University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 13, Issue 2 (2024) PP 67-74

https://jam.utq.edu.iq/index.php/main *https://doi.org/10.54174/utjagr.v13i1.323*

Study of the effect of adding different proportions of clove extract on some chemical and physical properties of cold-stored buffalo meat burgers.

[1] Israa Abdullah Saleh, [2] Maitham Ali Khalaf Al-Ghalibi

E-mail: *maitham@utq.edu.iq*

E-mail: *esraa-abullah.post@utq.edu.iq*

Abstract

This study was conducted at Dhi Qar University / College of Agriculture and Marshlands - Laboratories of the Animal Production Department for the period from 11/25/2023 to 12/25/2023, in which the alcoholic clove extract was extracted and added in different proportions to Burgers tablets of buffalo meat preserved by refrigeration at a temperature of 4°C. To find out the extent of its effect on the qualitative characteristics of the burger, meat samples were obtained from local markets and the experimental treatments were divided into four groups. The first treatment (T1) was free of the additive, while the second treatments (T2), the third (T3) and the fourth (T4) were treated with proportions of clove extract. 1%, 2%, and 3%, respectively. The physical and chemical characteristics of Burgers meat discs were measured for all samples of cryopreserved treatments.

The results of the statistical analysis of the study treatments showed that there was a significant improvement for the treatments to which clove extract was added in different proportions compared to the control treatment (T1) in the qualitative characteristics studied, and the decrease was clear in the values of oxidation indicators such as (PV, FFA, PH) and the volume of liberated liquid.

Keywords: Buffalo burger, clove extraction, chemical, physicalparameters

Introduction

Meat is considered one of the main and important sources in the processing of proteins, vitamins (vitamin B group), fats, and minerals (zinc and iron) Manessis et al. (2020). Consequently, the demand for meat consumption increased, and it is attributed that 54% of this quantity came as a result of increased population growth and the remaining 46% as a result of an increase Awareness of the important nutritional and biological value of meat (Whitnall et al. 2019). Boateng and others (2020) showed that not consuming meat as a primary source of protein for a long period of time leads to making the body weak.

In addition to a decrease in the level of stored fat and thus a disruption in the body's vital functions as a result of a decrease in vitamins and minerals, which are enzyme catalysts necessary to maintain vital activities, in addition to a decrease in non-protein nitrogen compounds such as nucleotides, peptides, and creatine phosphate (Al-Amiri 2020).

The use of artificial food additives to reduce spoilage and contamination of meat with microorganisms and the occurrence of oxidation processes has led to fears of serious health consequences, and this is what encouraged researchers in this regard and their direction towards the use of natural antioxidants (Sojic et al. 2018) and (Kumari et al. 2019) extracted from plants. Adding it to meat (Shah, 2014), and one of these plants is cloves.

UTJagr This is an open access article under the CC-BY-NC-SA license (https://creativecommons.org/licenses/by-nc-sa/4.0/)

University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 13, Issue 2 (2024) PP 67-74

https://jam.utq.edu.iq/index.php/main *https://doi.org/10.54174/utjagr.v13i1.323*

I. Materials and Methods

- **Meat**

Buffalo meat (thigh area) was obtained from the local markets of Dhi Qar Governorate (Souq Al-Shuyoukh District) early in the morning and was physically stripped, then chopped, placed in sterile containers, and then transported to the laboratory until processing.

- **Fats**

The fat was obtained from the same carcass from which the buffalo meat was taken, and it was chopped and transported in sterile containers until processing.

- **Spices**

Ready-made spices for making burgers were obtained from local markets in Dhi Qar Governorate/Souq Al-Shuyoukh District

- **Salt**

Salt was added at a rate of 1.5% of the weight of processed meat.

- **Starch**

Starch was added at a rate of 5% of the weight of processed meat.

