

## Investigating improve the quality properties and extend the shelf life of chicken burger when adding pomegranate seed aqueous extract

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### Abstract

The present study to extend the shelf life of chicken burgers by adding different levels of aqueous extract of pomegranate seeds. The results showed the chemical composition of the powder pomegranate seed powder's Chemical content as well as the amounts of protein, fat, ash, moisture, and phenolic chemicals that it contains (5.25, 18.23, 0.968, 4.926, 683.7), in that order. After that, an aqueous extract was made from pomegranate seed powder and added to the chicken meat burger product. Three different concentrations of the aqueous extract were added to the burger mixtures: 0.5, 1, and 1.5%. Burger after being kept at 5 °C for 1, 7, 14, and 21 d. the assessment of the peroxide number and the value of malonaldehyde (TBA) for the burger samples after storage for 1, 2, 3, and 4 weeks at a temperature of 5 °C were also studied, as was the impact of the addition on the physical and sensory qualities. In comparison to the control model without any addition, the findings demonstrated that the inclusion of pomegranate seed aqueous extract enhanced the burger nettles' physical qualities (thawing loss, change in diameter after cooking, and change in thickness after cooking). The peroxide number for the control group's burger models was 0.85, 0.83, 0.75, 0.74 mEq, whereas the models that received aqueous extract added at a rate of 0.5, 1, and 1.5% right after manufacture received 0.74 mEq. After four weeks of storage, the peroxide number values rose in the models and control group samples that received 0.5, 1, and 1.5% additions of aqueous extract, yielding values of 1.20, 1.13, 1.09, and 1.12, respectively. After being preserved for four weeks at a temperature of five degrees Celsius, the percentages of the burger models for the control group and the models to which the aqueous extract was added at a percentage of 0.5, 1, and 1.5% increased to 1.15, 0.95, 0.982, and 0.935, respectively. This was the case for both the models of the control group and the models to which the aqueous extract was added at a rate of 0.5, 1, 1.5% immediately after manufacturing (0.698, 0.681, 0.682, and 0.676), respectively. According to the findings of the sensory evaluation of the burger models, there was no discernible influence on the sensory qualities of the burger. The D model, which included Therefore, it is recommended to add 1.5% aqueous extract of pomegranate seeds to improve the storage and sensory properties of chicken burgers an aqueous extract of 1.5%, received the highest marks, followed by the other created models Therefore, it is recommended to add 1.5% aqueous extract of pomegranate seeds to improve the storage and sensory properties of chicken burgers .

**Key words:** Pomegranate seeds, aqueous extract, burger, TBA, peroxide value

## Introduction .

One of the world's most commercially useful crops is the pomegranate (*Punica granatum* L). Pomegranates are grown on a large commercial scale in all climatic zones (semi-ecological and diverse ecological climates). They are widely grown in Iran, Afghanistan, India, and the Mediterranean countries, and to a lesser extent in the United States of America, China, Japan, and Russia. Pomegranates are a very profitable crop because of its ability to adapt to different environmental conditions. (34). Growing conditions are best found in climates that are comparable to the Mediterranean environment. Pomegranate seeds are eaten raw, but they can also be used as flavorings or colors to foods like juice or jellies. It is significant for the economy and ecology in addition to its medicinal qualities (21). Compared to other fruits that have been investigated, it has a higher concentration of total phenolic compounds and is regarded as one of the oldest edible fruits (19). The amount to which each crop or plant is cultivated depends largely on the environment, as crop growth requires a certain climate. According to (6), pomegranate trees thrive in conditions that are comparable to those of the Mediterranean Sea. According to (25), many pomegranate seed varieties have high fat contents, ranging from 140 to 270 g/kg of dry matter. According to (41), pomegranate seed oil makes about 10–20% of the seed weight overall and has a high content of unsaturated fatty acids, particularly linoleic acid, which has anti-inflammatory and antioxidant properties. The oil extracted from pomegranate seeds is distinguished by a high concentration of polyunsaturated fatty acids, such as linoleic and linolenic acids, and contains crude fiber, vitamins, proteins, pectin, minerals, sugars, polyphenols, and isoflavones

