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ORIGINAL ARTICLE

EXTENDING THE SHELF LIFE OF BEEF BURGERS BY ADDING PARSLEY SEED EXTRACTS

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Abstract: The study aimed to estimate the chemical composition of parsley seeds, as the percentages of protein, fat, ash, moisture, fiber, and carbohydrates were (11.49, 9.56, 11.61, 2.22, 16.33, 48.9), respectively. The aqueous and alcoholic extracts were prepared from the parsley seeds and added to the beef burger product. The aqueous and alcoholic extracts were added to the burger mixtures with two concentrations of 0.5 and 1%, then the effect of adding on the physical and sensory properties were studied, as well as the estimation of the peroxide number and the value of malonaldehyde (TBA) for the burger samples after storage for 1, 2, 3, 4 weeks at a temperature of 4°C. The results showed that the addition of aqueous and alcoholic extract improved the physical properties of the burger (loss after cooking, change in diameter after cooking, change in thickness after cooking) compared to the control sample without any addition. As for the value of the peroxide number, it was for the burger sample of the control and the sample to which the aqueous and alcoholic extract were added at a rate of 0.5, 1% immediately after manufacturing (0.99, 0.93, 0.90, 0.92, 0.81), respectively. As for the values of the peroxide number after 4 weeks of storage, it increased in the sample control group and the samples to which the aqueous and alcoholic extract were added by 0.5, 1% and it was (1.20, 1.13, 1.09, 1.12, 1.06), respectively, while the TBA value was for the burger samples. For the control group and the samples to which the aqueous and alcoholic extract were added at a ratio of 0.5, 1% immediately after manufacturing (1.00, 0.98, 0.99, 0.95, 1.01), respectively.

***Key words*:** Parsley seed, Extracts, Peroxide number, TBA.

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1. Introduction

Meat is a primary source of proteins, fats, some vitamins and minerals, and its nutritional value is linked to its good content of these components. Producers and consumers are interested in maintaining the quality of meat and its products by limiting physical, chemical and microbial changes, thus preserving its nutritional value and prolonging its storage life [Weber and Antipatis (2001), Alzubaidi (2021)]. Consumers always try to have healthy food that is free of chemical additives. Many studies indicate the extent to which processed meat consumption is dangerously associated with some diseases [Carr *et al.* (2016)]. Despite these risks, burgers are still consumed by some groups, especially the younger ones, especially since burgers are processed meat exposed to high levels of oxidation, as well on microbial contamination [Asioli *et al.* (2017)]. Foods with high fat content are exposed to the risk of oxidation, and fats rancidity quickly when exposed to oxygen [Akram *et al.* (2012)], and fat oxidation has negative effects on the quality of processed meat as it causes a change in sensory and nutritional characteristics [Trefan *et al.* (2011)]. Meat and meat products can be preserved using industrial preservatives, including nitrite and benzoic acid, which delay or prevent chemical, microbial and qualitative changes and prolong their storage period. Natural alternatives such as plants and their extracts instead of preservatives and add them directly to food. Parsley is an herbal plant. It is an aromatic medicinal plant that is