The process of manufacturing and preparing minced meat tablets

The meat was chopped using an electric mincing machine, and the fat (minced lard) was added to some treatments at a rate of 15% and mixed well. Clove extract was added in different concentrations, and the treatments were distributed as follows:

1- Control treatment (15% fat added to the meat without adding clove extract)
2- The second treatment (add 15% fat to the meat with the addition of 1% clove extract).
3- The third treatment (add 15% fat to the meat from clove extract).
4- Fourth treatment (add 15% fat to the meat and add 3% clove extract).

Then the meat burgers were made weighing 100 grams per sample and kept in the refrigerator until tests were conducted.

Chemical tests

Free Fatty Acid Ratio

Free fatty acids (F.F.A) were estimated based on the method of Pearson et al. (1981) Weighed 3 grams of finely chopped meat and added 50 ml of 99.9% ethanol alcohol, then drops of the indicator phenolphthalein were added to the sample after it was heated in a water bath until boiling, and the mixture was flushed with a 0.1 potassium hydroxide solution until The color of the solution turned light pink, and the percentage of free fatty acids was estimated by following the following equation:

$$\textbf{Percentage of free fatty acids} = \frac{\textbf{100 x 282 x N x (B}-\textbf{A) smoothing}}{\textbf{1000 x sample weight}}$$

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

B = number of milliliters of KOH swabbed with the plank sample

282 = molecular weight of oleic acid

UTJagr This is an open access article under the CC-BY-NC-SA license (https://creativecommons.org/licenses/by-nc-sa/4.0/)

University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 13, Issue 2 (2024) PP 67-74

https://jam.utq.edu.iq/index.php/main *https://doi.org/10.54174/utjagr.v13i1.323*

Peroxide value

The peroxide number was estimated according to the method of Pearson et al., (1981), by weighing 3 g of finely chopped meat and adding to it 30 ml of a mixture of glacial acetic acid and chloroform in a ratio of 3:2, 5 ml of saturated potassium iodide, 20 ml of distilled water, and a few drops of starch indicator. Then wipe the mixture with a 0.001 sodium thiosulfate solution until the blue color disappears, and the peroxide number was estimated by following the following equation:

$$\textbf{Peroxide value} = \frac{\text{Na2S3O4 1000 x N x } ml.}{\text{sample weight}}$$

Malonaldehyde concentration (mg/kg) = optical absorbance x 7.8

Physical tests tests Physical

Estimating the pH Value (pH) pH

The pH was estimated according to the method of John et al., (1975) by using a pH meter device, mixing 5 g of minced meat with 100 ml of distilled water in a baker, then leaving it for 5 minutes, then the pH value was estimated in the device.

Extract Release Volume (ERV)

By following Pearson (1970) method indicated by placing 15 grams of minced meat in a 100 ml baker containing a homogenizing rod, adding 60 ml of extraction reagent, shaking well for two minutes, then filtering using Whatman N0.1 filter paper, and measuring the volume of the filtrate oozing through. 15 minutes at 25°C, which is the opposite of water holding capacity WHO

The extraction reagent was prepared from (50 ml of potassium dihydrogen phosphate, N 0.2 KH2PO4 + 3.72 ml of sodium hydroxide, NaOH, 0.2 N), then supplemented with distilled water to 200 ml.

Results and discussion

Physical tests

pH Value

Table (1) shows the pH values for the different treatments within the storage periods studied. The pH was not affected significantly (P≤0.05) in the different treatments by the concentrations of clove extract added to the buffalo meat burger tablets for all storage days except the seventh day, as it decreased significantly (P≤0.05) in The treatments to which clove extract was added compared to the control treatment, the pH value reached (5.60, 5.46, 5.51, 5.53) for treatments T1, T2, T3, and T4, respectively.

Meat with a pH of 5.5-6 has the highest quality in color, taste and texture, while the pH of natural live muscle is (7.2).

The reason for the decrease in pH is due to the conversion of glycogen into lactic acid, especially in poor storage conditions. When the pH becomes less than (5.3), changes occur in the color of the meat (dull color and soft texture, and this condition is called the exudative state). Conversely, when the pH increases to more than From (6.00), the meat is characterized by a dark color and dryness, and the change in pH depends on the ability of the meat to retain water. There are factors that limit the rapid decrease in the pH value and its delayed change depending on the appropriate storage conditions.

