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Effect of adding lemon peel extract fortified with gelatin in preserving beef meatballs by refrigeration on some properties Microbial

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Abstract

The study aimed to use lemon peel extract at concentrations of 2,1.5,1,0.5% in storing beef meat balls in the refrigerator at a temperature of 4°C. The results showed a significant decrease in Total bacterial count For meat samples treated with lemon peel extract compared to the control treatment, which amounted to 192.32% On the sixth day of preservation, the treated samples remained within the standard limits until the refrigeration period, which reached 83.32, 75.11, 69.11 and 67.11 (cfu/g). Also, showed moral decline in amount number of cold-loving bacteria In beef meatball treatments with lemon peel extract compared to the control sample. The averages in the treatments were Second and Third, fourth, fifth 69.66 and 65.22 and 60.33 and 58.33 (cfu/g) To the governor in The sixth day of cryopreservation while in the control treatment it reached 93.22% for the same storage period

Keyword: beef meatballs, lemon peel, microbial characteristics

I. Introduction

Meat and meat products are considered it has a high nutritional value as it is a major source of essential amino acids that the human body needs. In building their tissues, and also considered a source main vitamin group B-complex and some mineral elements the most important one is iron, as it is a means of reducing malnutrition and increasing household food security(Plats-Mills *et al.*,2020). And for the chemical and biological nature of meat made it susceptible to spoilage during storage. Growth microbes are among the most important factors. Affecting the quality of meat, as oxidation negatively affects the taste and flavor, which reduces the shelf life of meat and its products.(Kazem et al., 2024) microbial growth also affects In food poisoning the can sing of and economic losses as a result Meat spoilage (Moustafa et al., 2022). Therefore, many privative artificial materials were used. for centuries to preserve flavor and improve taste Extending the shelf life of meat, which reduces food spoilage. Haque *et al.*, (2020)Lemon peels are an important source of biologically active compounds and have been used in folk medicine for centuries. Anti-inflammatory activity has been reported. For microbes the phenolic compounds of citrus peel and lemon have shown a low lipid peroxidation effect. Their extracts are rich sources of biologically active compounds, for example, flavonoids and vitamin C.C and therefore its addition to meat products Abd elnaeem *et al.*, (2022) Due to the importance of the topic, the current study aimed to achieve the following: Study of the effect of lemon peel extract on microbial properties







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II. MATERIAL AND METHODS

A. Materials used

Water extraction method for lemon peels/The aqueous extract is prepared according to the method of Roseçin *et al.*,(2003) Weight25 g of each sample was placed in 500 ml of boiling distilled water and left for 30 minutes on a magnetic stirrer, then filtered through filter paper with vacuum and then concentrated the filtrate in a rotary evaporator at a temperature of 40^m to get rid of the water, then leave the filtrate to dry at laboratory temperature (25M) Then put it in opaque, tightly sealed bottles and stored in the refrigerator at a temperature of 4^oC until use

Meat: Beef (thigh area) was obtained from local markets in Basra Governorate..

Beef meatball manufacturing and processing process

It was completed chop meat by Machine Chop Electric and add 15% fat, It was completed Chop Again with the fat for homogeneity, added 1.5% salt to meat samples Minced Treated meat With the plant extract, meat samples were treated with lemon peel extract at concentrations of 0.5, 1, 1.5, 2%, while the control treatment was left without addition and the samples were stored in the refrigerator at a temperature of 4°C for specific periods of time 0, 2, 4, 6, 8, 10 days.

Microbial tests

I did Bacterial testing of beef meatball samples During cryopreservation in the microbiology laboratory Belonging to the Animal Production Department, where Total bacterial count included Aerobic Plate Count (APC), Psychrophilic bacteria, Lipolysis bacteria and Proteolysis bacteria according to Eaton *et al.*, (2005)As follows:

1: Preparing the culture media

2: Prepare the dilution solution Peptone Water

Prepare peptone water by dissolving 1 g of peptone in 1 liter of water distilled and cultured in test tubes at a rate of 9 ml each. The tube was then closed well with cotton plugs. And sterilized well with Autoclave At 121°C 15 pound pressure/ENG2 and work from it Decimal reductions.

3: the count Total bacteria Nutrient Agar

I followed How to pour into dishes using the medium The agricultural Nutrient Agar, prepared Medium according to the instructions of the supplier, and sterilize Autoclaved at 121°C and 15 lbs./ Eng2 for 15 minutes total number of bacteria and cold-loving.

5Estimation of the number of cold-loving bacteria

Power Preparation of cold-loving bacteria in the same way Total bacteria estimation method above And I hugged Dishes in the refrigerator at temperature4 m For a period of10 days and then according to the number of bacterial cells From the following law:

Number of cells Bacterial/poison²From original sample = number of colonies In the dish \times invert the sample diluted.