(40). (16) highlighted the unsaturated fatty acid concentration of pomegranate seed oil, pointing out that 33 different types of fatty acids were found in the oil, with 83.16% of those fatty acids being polyunsaturated fatty acids. It has been shown that planting locations, harvest times, fruit genotypes, and climate have an impact on the oil content of fatty acids in seeds (7). According to (19), the alcoholic extract contained 326.56 mg/caloric acid equivalent, while the aqueous extract of phenolic compounds (TPC) from the seeds of the Tunisian pomegranate variety Gabsi ranged between 134.58 mg/caloric acid equivalent of fresh weight. Eating a plant-based diet high in phytochemicals, such as flavonoids, anthocyanins, and tannins—the primary class of antioxidant phytochemicals with fascinating characteristics and significant health benefits—has been linked to a lower risk of developing chronic illnesses in humans, including some cancers, infections, and cardiovascular disease. Since it scavenges free radicals and engages in biological activity (29). Pomegranates are said by practitioners of traditional medicine to possess inherent antiviral, antifungal, and antibacterial properties. Pomegranate juice has been used as a natural astringent to cure intestinal parasites and diarrhoea since ancient times. The Punicaceae family includes the pomegranate (*Punica granatum* L.), which is regarded as a highly nutritious food. According to (39) and (30), phytochemical substances. (27) measured the phenolic compound content and free radical-suppressive capacity of six different pomegranate kinds' seeds to elucidate their antioxidant role. Fresh fruit, drinks (like juices and wine), foods (like jams and jellies), and extracts—which are utilized as botanical components in herbal remedies and dietary

supplements—are all frequent ways to eat pomegranates. The fruit of the pomegranate—the peel, seeds, and juice—is the primary dietary source of phytochemicals.( 28). The main source of proteins, lipids, and certain vitamins and minerals is meat, and the high concentration of these nutrients in meat makes it a valuable food source (6). Reducing physical, chemical, and microbiological changes to meat and its products is in the best interests of both farmers and customers as it preserves the meat's nutritious worth. as well as extending its shelf life. (44). When exposed to air, foods high in fat are susceptible to quick oxidation and fat rancidity (10). Additionally, processed meat quality is negatively impacted by fat oxidation, as it alters its sensory and nutritional qualities (43). Industrial preservatives, such as nitrite and benzoic acid, can be used to preserve meat and its byproducts. These preservatives can delay or stop microbiological, chemical, and

## MATERILS AND MFTHODS

**Materials:** Pomegranates were bought such that the seeds and skins could be separated by hand. The fruits of the pomegranates were cleaned and chopped by hand, and the seeds were removed, thoroughly cleaned, and Squeeze the seeds and dry them for 6 hours at 50 °C in an incubator. The seeds were dried and then finely powdered to make pomegranate seed powder, which was stored at room temperature (25°C) until testing was done.

**.2Calculating the Pomegranate seeds' chemical composition content :** To determine the proportion of phenolic chemicals, protein, fat, ash, and moisture in the graduate

qualitative changes from occurring while also extending the shelf life of the goods. The degree of these chemicals' safety as well as the allowable limits, however, raise a number of concerns about how dangerous they may be over time. Thus, the trend toward adding natural preservatives directly to food and employing plant extracts as an alternative to preservatives. (26). Thus, the purpose of this study is to determine the chemical makeup of dried pomegranate seeds and the amount of phenolic compounds they contain. It also intends to investigate the impact of varying concentrations of pomegranate seed aqueous extract on certain sensory and physical attributes of chicken meat burger patties and the degree to which these attributes are maintained over time. Finally, the study will investigate the influence of the addition on the TBA percentage and the peroxide number during the storage period.

.1

laboratories of the University of Baghdad's College of Agricultural Engineering Sciences .

-1-2Estimation of protein content: The Micro Kildahl (1) technique was utilized to ascertain the protein content.

-2-2Estimation of fat %: Using a Soxhlet equipment and hexane as a solvent, the technique (42) was used to determine the percentage of fat in pomegranate seed samples. After weighing 5 grams of the sample, it was put in a filter flask and completely coated with two filter papers. It was inserted into the allotted area of the apparatus and filled with 250 milliliters of hexane. After six hours at 50°C, the device's

temperature was adjusted, and the sample's solvent was removed using a rotary evaporator. The fat weight was then computed.

Weight of fat / sample weight x 100 equals fat percentage.

-3 -2Estimating moisture: The moisture content was calculated using the method described in (5), which involved weighing five grams of powdered pomegranate seed and putting it in a specific container in an electric oven set to 105°C until the weight stabilized. Then, the following equation was used to determine the moisture content:

Weight of sample - weight of sample after drying / weight of sample x 100 equals moisture percentage.