The samples to which (2.3%) of clove extract were added maintained their pH value until the twelfth day of preservation, as the pH value reached (5.37, 5.36) for the two treatments T3 and T4, respectively. This is due to the preservation of the treatments to which the clove extract was added.

UTJagr This is an open access article under the CC-BY-NC-SA license (https://creativecommons.org/licenses/by-nc-sa/4.0/)

University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 13, Issue 2 (2024) PP 67-74

https://jam.utq.edu.iq/index.php/main *https://doi.org/10.54174/utjagr.v13i1.323*

Carrying water decreased the volume of liberated liquid, which helps in preventing the deterioration of the pH value of food products, while the control group had an increase in the pH value as a result of dehydration and an increase in the volume of liberated liquid. This study agreed with Al-Moussawi (2022).

On the other hand, the current results differ from those obtained by Mustafa (2013) when using green tea extract when preserving meat for different periods of time, and Mahmmoud and Gharib (2020) when different concentrations of pomegranate peels and seeds were added to meat and preserved for a period of time. These results agreed with Al-Moussawi (2022) when using ginger powder to cold-preserve meat burgers.

Table No. (1) Effect of adding different levels of clove extract on the pH of buffalo meat stored cold for different periods of time (mean±standard error).

Significant	Storage duration (day)					
	1	**3**	**5**	**7**	**9**	**12**
T1	5.72 ± 0.06	5.70 ± 0.05	5.66 ± 0.05	5.60 a ± 0.17		
T2	5.71 ± 0.05	5.68 ± 0.09	5.63 ± 0.11	5.46 b ± 0.09	5.33 ± 0.15	
T3	5.70 ± 0.04	5.69 ± **0.01**	5.64 ± 0.15	5.51 b ± 0.07	5.45 ± 0.06	5.37 ± 0.09
T4	5.71 ± 0.05	5.70 ± 0.07	5.60 ± 0.06	5.53 b ± 0.05	5.48 ± 0.08	5.36 ± 0.06
Averages	NS	NS	NS	0.05	NS	N.S

***Different letters vertically indicate that there were significant differences between the means of the coefficients below the significance level of 0.05. N.S means there is no significant difference between the means**

Extract Release Volume (ERV)

The results of the statistical analysis of the data of the current study, Table (8), showed that there were significant differences (P≤0.05) at (3,5,7) days of cryopreservation, as the liberated liquid decreased in all treatments to which clove extract was added in different proportions compared to the control group, as it was The value of the fluid released for treatment T1 was (18.33, 21.25) for the fifth and seventh days of the experiment. The rate of water released for treatments T4, T3, and T2 ranged from 10.33 - 13.33 ml, after which the fluid released for all treatments decreased from (T2 to T4), and the differences were not significant on both days. (9,12) from cooling, and the lowest fluid release recorded by T2 was 7.00 ml on the twelfth day.

It is known that when preserving meat products by cooling, the liberated liquid increases with the increase in the duration of cold storage, and as a result of adding clove extract, it causes a significantly smaller decrease compared to the T1 treatment. The reason may be attributed to the phenolic compounds in cloves, which work to bind water and reduce its release from the samples, in addition to reducing the rupture of meat cell membranes (Al-Mousawi 2022, Al-Adhari 2017).

This explains that adding cloves in proportions of (1,2,3)% leads to an increase in the ability to hold water, which increases the tenderness and juiciness of food products that include meat as one of the ingredients.

UTJagr This is an open access article under the CC-BY-NC-SA license (https://creativecommons.org/licenses/by-nc-sa/4.0/)

University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 13, Issue 2 (2024) PP 67-74

https://jam.utq.edu.iq/index.php/main *https://doi.org/10.54174/utjagr.v13i1.323*

These results agreed with Al-Tufaili (2016) and his use of foods in preserving meat, and Al-Adhari (2017) who prepared plant extracts, identified their active compounds, and used them in preserving meat.