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used in cosmetics, food and pharmaceutical industries [Viuda-Martos *et al.* (2011), Teixeira *et al.* (2013)]. Parsley is an important source of vitamins, as it is rich in potassium and magnesium, and a good source of calcium. The mineral has many benefits, including treating urinary tract infections and treating kidney and bladder stones. It contains substances that stimulate diuresis [Meyer *et al.* (2006)] and parsley seeds are rich in antioxidants, anti-inflammatory and anti-cancer agents [Nour *et al.* (2017)], they contain phenolic compounds, which are one of the most important antioxidant factors due to their effect on inhibiting free radicals [Del Rio *et al.* (2013)]. The parsley is distinguished by the fact that all its parts are rich in nutrients, including active phenolic compounds and flavonoids such as (apigenin, chrysin and luteolin). As well as its high content of vitamins, including vitamin C and E, and its content of mineral elements, including phosphorous, magnesium and calcium. It was found that the mineral contains a volatile oil called Myristicin, which is important and one of the most important compounds of Apiole. This oil, along with vitamins A, B, C, iron salts, calcium and iodine, is the effective essence of the plant [Razzaghi-Abyaneh *et al.* (2007)]. Parsley seeds and extracts are added to food products with the aim of protecting against bacterial growth or unwanted chemical changes. Preserving products with chemicals includes adding chemicals to the product to be preserved, while physical preservation includes cooling and drying. Usually, the two preservation methods are used at the same time in order to ensure greater preservation efficiency of products, including meat, as parsley contains many compounds that have antioxidant activity, in addition to that it raises the level of the body in resistance to oxidation. As well as its ability to improve blood sugar in cases of diabetes and reduce the oxidative damage that accompanies it, including liver toxicity, as parsley seeds were used as a natural preservative to protect the product from spoilage. The health effects of parsley result from the high content in flavonoids (about 100 mg / 100 g of fresh weight) with antioxidant activity and the ability to scavenge free radicals [Potapovich and Kostyu (2003)]. Asimi *et al.* (2013) indicated the ability of parsley seeds to be preserved, as the industrial preservatives have a negative effect on the product. They may be the cause of some serious diseases such as cancer and others when used in abundance and their symptoms appear after a long period and by a cumulative effect in the body, so it was replaced by a substance natural. This study was conducted with the aim of explaining the effect of adding alcoholic and aqueous extract of parsley seed on some physicochemical, microbial and sensory properties of the processed burger by replacing different proportions of the extract of parsley seed in the burger mixture and studying the effect of that addition in prolonging the storage period of the burger.

2. Materials and Methods

2.1 Preparation of Parsley seeds

The parsley seeds were obtained from the local markets, and the parsley seeds were finely ground using the electric grinder and kept in polyethylene bags at a temperature of 4°C until the rest of the tests were performed.

2.2 Determination of basic chemical composition

The protein, moisture, fat, ash and fiber of ground parsley seeds were estimated using the method given in AOAC (2008).

3. Preparation of Extracts

3.1 Aqueous extract

The aqueous extract was prepared according to what was stated in Gülçin *et al.* (2004) by taking 25 gm of ground parsley seeds with 250 ml of distilled water and leaving for 3 hours on a magnetic stirrer, filtered by means of a Buechner funnel through a filter paper (Whatman No. 1) with discharge after that the filtrate was left to dry by placing it in dishes in the oven at a temperature of 40°C, until it dries, then placed in dark bottles and kept at 4°C until use.

3.2 Alcoholic extract

Extraction was carried out according to the method described by Zhou *et al.* (2005) where 10 gm of parsley seed powder was placed with 100 ml of ethanol (70%) and left for two hours on a magnetic stirrer, filtered by means of a Buechner funnel and vacuumed through filter paper (Whatman No. 1). The extraction was repeated for three successive times for two hours each time. The filtrate was collected and concentrated in a rotary evaporator at a temperature of 40°C until the volume reached 20 ml, then the concentrated extract was poured into a Petri dish and placed in the electric oven at a temperature of 40/24 hours to dry. The dried powder was scraped off and collected in clean, dry bottles and kept at 4°C until use.

Table 1: The mixtures used in the experiment.

The first mixture (A)	Standard without any additions
The Second mixture (B)	Standard mixture with the addition of 0.5 g of aqueous extract
The Third mixture (C)	Standard mixture with the addition of 1 g of aqueous extract
The Forth mixture (D)	Standard mixture with the addition of 0.5 g of alcoholic extract
The Fifth mixture (E)	Standard mixture with the addition of 1 g of alcoholic extract

4. Manufacture of Burger Sample

The beef was obtained from meat shops in Baghdad, and the meat was minced several times. The mixture was added to the standard burger mix, consisting of the following materials: Sharh beef 73 gm, beef fat 10 gm, water 12.5 gm, salt 1.5 gm and bacon crumbs 3 gm. The aqueous extract and the alcoholic extract were added at two concentrations as shown in Table 1.

After completing the work of the mixtures, the burger discs were formed, physicochemical tests and sensory evaluation were conducted on the treatments.