:4-2Ash estimate: Five grams of the material were weighed, put in a known-weight ceramic jar, and burnt in an electric incinerator. Following six hours at 600°C, the ash % was computed using the weight differential as follows:

Ash percentage is calculated as follows:  

$$\frac{\text{sample weight before incineration} - \text{sample weight after incineration}}{\text{sample weight}} \times 100\%$$

.3Quantification of total phenolic compound content: The (13) methodology was

employed. The Folin–Ciocalteu technique was utilized to measure the total phenols, with gallic acid serving as the standard equivalent (mg/g). 100 µl of diluted pomegranate extracts were combined with 500 µl of Folin-Ciocalteu reagent. Following three or five minutes, 400 µL of 7.5% sodium carbonate was added to the mixture, and it was allowed to sit at room temperature for thirty minutes. At a wavelength of 765 nm, the absorbance was measured using a spectrophotometer.

.4Making the pomegranate seed powder aqueous extract: As instructed by (23), prepare the aqueous extract by mixing 25 grams of powdered pomegranate with 250 milliliters of distilled water, then letting it sit on a magnetic stirrer for two hours. Whatman No. 1 filter paper was used to filter it. The filtrate was then placed in opaque bottles and kept in the refrigerator until needed. It was dried by placing dishes in the oven at 40 degrees until they were dry .

-5Manufacturing of the burger: The burger was made using (8) method, and Table No. 1 below illustrates the proportion of ingredients in the standard mixture used in its creation. All ingredients were sourced from nearby markets, and the pomegranate extract powder was made ahead of time .

**Table No. 1: The main ingredients used in the manufacture of chicken meat burgers**

Components	(g)
Meat	80
Fat (belly fat)	10
Filler( flour)	2
Spices	1
salt	1-1.5
Crushed garlic and onion	0.5

**-5Burger****manufacturing**

The ground fat and chicken breast flesh were combined and added to a medium-sized round glass bowl. Bread crumbs, spices, ground onions, and garlic powder were added. After that, it was split up into 4 groups, and 4 burger treatments were made, with treatment A serving as a control sample and representing the burger's typical components. Treatment B involved adding 0.5 g of powdered pomegranate seed extract along with standard ingredients; Treatment C involved adding 1 g

of powdered pomegranate seed extract along with standard ingredients for the burger; and Treatment D involved adding 1.5 g of powdered pomegranate seed extract along with standard ingredients. Using a unique mold, the samples were formed into round discs. Five identical copies of each sample, each weighing 100 g, were made, and they were each put into a mold or bagged in special burger paper. After conducting sensory testing, the samples were kept for three weeks at 5°C.

**Table 2 :Components of different burger model mixes**

<b>Treatment</b>	<b>Spices (gm)</b>	<b>Salt(gm)</b>	<b>Onion and garlic (gm)</b>	<b>Bread crumbs (gm)</b>	<b>Fat (belly fat) gm</b>	<b>Meat (gm)</b>	<b>pomegranate seed extract powder (%)</b>
<b>A</b>	<b>5</b>	<b>5</b>	<b>2.5</b>	<b>10</b>	<b>100</b>	<b>400</b>	<b>0</b>
<b>B</b>	<b>5</b>	<b>5</b>	<b>2.5</b>	<b>10</b>	<b>100</b>	<b>400</b>	<b>0.5</b>
<b>C</b>	<b>5</b>	<b>5</b>	<b>2.5</b>	<b>10</b>	<b>100</b>	<b>400</b>	<b>1</b>
<b>D</b>	<b>5</b>	<b>5</b>	<b>2.5</b>	<b>10</b>	<b>100</b>	<b>400</b>	<b>1.5</b>

**-1 Study of the physical properties of burger**

-1-6The weight loss that occurs during the thawing process (also known as "Thawing Loss") was calculated using the (32) method, in which the burger tablets for each treatment were weighed while they were still solid and then refrigerated on a wire rack for a full day to dissolve completely. Once the water was removed from the burger patties, they were weighed once again. It was extracted how much was lost while thawing. Dissolution based on the equation that follows:

Weight of the frozen sample (g) - weight of the sample after the seeping water is removed

(g) / weight of the frozen sample (g) x 100% is the loss percentage.(%)

-2-6Cooking Loss"while cooking: The burger patties were weighed before they were fried, cooked in a tiny amount of fat in a large frying pan, and then weighed to determine the percentage loss during cooking, as per (32) procedure. The following formula was used to determine the percentage loss during cooking :

Weight before frying (g) - weight after frying (g) / weight before frying (g) x 100% equals the percentage of loss during cooking .

-3-6Change in diameter after cooking :

The diameter of four patties was measured after each treatment, with three readings for each patty before and after frying, in order to calculate the percentage change in diameter after cooking. This method was used to calculate the diameter of the burger patties after frying, as per (32) method .