These results agreed with Al-Mousawi (2022) when using ginger powder to cold-preserve meat burgers.

Table No. (2) Effect of adding different levels of clove extract on the volume of liquid released (ml) in buffalo meat stored cold for different periods of time (mean ± standard error).

Significant	Storage duration (day)					
	1	**3**	**5**	**7**	**9**	**12**
T1	7.33 ± 0.82	15.23 a ± 0.87	18.33 a ± 0.89	21.25 a ± 0.57		
T2	7.34 ± 0.81	13.33 b ± 0.99	10.33 b ± 0.90	13.33 b ± 0.97	7.83 ± 0.94	7.00 ± 0.88
T3	7.30 ± 0.80	11.00 b ± 1.00	11.50 b ± 0.88	12.67 b ± 0.87	8.16 ± 0.91	7.33 ± 0.89
T4	7.36 ± 0.87	12.00 b ± 1.00	10.66 b ± 0.97	10.33 b ± 0.80	7.66 ± **0.90**	7.67 ± 0.86
averages	NS	0.05	0.05	0.05	NS	NS

*Different letters vertically indicate that there were significant differences between the means of the coefficients below the significance level of 0.05. N.S means there is no significant difference between the means

Chemical properties

Peroxide Value(PV)

The results of the statistical analysis of the current study showed that there were no significant differences for the first and third days of the study as a result of adding different levels of clove extract (0, 1, 2, 3)% to the meat burger patties on the first day (2.333, 2.267, 2,467, 2,333) mEq/ kg of meat

On the third day (3.833, 2.533, 2.433, 2.500) mEq/kg meat for treatments T1, T2, T3, and T4, respectively.

While the significant differences, $p \leq 0.05$, were clear on the fifth, seventh, ninth, and twelfth days of the study, as the value and number of peroxide in the T1 treatment increased significantly, $p \leq 0.05$, with an average of (4.100) mEq/kg meat over the T2 treatment average (3.533) mEq/kg meat and increased. Treatment T2 was significantly ($p \leq 0.05$) over the averages of treatments T3 and T4 (2.633, 2.433) mEq/kg meat on the fifth day of the study, respectively.

On the seventh day of the study, the peroxide number values remained significantly higher ($P \leq 0.05$) than the treatments to which clove extract was added, with an average of (6.433) mEq/kg meat, while the remaining treatments recorded (2.83, 3.23, 3.17) mEq/kg meat, respectively. The fourth treatment maintained a low value of the peroxide number (3.11) mEq/kg meat.

UTJagr This is an open access article under the CC-BY-NC-SA license (https://creativecommons.org/licenses/by-nc-sa/4.0/)

University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 13, Issue 2 (2024) PP 67-74

https://jam.utq.edu.iq/index.php/main *https://doi.org/10.54174/utjagr.v13i1.323*

On the twelfth day, when the control treatment was excluded due to its spoilage, there was a significant superiority for the treatments T2 and T3, which averaged (3.567 and 3.600) mEq/kg meat compared to the T4 treatment, which averaged (2.833) mEq/kg meat.

Table (3) Effect of adding different levels of clove extract on the peroxide number value (mEq/kg meat) of buffalo meat burger patties stored in cold storage for different periods of time (mean ± standard error).

Significant	Storage duration (day)					
	1	3	5	7	9	12
T1	2.33 ± 0.06	3.83 ± 0.29	4.10 a ± 0.17	6.43 a ± 0.11		
T2	2.27 ± 0.06	2.53 ± 0.22	3.53 b ± 0.21	3.17 b ± 0.05	3.57a ± 0.06	3.61a ± 0.05
T3	2.47 ± 0.06	2.43 ± 0.11	2.63c ± 0.23	3.23c ± 0.06	3.60a ± 0.01	3.64 a ± 0.04
T4	2.33 ± 0.01	2.50 ± 0.17	2.43c ± 0.22	2.83 c ± 0.16	3.00 b ± 0.07	3.11 b ± 0.07
Averages	N.S	N.S	0.05	0.05	0.05	0.05

*Different letters vertically indicate that there were significant differences between the means of the coefficients below the significance level of 0.05. N.S means there is no significant difference between the means.

