Iraqi Journal of Market Research and Consumer Protection
(2025) 17(3): 47-58.
DOI:
Hassan & Hadi

المجلة العراقية لبحوث السوق
وحماية المستهلك

STUDY OF THE QUALITATIVE CHARACTERISTICS OF ARTEMISININ EXTRACT AND ITS ROLE IN PRESENVING LOCAL CHICKEN MEAT

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Received 19/ 11/ 2023, Accepted 3/ 1/ 2024, Published 31/ 12/ 2025

ABSTRACT

The study aimed to determine the effect of alcoholic extract of the wormwood plan (Artemisia -herba -alba) extract on some physical and sensory characteristics of minced chicken meat kofta and the extent of the shelf life of chicken meat during periods of cold storage and to compare it with imported commercial artemisinin. Concentrations of (2, 3, 4) mg/g Alcoholic extract of wormwood and commercial artemisinin for minced chicken meat samples samples were added to minced chicken meat. Microbial tests were conducted on the meat before cooking and during storage periods. After cooking, physical and sensory tests were conducted on the product. The results of the microbial examination showed a significant decrease in the logarithmic bacterial count with increasing concentration, a significant increase ($p \leq 0.05$) in the pH value, and a decrease in the loss of oozing fluid and the (P.V).The results of the sensory evaluation when adding natural artemisinin extract and commercial artemisinin to chicken breast meat kofta indicated a significant decrease ($p \leq 0.05$) with an increase in concentration the assessors did not accept the product because the product has a pungent taste and a bitter aftertaste due to the compounds. It contains flavonoids, saponins, and santonin, which are responsible for the bitter taste، However, the A1 treatment had a significant difference close to the control sample in all characteristics, especially in the freshness characteristic, which reached.(6.2)

We conclude from the study that artemisinin extract has anti-pathogenic activity against some types of pathogenic bacteria. It can also be used in food preservation by synergizing it with another medicinal plant in order to improve the taste.

Keywords: Minced chicken meat Wormwood extract Natural artemisinin, Commercial artemisinin, Microbial, physical examinations, sensory evaluation.

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(2025) 17(3): 47-58.

دراسة الخصائص النوعية لمستخلص الشيح ودوره في حفظ لحم الدجاج المحلي

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الخلاصة

هدفت الدراسة الى معرفة تأثير المستخلص الكحولي لنبات الشيح (Artemisia herba alba) على بعض الصفات الفيزيائية والحسية لكفتة لحم الدجاج المفروم ومدى صلاحية لحم الدجاج خلال فترات الخزن بالتبريد، ومقارنته بـ (Artemisinin) التجاري المستورد، حيث اضيفت تراكيز (2،3،4) ملغم/غم من المستخلص الكحولي لنبات الشيح والارتميسينين التجاري لعينات لحم الدجاج المفروم، أجريت الفحوصات المايكروبية للحم قبل الطبخ بفترات الخزن وبعد الطبخ أجريت الفحوصات الفيزيائية والحسية للمنتوج،وقد اظهرت نتائج الفحص المايكروبي انخفاض معنوي في العد البكتيري اللوغارتمي بزيادة التركيز ، وارتفاع القيمة المعنوية ($p \leq 0.05$) في قيمة الاس الهيدروجيني وانخفاض في فقدان السائل الناضح وقيمة البيروكسيد (P.V)، كما اشارت نتائج التقييم الحسي (الطراوة والعصيرية والنكهة واللون والتقبل العام) عند اضافة مستخلص الارتميسينين الطبيعي والارتميسينين التجاري لكفتة لحم صدر الدجاج انخفاض معنوي ($p \leq 0.05$) بزيادة التركيز اذا لم يحظى المنتوج مقبوليه من قبل المقيمين لكون المنتوج له طعم لاذع ومذاق مر بسبب المركبات الموجوده فيه من فلافونيدات وصابونينات ومادة السانتونين المسؤوله عن الطعم المر فهو يصنف بانه اكثر النبات الطبية مرارة ولهذا استخدم في علاج الملاريا وآلام المعدة وفقدان الشهيه. ومع ذلك فقد حازت معاملة A1على فرق معنوي قريب من عينة السيطرة في كل الصفات وخاصة في خاصية الطراوة التي وصلت الى (6.2).

نستنتج من الدراسة أن مستخلص نبات الشيح (الارتميسينين) يمتلك فعالية مضادة لانواع من البكتريا الممرضة، كما يمكن استخدامه في حفظ الاغذيه عن طريق تآزره مع نبات طبي أخر بهدف تحسين الطعم.