5. Studying the Physicochemical Properties of the Burger

5.1 Loss after cooking

The percentage of loss during cooking was estimated by weighing the burger patties before cooking them in an electric oven at a temperature of 160°C for 7 minutes and then weighing after cooking after the liquid produced from the cooking was excluded. The percentage of loss during cooking was calculated according to the following equation:

Loss during cooking = weight before frying - weight after frying / weight before frying×100

5.2 Change in Diameter after cooking

The percentage change in the diameter of the burger discs after cooking was calculated by measuring the diameter of four discs from each treatment and by three readings per disc before and after cooking using the Verneh tool. The percentage change in the diameter after cooking was calculated according to the following equation:

Table 2: Chemical Proximate analysis of parsley seeds.

Components	Parsley seeds%
Moisture	2.22
Protein	11.39
Fat	9.56
Ash	11.61
fiber	16.33
carbohydrates	48.9

Change in diameter % = diameter before frying - diameter after frying / diameter before frying×100

5.3 Change in thickness after cooking

The percentage change in the thickness of the burger discs after cooking was estimated by measuring the thickness of four discs from each treatment and by three readings per disc using the Vernier tool before and after cooking. The percentage change in thickness after cooking was calculated according to the following equation:

Change in thickness % = fish before frying - fish after frying / fish before frying×100

5.4 Sensory Examinations

The manufactured burger product was evaluated in the laboratory before freezing of the prepared samples. All samples were fried using a frying pan at the same time to ensure the same thermal effect for all samples, and then sensory evaluation was carried out by experienced and specialized persons from the Department of Food Science, College of Agricultural Engineering Sciences. The evaluation included taste and color.

5.5 Estimation of the Peroxide Number

Estimate the value of the peroxide number according to the AOAC (2008) method for the burger samples immediately after manufacturing and after storing the samples at a temperature of 4°C for 1,2,3 weeks.

5.6 Determination of Malonaldehyde TBA

The TBA value according to the AOAC (2008) method of the burger samples was estimated immediately after manufacturing and after storage at a temperature of 4°C for 1,2,3 weeks.

5.7 Statistical Analysis

Statistical analysis was done using the SAS program with the least significant difference test at the 0.05 level Least Significant Difference [SAS (2018)].

Table 3: Physical characteristics of the burger.

Physical Properties				
Sample	**Change in diameter %**	**Change in thickness %**	**Weight loss after cooking %**	**Weight loss after dissolving %**
A	15.35	18.79	45.15	4.23
B	14.14	18.56	33.6	3.36
C	13.20	17.45	37.66	3.75
D	14.39	18.45	34.13	2.89
H	14.83	18.23	41.83	3.71

Table 4: Sensory evaluation.

Sample	Taste	Color	Odor	Texture	General acceptance
A	7	8	6	6	7
B	6	8	6	7	8
C	8	9	8	8	6.15
D	8	9	9	9	8.7
E	6	8	6	7	8.5
L.S.D	0.43 NS	0.51 N.S	1.13 *	1.27*	0.32*

* ($P<0.05$), NS: Not significant.

6. Results and Discussion

6.1 Chemical composition of parsley seeds

Table 2 shows the chemical composition of parsley seeds used in the preparation of aqueous and alcoholic extracts. The results indicated its low moisture content, which amounted to 2.22, and then the percentage of fat, which amounted to 9.56, and the percentage of protein and ash (11.49, 11.61), respectively, and the percentage of fibers increased, reaching 16.33% and higher the percentage of carbohydrates was 48.9%.