The percentage of free fatty acids

Table (2) shows the percentage of free fatty acids in beef burger tablets made from buffalo meat and added to different percentages of clove extract and stored in cold storage for different periods of time. The percentage of free fatty acids decreased significantly (P≤0.05) from the third day of storage until the ninth day as a result of adding Different percentages of clove extract, and the percentage of effective free fatty acids T1 was (0.67, 1.77, 1.89)% at day (3, 5, 7), respectively, while the treatment (T4, T3) recorded the lowest percentages of free fatty acids for all periods and did not The differences between them were not significant, and it was noted that the percentage of free fatty acids increased as the storage period progressed, especially in the (T1) treatment, whose percentage on the seventh day was about four times its percentage on the first day. The clove extract helped prevent a significant increase in the percentage of free fatty acids and slowed down their decomposition (0.43% on the first day of storage, T4 became (0.76)% on the twelfth day. Among the factors that help in reducing the percentage of free fatty acids are the multiple phenolic compounds in clove extract, which work to stop the series of oxidation reactions by giving a hydrogen atom to the fatty acids and free radicals. (Jassem, 2016).

Which causes a prolongation of the storage life of meat and food products, as Al-Daoudi et al. (2019) noted a decrease in the percentage of free fatty acids when treated with ginger extract, Aboud (2021)

UTJagr This is an open access article under the CC-BY-NC-SA license (https://creativecommons.org/licenses/by-nc-sa/4.0/)

University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 13, Issue 2 (2024) PP 67-74

https://jam.utq.edu.iq/index.php/main *https://doi.org/10.54174/utjagr.v13i1.323*

when adding pumpkin seed extracts to minced camel meat, and Al-Musawi (2022) when adding ginger powder to buffalo meat.

Andres et al. (2017) did not notice a decrease in the percentage of free fatty acids when treating steaks with tomato pomace.

Table (4) Effect of adding different levels of clove extract on the value of free fatty acids (%) in buffalo meat stored cold for different periods of time (mean ± standard error).

Significant	Storage duration (day)					
	1	3	5	7	9	12
T1	0.47 ± 0.09	a 0.67 ± 0.07	a 1.77 ± 0.06	1.89a ± 0.15		
T2	0.43 ± 0.07	b 0.50 ± 0.08	b 0.63 ± 0.06	0.70 b ± 0.16	0.85 a ± 0.13	
T3	0.37 ± 0.05	c 0.33 ± 0.07	c 0.47 ± 0.06	0.49 c ± 0.14	0.64b ± 0.15	0.75 ± 0.10
T4	0.43 ± 0.11	c 0.30 ± 0.09	c 0.50 ± 0.07	0.53c ± 0.12	0.68 b ± 0.13	0.76 ± 0.11
Averages	N.S	0.05	0.05	0.05	0.05	NS

Different letters vertically indicate that there were significant differences between the averages of the coefficients below a significance level of 0.05. N.S means that there is no significant difference between the averages.

II. Conclusion

It can be concluded from the results of the current study that adding different levels of clove extract causes an improvement in the qualitative characteristics of buffalo meat burgers preserved in refrigeration for different periods of time, through a decrease in the number of peroxide and free fatty acids, the volume of the liberated liquid, and the pH compared to control treatments and different storage periods.

III. References

Abboud, Ghaida Ali Makki. (2021). The effect of adding alcoholic extract of pumpkin seeds on the chemical and qualitative characteristics of cold-preserved camel meat, Master's thesis, College of Agriculture, University of Basra.