Statistical analysis Statistical analysis

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The results were analyzed statistically using Three-factor experiment Completely randomized design (CRD) Complete Randomized Design The data were statistically analyzed using the ready-made statistical program SPSS (Genstate., 2012) and the results were compared using the least significant difference (RLSD) at probability level0.05

III. RESULTS AND DISCUSSION

1-Total number of bacteria

The results of the table (1) There is a significant decreasep ≤ 0.05) in the percentage of total bacteria in meatballs Cow When stored in a refrigerator at 4°C, treatment With different concentrations of lemon peel extract (0.5, 1, 1.52)% compared to the control sample, with the continued storage period, the percentage increased. Centennial To prepare the total bacteria in the control treatment of 59.39 (cfu/g) to 192.32 (cfu/g) on the sixth day of storage, On the seventh day, the control sample was excluded., While the middle average total bacterial counts reached Treatment With lemon peel extract on day 6 (83.32,75.11,69.11,67.11) (cfu/g) for concentrations (0.5, 1, 1.5, 2)% respectively., When comparing the treatments for beef meatballs on day 10 of refrigeration, the averages were (94.22, 92.21).cfu/g) for concentrations (0.5,1)% while reached(88.11,89.62) (cfu/g) for concentrations (1.5, 2)%, respectively.

The decrease in the total bacterial count in lemon peel treatments may be attributed to the lemon peel extract having active substances that inhibit bacterial growth and the phenolic compounds content of lemon peels helps them act as antimicrobials as a result of changing the permeability of microbial cell membranes.(Pure *et al.*, 2023) This is consistent with Abd el-Naeem *et al.*, (2022).

Table (1): The effect of using different concentrations of lemon peel extracting average numbers

Average	Periods							
	10	8	6	4	2	0	Transacti	
111.66			192.32	99.32	95.67	59.39	T1	
74.21	94.22	87.11	83.32	61.66	59.67	59.39	T2	
68.94	92.21	80.21	75.11	54.11	52.66	59.35	T3	
63.62	88.11	73.21	69.11	45.67	46.33	59.33	T4	
66.29	89.62	77.66	67.11	55.67	48.33	59.33	T5	
	91.04	79.55	97.39	63.29	60.53	59.35	Average	

Total bacteria (cfu/g) for chilled beef samples at 4°C

RLSD For transactions2.66

RLSD For extensions 2.75

2: Cold-loving bacteria



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Show Table results (2)The effect of using different concentrations of lemon peel extract (0.5, 1, 1.5,2)% Average numbers of cold-loving bacteria in meatball samples Beef stored refrigerated at 4°C ,There is a significant decrease ($p \le 0.05$) in the percentage of cold-loving bacteria in the treated beef meatballs and for Lemon peel extract compared to the control sample, with the continued storage period, the percentage increased. Centennial to prepare bacteria cold loving in the control transaction of 39.18 (cfu/g) to 93.22 (cfu/g) on the sixth day of storage and on the seventh day the control sample was excluded., While the average numbers of cold-loving bacteria for the lemon peel extract treatments on the sixth day were (69.66, 65.22, 60.33, 58.33).cfu/g) for concentrations (0.5, 1, 1.5, 2)% respectively. When comparing the treatments for beef meatballs on day 10 of refrigeration, the averages reached (90.11, 84.11) (cfu/g) for concentrations (0.5, 1)% while reached(74.33,75.67) (cfu/g) for concentrations (1.5, 2)%, respectively. The reason for the decrease in the numbers of cold-loving bacteria in lemon peel extract treatments may be attributed to the good antibacterial activity of lemon peel. Lemon peel extract may disrupt and destroy the cell walls of microbes and then penetrate the cell and disrupt its function. Wang *et al.*,(2022)

Where these results are consistent with Lorenzo *et al.*(2014) when studying the effect of plant extracts on the shelf life of pork patties. Antioxidants Naturalist has an effect against fat oxidation as well as reducing the number of bacteria, which leads to extending the storage period of meat products.

table(2): The effect of using	g different concentration	ns of lemon peel	extract on the	e average number	s of cold-
loving bacteria (cfu/g) for m	eatball samples stored r	efrigerated at 4°	°C		

	Periods						
Average	10	8	6	4	2	0	Transacti
							ons
79.69			93.22	88.33	74.33	39.18	T1
65.13	90.11	79.33	69.66	63.22	49.33	39.18	T2
61.75	84.11	75.33	65.22	61.44	45.33	39.15	T3
55.72	74.33	66.11	60.33	54.11	40.33	39.11	T4
55.89	75.67	67.11	58.33	55.22	39.87	39.11	T5
	84.25	74.81	69.35	64.46	49.84	39.14	Average