6.2 Physicochemical characteristics of the burger

The percentage of burger weight loss after cooking depends on several factors, starting with the quality of the ingredients and then manufacturing. It ends with the cooking method if it is noticed that the good mixing helps to link the components of the meat together as well as increase the ability of the burger to carry water and thus reduce the percentage of total loss of weight after cooking temperature affects changes in protein and collagen due to increased solubility, so cooking meat in the presence of moisture leads to saturation of collagen with water and decomposition by heat into gelatin and becomes more soft and increases its ability to carry water. There is an effect of cooking temperature on the amount of moisture lost from meat if the amount of loss is directly proportional to the temperature. The loss of moisture during cooking is accompanied by a loss in weight resulting from the leaching of meat liquids, water evaporation, evaporation of volatile substances, and loss in some nutrients and the resulting loss of some palatability characteristics and the exit of meat juices due to shrinkage during cooking and loss of nutrients dissolved in water. The increase in liquid loss after cooking leads to a decrease in the tenderness and juiciness and the degree of acceptability of meat. It is noted from the results that the highest weight loss after dissolving was in the standard mixture (A), then came the mixture C, H, B, and finally came the mixture D. Also, the highest weight loss occurred after cooking for the standard plan (A), and then came the mixtures H, C, D, and B. As for the change in thickness, the standard mixture A got the highest percentage, which was 18.79%, and then the rest of the mixtures came as shown in the table. As for the change in diameter. The physical tests indicate the extent of the role of the extracts in improving the physical properties of the mixture compared to the standard mixture that did not contain any addition.

6.3 Sensory evaluation

The results of sensory evaluation showed that adding parsley extract to meat in the burger industry did not significantly affect the sensory characteristics. It was noted that the sample (D containing 0.5 g of alcoholic extract) was the best in terms of taste, color, texture, smell and general acceptance, and then came form the sample C (which contains on aqueous extract with a percentage of 0.5) and then came forms A, B,

Table 5: PV values of the burger samples during the storage period at 4°C.

The week	A	B	C	D	H
The first	0.99	0.93	0.92	0.90	0.81
The second	1.08	1.01	0.97	1.03	0.99
The third	1.12	1.05	1.03	1.07	1.02
The fourth	1.20	1.13	1.12	1.09	1.06

and E, respectively. The results showed the possibility of using parsley seed extract as a safe and cheap material that did not affect the sensory evaluation of the burger sample, as well as the positive effect of seed extracts on the qualitative characteristics of the burger as well as extended shelf life.

6.4 Effect of adding aqueous and alcoholic extracts on the peroxide number and TBA value

The Table 5 shows the results of the change in the values of the peroxide number of the burger samples immediately after manufacturing and after storage for 1, 2, 3 weeks at a temperature of 4°C. It is noticed from the results that the values of the peroxide number in the first week were low for the samples, but began to rise in the subsequent weeks of the control sample compared to in the other samples that were supported by the aqueous and alcoholic extract, it was noted from the samples that the increase in the peroxide number was less and the best results were for the alcoholic extract at a concentration of 1%. The peroxide number test is used to detect the oxidation of fats in meat. Sallam *et al.* (2010) noted an increase in the peroxide values in the chicken samples stored at 3 temperature for 21 days, reaching 2.71, while the addition of wheat germ meal by (0.9 g / kg) reduced the peroxide number of the samples.

As for the values of TBA, it was the highest value in the control sample in which the values of TBA increased, while it decreased in the rest of the samples to which the alcoholic and aqueous extract was added. The TBA test is used to determine the degree of rancidity of fats in foods during cold storage and freezing. Sallam *et al.* (2010) observed a slight increase in TBA values from 0.140 to 0.214 when ginger powder was added by (0.9 g/kg) to chicken sauce stored in refrigeration at 3 m for a period of time 21 days, while the control treatment recorded a greater increase of 1.71.

7. Conclusions

The results showed that the addition of alcoholic and aqueous extracts of parsley seed improved the storage life of burger samples by reducing the peroxide number and TBA during the storage period, as well as improving the Sensory evaluation.

References

AOAC (2008). *Official Methods of Analysis* 17th Edition. The Association of Official Analytical Chemists, Gaithersburg, MD, USA.

Akram, S., R.M. Amir, M. Nadeem, M.U. Sattar and F. Faiz, (2012). Antioxidant potential of black tea (Camellia sinensis L.)- A review. *Pakistan Journal of Food Science*, **22(3)**, 128-132.

Alzubaidi, S.A.K. (2021). Effect of Adding Organic Matter on Some Soil Traits and Potato Yield in two Location of Dhi Qar Province, Southern Iraq. *International Journal of Agricultural and Statistical Sciences*, **17(1)**, 25-37.

Asimi, O.A., N.P. Sahu and A.K. Pal (2013). Antioxidant capacity of crude water and ethylacetate extracts of some Indian species and their antimicrobial activity against Vibrio vulnificus and Micrococcus luteus. *Journal of Medicinal Plants Research*, **7(26)**, 1907-1915.