الكلمات المفتاحية: لحم الدجاج المفروم، مستخلص الشيح الارتميسينين الطبيعي، الارتميسينين التجاري، الفحوصات المايكروبية والفيزيائية والتقييم الحسي.

INTRODUCTION

Most consumers prefer fresh poultry meat over frozen meat. This is due to defects in appearance, flavor, tenderness, nutritional value and general acceptability of the product **(Chatterjee & Rajkumar, 2015)** .Chicken may be susceptible to spoilage due to bacteria and other sources. Therefore, these changes negatively affect the sensory qualities of the meat , For this reason, many studies have been conducted to reduce or kill the content of contaminating microorganisms in meat and meat products. Some studies recommend the use of preservatives that act as antimicrobials. Suppose added to meat in different types and concentrations (**Mothershaw & Jaffer, 2004**). Due to the increasing demand for food products free of chemical preservatives, food preservation faces great challenges in finding preservatives from natural sources that have effective ingredients that can be used to preserve meat and food and prolong their shelf life (**Kennedy *et al.*, 2005**) (**Al-Manhal, 2013**).In recent times, plant extracts have provoked remarkable interest, as they are a source of natural products, they possess protective specifications and protection when used as therapeutic alternatives **(Al-Hafud**, **2017**)There are many natural herbs and plants known for their benefits and medicinal uses, such as antioxidants and antimicrobials, they can be used as food additives and spices, or their extracts can be used as preservatives.**(Hadi, 2018**). Plant extracts represent a tool to combat microorganisms, as they are considered a safe alternative compared to chemical extracts. Natural sources of medicinal herbal plants have become the focus of attention. They are an important source for obtaining effective compounds that can be used as natural food additives instead of industrial chemical additives to prevent food spoilage **(Ismail, 2010**). Among these medicinal herbs is (*Artemisia herb alba*). It is a mainly branched woody herbaceous plant belonging to the family (Asteraceae). The genus contains approximately 380

species distributed throughout europe, tropics, southwest asia, middle east, north africa, and northeastern america **(Watson *et al*., 2002**). This species is commonly found in many areas of Iraq, including the northwest of mandali, lake tharthar, erbil, basra, rutba, jazira region in najaf, sinjar, western desert west of ramadi, and salman bak (**Hamid *et al,. 2018***). According to the World Health Organization (**WHO. ,2006**), *Artemisia* annuum possesses effective antibacterial and anti-inflammatory properties. The plant is a unique source of *artemisinin*. Recent studies have also proven that it is effective in killing breast cancer cells in addition to being effective against malaria. Studies have also focused on evaluating its effectiveness as an antidote to HIV (**Dunya, 2015**). In addition, the flavonoids found in *wormwood* have antioxidant and anti-cancer activity when combined with *artemisinin* (**Ferreira &Janick, 2009**). It was also found that *wormwood* is rich in essential oils (0.37% of the wet plant), these oils are *artemisia* Ketone up to 68%, Cincole 1-8 up to 51.5%, and Camphor up to 48% (**Bilia *et al*., 2006; Donato e*t al*., 2015**). It also showed activity against types of gram- positive bacteria, including (*Escherichia coli, Salmonella, Haemophilus, Pseudomonas*) and gram-positive bacteria, such as (*Staphylococcus, Streptococcus, Listeria, Bacillus,* and *others*), as well as some types of fungi, including (*Aspergillus*, *Saccharomyces*, and *Candida*) (**Donato *et al.,* 2015**). because of the above and the importance of prolonging the shelf life of chicken meat and preserving its quality and sensory characteristics by using some internationally permitted medicinal plant additives. Due to the scarcity of research on the use of the *wormwood* plant in food preservation, our study aimed to use the natural *artemisinin* plant extract as a preservative to prolong the shelf life and compare it with the commercial *artemisinin* prepared by Sigma.

MATERIALS AND METHODS

The study was conducted in one of the laboratories of the Ministry of Science and Technology/Department of Environment and Water/Food Contamination Unite after obtaining the *Artemisia* plant from a nursery in the city of Baghdad in September 2022. It was dried in the shade away from moisture at room temperature (25-30°C). Naturally, for ten days, with continuous monitoring to prevent rotting, the herb was classified at the University of Baghdad / College of Science, Department of Life Sciences, and it turned out to be a variety of Artemisia herba alba, Asteraceae family.