RLSD for transactions0.16

RLSD for duration2.62

3: Lipolysis bacteria

The results of the table (3) showed the effect of using different concentrations of peel extract lemon (0.5, 1, 1.5,2)% in the middle average number of lipolysis bacteria in beef meatball samples stored in the refrigerator at 4°C showed a significant decrease ($p \le 0.05$) in the percentage of fat-degrading bacteria in processed beef meatballs and With extract Peels Lemon Compared to the control sample, as the storage period continued, the percentage increased. Centennial to prepare lipolysis bacteria in the control treatment of 45.17 (cfu/g) to 57.11 (cfu/g) on the sixth day of storage and on the seventh day the control sample was excluded., While the average number of lipolysis bacteria for treatments with peel extract reached Lemon On the sixth day (49.33,33.32,31.98,27.85) (cfu/g) for concentrations (0.5, 1, 1.5, 2)% respectively., When comparing the treatments for beef meatballs on day 10 of refrigeration, the averages were (30.88, 24.92).cfu/g) for concentrations (0.5, 1)% while reached(21.28,23.18) (cfu/g) For concentrations (1.5,2)% respectively this is due to the presence of marginal in lemon peels, which has an antimicrobial effect and may in turn enhance the shelf life of foods. Simranpreet and Chayanika.,(2021).These results agree with Hassan *et al.*(2017) When studying the antibacterial and antimicrobial activity of citrus peels in beef





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table(3): The effect of using different concentrations of lemon peel extract on the average numbers of lipolysis bacteria (cfu/g) for meatball samples stored refrigerated at 4° C)

	Periods						
Average	10	8	6	4	2	0	Transactions
45.49			57.11	49.32	46.22	45.17	T1
42.12	30.88	37.95	49.33	46.11	43.33	45.17	T2
35.59	24.92	30.11	33.32	38.76	41.28	45.14	Т3
32.05	21.28	26.62	31.98	28.98	38.33	45.11	T4
31.93	23.18	25.33	27.85	29.76	40.33	45.11	T5
	27.06	32.03	39.92	38.59	41.90	45.14	Average

RLSD for transactions0.12

RLSD for duration1.33

4-Proteolytic bacteria

I showed Table results (4) showed the effect of using different concentrations of lemon peel extract was (0.5, 1, 1.5,2)% There was a significant decrease in the average number of proteolysis bacteria in beef meatball samples stored in the refrigerator at 4°C.($p \le 0.05$) in the percentage of protein-degrading bacteria in processed beef meat balls and for Lemon peel extract compared to the control sample, with the continued storage period, the percentage increased. Centennial to prepare proteolysis bacteria in the control treatment of 30.09 (cfu/g) to 43.13 (cfu/g) on the sixth day of storage and on the seventh day the control sample was excluded., While the average numbers of proteolysis bacteria for the lemon peel extract treatments on the sixth day were (25.11, 31.44, 25.11, 27.78).(cfu/g) for concentrations (0.5, 1, 1.5, 2)% respectively. When comparing the treatments for beef meatballs on day 10 of refrigeration, the averages were (25.33, 28.11) (cfu/g) for concentrations (0.5, 1)% while reached(19.71,23.08) (cfu/g) for concentrations (1.5, 2)%, respectively. The reason for the decrease in the number of proteolysis bacteria in lemon peel extract treatments may be attributed to the lemon peels possessing active substances that inhibit the growth of bacteria and microbes Badr Eldin *et al.*, (2024). These results are consistent with Dua *et al.*, (2015) when studying effect of lemon peel extract on storage quality of fried lamb ribs

table(4): The effect of using different concentrations of lemon peel extract on the average numbers of proteolysis bacteria (cfu/g) for meatball samples stored refrigerated at 4°C

	Periods						
Average	10	8	6	4	2	0	Transactions
37.34			43.13	39.67	36.55	30.09	T1
28.90	25.33	28.77	25.11	30.42	33.75	30.09	T2
31.22	28.11	29.11	31.44	33.55	34.41	30.07	T3
25.62	19.71	22.44	25.11	27.32	29.12	30.02	T4
27.85	23.08	26.11	27.78	29.76	30.31	30.02	T5
	24.23	26.61	30.52	32.15	32.83	30.05	Average

RLSD For transactions 1.06

RLSD For extensions 0.49

IV. CONCLUSION





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The results showed a decrease in microbial contamination indicators in samples of mail-stored beef meatballs when treated with different concentrations of lemon peel extract compared to the control sample.

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