Asioli, D., J. Aschemann-Witzel, V. Caputo, R. Vecchio, A. Annunziata, T. Næs and P. Varela (2017). Making sense of the clean label trends. A review of consumer food choice behavior and discussion of industry implications. *Food Res. Int.*, **99**, 58-71.

Carr, P.R., V. Walter, H. Brenner and M. Ho_meister (2016). Meat subtypes and their association with colorectal cancer. Systematic review and meta-analysis. *Int. J. Cancer*, **138**, 293-302.

Daradkeh, G. and M.M. Essa (2016). Parsley. In: Ambrose, D.C.P., Manickavasagan, A., Naik, R., Eds. Leafy medicinal herbs: Botany, chemistry, postharvest technology and uses. London, UK. CAB International.

Del Rio, D., A. Rodriguez-Mateos, J.P. Spencer, M. Tognolini, G. Borges and A. Crozier (2013). Dietary polyphenolics in human health: Structures, bioavailability, and evidence of protective effects against chronic diseases. *Antioxidants & Redox Signaling*, **18**, 1818-1892.

Gülçin, I., Ö.O. Küfrevioçlu, M. Oktay and M.E. Büyükokuroçlu (2004). Antioxidant, antimicrobial, antiulcer and analgesic activities of nettle (*Urtica dioica L.*). *Journal of Ethnopharmacology*, **90(2-3)**, 205-215.

Meyer, H., A. Bolarinwa, G. Wolfram and J. Linseisen (2006). Bioavailability of apigenin from apiin-rich parsley in humans. *Annals of Nutrition and Metabolism*, **50(3)**, 167-172.

Nour, V., I. Trandafir and S. Cosmulescu (2017). Bioactive

compounds, antioxidant activity and nutritional quality of different culinary aromatic herbs. *Notulae Botanicae Horti Agrobotanici Cluj-Napoca*, **45(1)**, 179-184.

Potapovich, A.I. and V.A. Kostyuk (2003). Comparative Study of Antioxidant Properties and Cytoprotective Activity of Flavonoids. *Biochemistry*, **68**, 514-519.

Razzaghi-Abyaneh, M., T. Yoshinari, Shams-Ghahfar, M. Okhi, M.B. Rezaee H. Nagasawa and Sakudas (2007). Dillapiof and apiol as specific inhibitors of the biosynthesis of aflatoxin G1in aspergillus parasiticus biosci, biotechnol. *Biochem*, **71(9)**, 2329-2332.

Sallam, K., M. Ishioroshi, and K. Samejima (2010). Antioxidant and antimicrobial effects of ginger in chicken sausage. *Meat Science*, **37(8)**, 849-855.

SAS (2018). *Statistical Analysis System*, User's Guide. Statistical. Version 9.6th Ed. SAS. Inst. Inc. Cary. N.C. USA.

Teixeira, B., A. Marques, C. Ramos and NR Neng (2013). Chemical composition and antibacterial and antioxidant properties of commercial essential oils. *Ind. Crops* Prod. **43**, 587-595.

Trefan, L., L. Bürger, J. Bloom-Hansen, J.A. Rooke, B. Salmi, C. Larzul, C. Terlouw and A. Doeschl- Wilson (2011). Meta-analysis of the effects of dietary vitamin E supplementation on α-tocopherol concentration and lipid oxidation inpork. *Meat Sci*., **87**, 305-314.

Viuda-Martos, M., M.A. Mohamady, J. Fernández-López, K.A. Abd ElRazik (2011). *In vitro* antioxidant and antibacterial activities of essentials oils obtained from Egyptian aromatic plants. *Food Contr.* **22**, 1715-1722.

Weber, G.M. and C. Antipatis (2001). Pork meat quality and dietary vitamin E second international virtual conference on pork quality. *J. Food Chem*., **56**, 6-20.

Zhou, K.Z., C.K. Yim and D.K. Tse (2005). The effects of strategic orientations on technology and market-based breakthrough innovations. *Journal of marketing*, **69(2)**, 42-60.