Diameter change percentage =  $\frac{\text{diameter pre-cooking (cm)} - \text{diameter (cm) following cooking}}{\text{diameter (cm) before to cooking}} \times 100$

-6.4 Difference in thickness following cooking: The method of (32) was used to calculate the percentage change in burger patties' thickness after cooking. Four patties' thickness was measured after each treatment, with three readings taken for each patty before and after frying. The percentage change in thickness after cooking was then computed using the following equation:

Thickness change percentage equals  $\frac{\text{thickness pre-cooking (cm)} - \text{thickness (cm) following cooking}}{\text{thickness (cm) before to cooking}} \times 100$

## Results and discussion

-1

Analysis of the chemical content of powdered pomegranate seeds: The chemical composition of pomegranate seed powder is presented in Table 3, with regard to the percentages of protein, fat, moisture, ash, and carbs at 5.25, 18.23, 4.92, 0.968, and 70.56, respectively. Phenolic compounds made up 683.7 mg/kg of the total. The results of the chemical composition of pomegranate seeds, according to (11) were 13.2% crude protein, 27.2% fat, (

cooking / thickness (cm) before to cooking x 100%

.2 Examination of the impact of incorporating the extract on thiobarbituric acid and peroxide number: For the samples on the first day of manufacture and after 7, 14, and 21 days of storage, the (5) method was used to estimate the peroxide number and thiobarbituric acid number.

.3 Sensory assessment Twelve raters used the (33) evaluation form to conduct a sensory assessment of the burger samples immediately following production. The assessment covered the following sensory attributes: color, smell, flavor, texture, and overall acceptability.

-4 Analytical statistics: The statistical analysis system, (38) program, was employed to find the variation among the study's coefficients. In this study, the LSD least difference test (ANOVA) was utilized to compare the means in a meaningful way.

2.0% ash, and 8.6% moisture content. These are less than what the study's findings showed. The variation in the variety utilized might be the cause. The processes of drying, germination, and hydration, as well as other manufacturing variables that may have an effect on the composition of the seeds, might all have an effect on the chemical composition of the seeds, according to the study (24

**Table 3 The chemical makeup of powdered pomegranate seeds**

Chemical composition	%
Protein	5.25
Fat	18.23
Moisture	4.92
Ash	0.968
Carbohydrates	70.56
phenolic compounds	683.7mg/ kg

## 2-2

Examining the physicochemical characteristics of burgers. The quality of the ingredients, the manufacturing process, and the cooking technique all have an impact on the percentage of weight loss in the burger after it has been cooked. It should be highlighted that thoroughly mixing the meat ingredients not only improves the burger's ability to hold water but also lowers the percentage of weight loss overall after cooking. Because of its greater solubility at cooking temperatures, collagen and protein undergo modifications. As a result, when meat is cooked with moisture present, the collagen becomes saturated with water and turns into gelatin when heated. The meat's tenderness and water-holding capacity both increase with cooking temperature. If moisture loss from the meat is directly correlated with temperature, then cooking temperature also affects this property. The loss of some nutritious components, the evaporation of water, the exudation of meat fluids, and the subsequent loss of some palatability attributes all contribute to weight loss when meat is cooked with moisture. The shrinkage that occurs during cooking and the loss of nutrients dissolved in the water cause the meat juices to escape. Meat acceptability, juiciness, and

tenderness all decline as a result of increased liquid loss during cooking (3). The results show that the standard combination (A) had the greatest weight loss during thawing, with treatments C, B, and D following closely behind. Additionally, the conventional plan (A) cooking resulted in the greatest weight reduction, with combinations C, B, and D following suit. Regarding the variation in thickness, it was The typical concoction As seen in Table 4, A had the greatest proportion of 18.79%, followed by the remaining mixes. The standard combination had the best results in terms of the % change in diameter, followed by the other mixes. Physical test findings show how much extracts contributed to enhancing the burger samples' physical attributes as compared to the reference combination, which was additive-free (9). The findings were comparable to those of (21), who found that adding date pit extract improved the burger models' thickness properties after cooking them and extended their shelf life. According to (5), there were alterations in the physical traits that loss by dissolving represented. the variations in thickness and diameter that occur when burger samples are mixed with varying amounts of ginger

**Table -4- physical properties for burger models after manufacturing**

Treatment	physical properties			
	Thawing Loss%	Cooking loss%	Change in thickness %	Change in diameter %
A	4.23	45.15	18.79	15.35
B	3.36	33.6	18.56	14.14
C	3.75	37.66	17.45	13.20
D	2.89	34.13	18.45	14.39
LSD	1.052*	2.452*	2.941 NS	1.364 NS