Preparation of the extract:

To prepare the alcoholic *artemisia* plant extract, a 50 g sample of the ground *(artemisia herb alba*) plant powder was taken and placed in a piece of cloth (medical gauze) inside a Soxhlet device, added 500 ml of ethyl alcohol at a concentration of 80%, as it is a good solvent for the active ingredients present in the plant. The extraction process lasted 12 hours at room temperature and away from light (**Al-Jubouri *et al.,* 2022**). The extract was then transferred from the Soxhlet device to the rotary evaporator vacuum device at a temperature of 45°C for two hours to remove the alcoholic solvents (**Brown & Poxton, 1996**). We obtained a clear, dense extract for the purpose of diagnosing the *artemisinin* compound. I Followed the scientist's method (sykamn) by using a high-performance liquid chromatography device, a German model equipped with an ODS C18 analytical column (mn5,4.6mm x 250mm). was used for analysis. The composition of the mobile phase was acetonitrile DW: (70:30 v/v) rate. Flow 1.2ml/min 100µl injected with UV detection at 213nm.
The concentration rate was calculated according to the equation:

Concentration of Substance =concentration of standard substance × area of the model/ area of the standard substance × number of ways used/ weight of the model

The results showed that the sample contained *artemisinin* at a concentration of (16.8 ppm). We considered this percentage to be the concentration of the commercial extract that was relied upon in the experiment. The second concentration that we obtained was the extract (natural alcoholic artemisinin). It has been proven effective in inhibiting bacteria and fungi at a concentration of 150 mg/ml. Therefore, it was relied upon in the experiment, and the overlap ratio was (1:1) for both the concentration of natural artemisinin extract and commercial artemisinin.

Preparing chicken meat samples:

For the chicken samples used in the experiment, broiler chickens were obtained at approximately 4 months of age from one of the local markets in the city of Baghdad. After slaughtering and cleaning, they were cut into main pieces, isolated the breast meat cuts. It was cut into small pieces to be chopped using an electric chopper after the tools used in the experiment were sterilized. It was distributed into 7 treatments, at a rate of 20 g/kg for each treatment. The minced meat samples were mixed with the concentrations used using sterile medical gloves for the purpose of well-homogenizing each treatment separately. It was stored in the laboratory refrigerator at a temperature of 4°C, after which microbial, physical, and sensory tests could be conducted.

Preparation of chicken meat kofta:

Natural *artemisinin* extract and commercial *artemisinin* were used in the manufacture of chicken kofta as a partial substitute for the ingredients included in the preparation by adding them in concentrations (2،3،4)ml of a concentration of 150 mg the natural extract and (2،3،4) ml of a concentration of 16.8 mg for the commercial extract (and double the percentage compared to the chicken percentage while preparing a standard sample). Minced chicken meat used weighing 700 grams, to which only 1.0% salt was added. It was divided into 7 parts weighing 100 grams for each sample. Then, add the extracts to it at the concentrations mentioned above. The mixing process was carried out homogeneously for each sample, then prepared chicken kofta in equal sizes and placed it in the electric fryer at 160°C for 20 minutes.

Microbial tests:

Using the pour plate method mentioned before **FD (2021**) transfer 0.1 ml of the third aliquot using (Micropipate) sterile petri dishes containing 15 ml of pre-prepared Nutrient Agar medium, spread using a glass spreader (spreader) in the shape of the letter L. It was left until it hardened and stored upside down at a temperature of 4°C.

Physical examinations

Loss of exudate fluid

It was estimated according to the method presented by **Alvarado & Sam (2002**) by weighing fresh meat samples and placing them in polyethylene bags. It was stored in the refrigerator at 5°C for 24 hours. These samples were weighed again after drying the surface of the meat from the oozing liquid using filter paper. The percentage of lost exudate fluid was calculated according to the following equation:

Percentage of lost exudate fluid %= Initial meat weight - final meat weight/ Initial meat weight ×100

Measurement of pH

pH was measured according to the method presented by the scientist **Chakraborty & Dash (2014)** the article stipulates that take 10 grams of the sample, add 100 ml to it, and homogenize it for one minute. Then, filter the sample and measure its pH using a pH meter.

Estimation of the peroxide value

The estimate was made based on **(Egan *et al.*, 1981**), where 2 grams of the extracted fat were weighed using a Soxhlet device. Add to it 30 ml of a mixture containing (3 parts of glacial acetic acid + 2 parts of chloroform), with the addition of 0.5 ml of saturated potassium iodide, 30 ml of distilled water, and 1 ml of the starch index (1%). The mixture is flushed with a thiosulfate solution. Sodium ($Na_2S_2O_3$) has a standard of 0.1 until the blue color disappears, and it is estimated based on the following equation:

Peroxide number (mEq) = The number of millilitres of sodium thiosulfate is 0.01 × 1000/the weight of the model.

