
| 0.48 | 0.58 | 0.57 | 0.41 | 0.36 | T2 |
| 0.41 | 0.57 | 0.51 | 0.31 | 0.26 | T3 |
| 0.51 | 0.67 | 0.59 | 0.44 | 0.34 | T4 |
| 0.46 | 0.60 | 0.55 | 0.38 | 0.32 | Average |

R.L.S.D of coefficients = 0.052

R.L.S.D for storage periods = 0.036

**Total a count of bacteria**

It is noted from Table (4) that there is a significant decrease ($p<0.05$) in the numbers of thermophiles bacteria when treating meat with different flaxseed gel extracts compared to the control treatment, in which the average number of bacteria reached 79.33 x 104*cfu/g at the fourth month. The flax seed gel extract excelled in reducing the total number of bacteria in the second, third, and fourth treatments to (42.73, 38.71, 43.69) $4^{x}10$cfu/g, respectively, at the fourth month of storage. The reason for a decrease in the total a count of bacteria in meat treated with flaxseed gel extracts is attributed to its content of active compounds such as resins, saponins, and flavonoids (14). According to these results, the manufacture of minced meat tablets is considered encouraging if depends on them

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Table No. (4) The effect of adding flaxseed gel on the total a count of bacteria in freeze-preserved meat discs (c f u/ g 10^4)

| Average | Storage periods/month | | | | Transactions |
|---|---|---|---|---|---|
| | 4 | 3 | 2 | 1 | |
| 76.82 | 79.33 | 75.67 | 77.00 | 77.33 | T1 |
| 46.13 | 43.69 | 45.45 | 46.67 | 48.71 | T2 |
| 40.43 | 38.71 | 37.67 | 37.65 | 47.69 | T3 |
| 45.58 | 42.73 | 42.33 | 47.53 | 49.73 | T4 |
| 44.04 | 41.71 | 41.81 | 43.95 | 48.71 | Average |

R.L.S.D. for Transactions 22.06

R.L.S.D for extracts = 20.18

R.LS.D for storage periods = 21.19

**Psychrophilic bacteria**

Table (5) shows a significant decrease ($p<0.05$) in the numbers of Psychrophilic bacteria for all treatments treated with flax seed gel extract compared to the first treatment control . The average a count of Psychrophilic bacteria reached 71.27x10^4cfu/g while treating meat with flaxseed gel extract led to reducing the number of bacteria to 25.63 and 25.56 and25.61 x104cfu/g at the end of the fourth month of freeze preservation, respectively. The third treatment was superior in reducing the number of psychrophilic bacteria to 43.68 x 410 cfu/g, followed in terms of moral effect by fourth treatment , where the average a count of bacteria reached 43.68 x 104cfu/g, and the cause is that the plants contain active compounds such as phenols, alkaloids, resins, and glycosides .This result deals with ( 15), where it was found that the total a count of psychrophilic bacteria decreased in beef patties and camel meat add of extracts seed flax frozen storage 6 months .

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Table No. (5) The effect of adding flaxseed gel on Psychroplilic bacteria in freeze-preserved meat patties (sfu /g10x)

| Average | Storage periods/month | | | | Transactions |
|---|---|---|---|---|---|
| | 4 | 3 | 2 | 1 | |
| 71.27 | 75.90 | 68.87 | 67.72 | 72.61 | T1 |
| 49.23 | 25.63 | 48.59 | 59.48 | 63.25 | T2 |
| 43.68 | 25.56 | 39.53 | 53.39 | 56.25 | T3 |
| 46.20 | 25.61 | 39.58 | 58.39 | 61.25 | T4 |
| 46.37 | 25.6 | 42.56 | 57.08 | 60.25 | Average |

R.L.S.D. for Transactions 16.13

R.L.S.D. for Extracts 14.51

R.L.S.D for storage periods 21.22

**General acceptance status**

It is clear from Table (6) that there is a significant improvement at the level ($p<0.05$) for the meat samples treated with flaxseed plant extracts, as they obtained a grade of (good).When evaluating the general acceptability of meat tablets, they reached 6.67, 7.00, and 7.11, respectively, compared to the first treatment, which was 5.00 in the fourth month of the storage periodas for the effect of the type of treatment on general acceptance, the third treatment excelled in raising the general acceptance evaluation scores, reaching 7.33 compared to the rest of the treatments, where the average scores reached 7.25 and 7.08, respectively.As for the effect of storage durations on general acceptance, it was observed that there was a significant decrease ($p<0.05$) in general acceptance scores with increasing storage durations and all the parameters of minced meat tablets with continued freezing storage.The reason for this may be due to the decrease in other sensory characteristics of the tablets, such as color, flavour, freshness and juiciness.

The general acceptance characteristic is considered the final result of these characteristics. For example, the decrease in the flavor of the tablets when stored by freeze the result of the decomposition and oxidation processes of fats was reflected in

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the decrease in the general acceptability characteristic, in addition to the decrease in the characteristics of freshness and juiciness, which affected the evaluation of the general acceptance characteristic (16).

Table No. (6). The effect of adding flaxseed gel on the general acceptance of freeze-preserved meat patties

| Average | Storage periods (months) | | | | Transactions |
|---|---|---|---|---|---|
| | 4 | 3 | 2 | 1 | |
| 6.08 | 5.00 | 5.67 | 6.67 | 7.00 | T1 |
| 7.08 | 6.67 | 7.00 | 7.67 | 7.00 | T2 |
| 7.25 | 7.00 | 7.00 | 7.67 | 7.33 | T3 |
| 7.33 | 7.11 | 7.33 | 7.33 | 7.22 | T4 |
| 7.22 | 6.92 | 7.22 | 7.55 | 7.18 | Average |

R.L.S.D. for Transactions 160.31

R.L.S.D of extracts 0.33

R.L.S.D for storage durations 0.28

# Conclusion

The decrease in oxidation indicators in for meat stored by freezing, thus making it possible to use flaxseed gel as an antioxidant to prolong the preservation period. It was also observed that there was a decrease in indicators of microbial contamination in cold-preserved tballs meat samples when treated with different concentrations of gel compared to control samples, which led to improved sensory characteristics. General acceptance

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