-2 The impact of the aqueous extract on the TBA value and peroxide number: The peroxide number values for the burger models are displayed in Table 5 both immediately following fabrication and following a 21-day period of storage. The peroxide number values for the burger samples A, B, C, and D were found to be 0.85, 0.83, 0.75, and 0.74 mcf/kg oil, respectively. These values seemed to rise over the course of the storage period, but the standard form without any additive had the highest percentage when compared to the

burger models that included pomegranate seed aqueous extract. Meat fat oxidation is detected using the peroxide number test. While the addition of wheat germ meal (0.9 g/kg) led to the inhibition of oxidation and decreased peroxide number value, (35) noted an increase in peroxide values in samples of sausage stored in cold storage at 3 degrees for 21 days, reaching 2.71. (14) confirmed the possibility of improving peroxide number values by adding parsley seed extract to samples of beef peroxide.

**Table 5- Peroxide number (PV) values for burger samples during the storage period at 5°C**

Day	Treatments			
	A	B	C	D
First day	0.85	0.83	0.75	0.74
7 days	1.08	1.01	0.97	1.03
14 days	1.12	1.05	1.03	1.07
21 days	1.20	1.13	1.12	1.09
LSD	0.975 NS	0.864 NS	0.543*	0.652*
* (P≤0.05).				

When it came to the TBA values, the control treatment had the highest value, meaning that although the TBA values in the other treatments had a drop throughout the storage period, the TBA values in the control treatment grew. When storing and freezing food, the TBA test is used to assess how rancid the lipids are. (35) observed that adding ginger powder (0.9 g/kg) to chicken sausage that had been refrigerated at 3°C for a while resulted in a small rise in TBA values from 0.140 to 0.214. 21 days, but the control therapy had a higher rise, coming up at 1.71. The presence of active chemicals in

pomegranate seeds is the reason why burger models' antioxidant qualities have improved (22). According to (31), When many plant extracts were applied and the samples of beef burgers were kept for 15 days at 4°C, the TBA value of the samples dropped. By comparing the results of the peroxide number and TBA test with the control model, which showed a rise in the percentage of peroxide number and TBA, it can be observed that the addition of the pomegranate seed aqueous extract extended the shelf life of the burger tablets.

**Table 6: TBA value for burger samples after manufacturing and during storage at 5°C**

Day	Treatments			
	A	B	C	D
First day	0.698	0.681	0.682	0.676
7 days	0.789	0.735	0.694	0.688
14 days	0.93	0.895	0.893	0.854
21 days	1.15	0.95	0.982	0.935
LSD	0.623*	0.732NS	0.345NS	0.542NS
* ( $P \leq 0.05$ ).				

Sensory assessment: The findings of the sensory evaluation indicated that the sensory qualities of meat did not significantly change when pomegranate seed extract was added throughout the manufacturing process to make burgers. It should be mentioned that the model with the best flavor, color, texture, taste, and overall acceptance was model D, which had 1.5% extract in it. Model C (containing a 1% aqueous extract extract) was next, and then forms A and B, in that order. The findings demonstrated the potential use of pomegranate seed powder extract as a cheap, safe ingredient that did not compromise the sensory

assessment of burger models. They also demonstrated the beneficial effects of seed extracts on the qualitative qualities of burgers and the extension of their shelf life. These findings corroborated those of (33), who demonstrated that a 3% addition of ginger improved the sensory assessment scores for chicken burger models. The study's findings supported several research that suggested phenolic chemicals, which are found in a variety of aromatic substances including cumin seeds, grape extract, and chamomile, significantly improved the outcomes of the sensory assessment of meat products. (17 ; 4(

-4

**Table 7- Sensory evaluation of burger treatments**

treatments	Texture	Flavor	Colour	Taste	Overall acceptability
A	7.2	6.2	8.4	5.1	7.2
B	6.9	5.8	8.3	7.3	7.4
C	8.5	7.2	9.2	8.5	7.5
D	8.7	8.4	9.4	9.2	8.3
LSD	0.744 *	0.132*	0.413 NS	0.174 *	0.311 NS
* (P<0.05).					

Conclusion: The study's findings demonstrated that adding 1.5% of pomegranate seed extract to the burger produced the best outcomes, extending its shelf life and enhancing its sensory qualities and storageability after storage was determined by measuring the amount of malonaldehyde and peroxide number. As a result, using production waste is

advised, such as pomegranate seed aqueous extract. In enhancing the ability of other items to be stored, particularly those that quickly oxidize and deteriorate, and minimizing the use of industrial antioxidants that may have negative health impacts on consumers, as well as profiting from certain production waste.

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