AL Mousawi(2022) Noor M.D. ALMosawi Effect Of Adding Different Levels Of Ginger Powder To Chemical And Physical Forms Of Cold-Stored Buffalo Meat

Al-Adhari, Russell Ali Adnan (2017). Preparation of some plant extracts, identification of their active compounds, and study of their effect on the qualitative characteristics of beef patties stored by cooling and freezing. Master's thesis, College of Agriculture, University of Basra.

Al-Amiri, Marwa Thamer Ghayad Jassim. (2020). Extracting the gum from the fruits of the carob plant, and using it to study some qualitative characteristics of meat burgers stored by cooling and freezing, Master's thesis, College of Agriculture, University of Basra, Iraq.

UTJagr This is an open access article under the CC-BY-NC-SA license (https://creativecommons.org/licenses/by-nc-sa/4.0/)

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 13, Issue 2 (2024) PP 67-74

https://jam.utq.edu.iq/index.php/main *https://doi.org/10.54174/utjagr.v13i1.323*

Al-Daoudi, Taban Najm al-Din Majeed, Abdullah, Mahfouz Khalil, Mahmoud, Iyad Bakr. (2019). The effect of treatment with ginger extract and cold storage on some chemical, sensory and bacteriological characteristics of Kurdish lamb meat, College of Agriculture, Tikrit University, College of Agricultural Sciences, Sulaymaniyah University

Al-Moussawi, Nour Mohsen Dakhil. (2022). The effect of ginger on some qualitative characteristics of buffalo meat burgers preserved by cooling and freezing, Master's thesis, College of Agriculture and Marshlands - Dhi Qar University. Iraq

Al-Tufaili, Hawraa Hamed Shaker Ali. (2016). The effect of sprouted barley, flax seeds and maza as functional foods in preserving minced meat discs by cooling and freezing, Master's thesis, College of Agriculture, University of Basra, Iraq

Andres a, A. I., Petrón, M. J., Adámez, J. D., López, M., & Timón, M. L. (2017). Food by-products as potential antioxidant and 87 antimicrobial additives in chill stored raw lamb patties. Meat science, 129, 62-70

Discs ,Animal Producction Department ,Agriculture College University of Thi-Qar, 64001,Iraq.

Gharib, A., & Mahmmod, A. (2020). Effect Of Different Concentration Of Pomegranate Peel And Seed Extract On Some Chemical, Physical Traits And Sensory Evaluation Of Karady Sheep Meat During Different Frozen Storage. Assiut Veterinary Medical Journal, 66(164), 32-46

Jassim, Kholoud Obaid. (2016). The use of non-saponifiable substances extracted from red palm oil in improving the shelf life of frozen minced chicken meat, Master's thesis, College of Agriculture - University of Baghdad.

John, E. O., Lawrie, R. R. and Hardy, B. (1975). Effect of dietary variation with respect to rancidity exhibited by frozen procine muscle.J.Sci., Fd.Agric.,26:31-41

Kumari, P. K., Akhila, S., Rao, Y. S., & Devi, B. R. (2019). Alternative to artificial preservatives. Syst. Rev. Pharm, 10, 99-102.

Manessis, G., Kalogianni, A. I., Lazou, T., Moschovas, M., Bossis, I., & Gelasakis, A. I. (2020). Plant-derived natural antioxidants in meat and meat products. Antioxidants, 9(12), 1215.

Pearson, D. (1970). The chemical analysis of food. 6th ed., p.377, J. and A. Churchill, London

Pearson, D., Egan, H., Kirk, R. S. and Sawyer, R. (1981). Chemical analysis of food. Longman Scientific and Technical New York.

Shah, M. A., Bosco, S. J. D., & Mir, S. A. (2014). Plant extracts as natural antioxidants in meat and meat products. Meat science, 98(1), 21- 33

Whitnall, T., & Pitts, N. (2019). Global trends in meat consumption. Agricultural Commodities, 9(1), 96-99

UTJagr This is an open access article under the CC-BY-NC-SA license (https://creativecommons.org/licenses/by-nc-sa/4.0/ **)**