Sensory evaluation:

Sensory evaluation is characterized by determining evaluation characteristics, including juiciness, freshness, flavor, color, and general acceptability. The sensory evaluation scores for each characteristic ranged from (1-7) juiciness. (1) Very dry (7) Very juicy, tender (1). Not mushy. (7) Very tender, flavor (1). Totally non-existent (7) Very strong flavor, color (1). Unacceptable. (7) Very acceptable, general acceptance (1). Very unacceptable. (7) Very acceptable (**Al-Hajo *et al*., 2008**). The sensory assessment was conducted at the University of Baghdad/College of Education for Girls/Department of Home Economics. Ten faculty members specializing in food and nutrition participated in it. They were provided with information about the nature of the evaluation, taking into account the time period between cooking and the time of the evaluation.

STATISTICAL ANALYSIS

The Statistical Analysis System - SAS (2018) program was used to detect the effect of variation factors in the study parameters. LSD least difference test (Analysis of Variance-ANOVA) was used for a significant comparison of means in this study.

RESULTS AND DISCUSSION

Microbial tests

The results of Table No. (1) showed the effect of natural *artemisinin* extract and commercial *artemisinin* in preparing Psychrophiles bacteria for minced chicken meat stored cold at a temperature of (4)°C and at concentrations (2, 3, 4) mg/g of meat. The average logarithm of the number of Psychrophiles bacteria for the first day in natural *artemisinin* (A1, A2, and A3) (25, 17, and 0) cfu/ml×10^3 compared to the control factor (53) cfu/ml ×10^3. As for commercial *artemisinin*, the log rate reached (0) cfu/ml×10^3 for all concentrations compared to the control factor. When stored for three days, the total number of treatments (A1, A2, and A3) reached (93, 80, and 0) cfu/ml ×10^3. As for the control treatment without addition, it reached (217) cfu/ml×10^3. As for commercial *artemisinin*, the bacterial numbers after 3 days reached (9, 5, and 0) cfu/ml×10^3 compared to the control treatment (217), while the number of Psychrophiles bacteria on the fifth day reached (500, 450, and 115) cfu/mlx10^3 for natural

artemisinin compared to the control (500) cfu/ml×10^3. In commercial bacteria, the numbers reached (517, 483, 76) cfu/ml×10^3 compared to the control treatment (without addition) (500). When stored for the seventh day, the average number of bacteria in the control plant was (5167) cfu/ml×10^3, while in the treatments (A1, A2, and A3) their numbers reached (4245, 2933, and 152) cfu/ml×10^3, while in (R1, R2, and R3) their numbers reached (4167, 1273, and 125) cfu/ml×10^3. Compared to the control (5167), respectively, we notice that the number of bacteria decreases with increasing concentration due to the presence of active compounds in the *wormwood* plant, this was confirmed by (**Mohammed *et al.*, 2021**) when studying the phenolic composition, antioxidant capacity, and antibacterial activity in white (*Artemisia herba alba*), where he emphasized the role of the compounds. The active ingredients present in the plant and their ability to inhibit bacterial growth. At the same time, we notice that the bacterial count increases with increasing storage periods. This means that there are Psychrophiles bacteria that are responsible and spoilage of meat. They tolerate low temperatures and do not stop growing, and this is consistent with what was stated (**Zangana & Kalaf, 2010**) when performing a microbial count of Psychrophiles bacteria on chicken breast slices after immersing them in certain concentrations of ginger solution and storing them at a temperature of (4°C), the study complies with the Iraqi standard specification (**Central Agency for Specifications & Standardization, 1987**) for refrigerated and frozen red meat and poultry products issued by the Central Organization for Standardization and Quality Control, which It stipulates that the total bacterial count should not exceed 1×10^7 Cfu/g of meat.

Table (1): Impact of natural artemisinin and commercial artemisinin extract on storage periods on Psychrophiles bacteria logarithm Cfu/ml.

Treatment	Day1		Day3		Day5		Day7	
	A	R	A	R	A	R	A	R
Control(B)	53	53	217	217	500	500	5167	5167
2mg/g (A1,R1)	25	0	93	9	450	517	4245	4167
3mg/g (A2,R2)	17	0	80	5	297	483	2933	1273
4mg/g (A3,R3)	0	0	0	0	115	76	152	125
LSD p value (NS/S/HS)	3.923 0.046 S		3.266 0.029 S		4.183 0.004 HS		4.977 0.001 HS	

A: natural artemisinin, R: commercial artemisinin

-Values expressed as(× 10^3)

Physical tests

The results of the statistical analysis in Table no. (2) showed that there were significant differences at the significance level ($p \leq 0.05$) in the pH value of the different chicken kofta treatments. The pH of the natural *artemisinin* extract reached (6.00, 6.5, 6.10) mEq/g compared to the control factor, which amounted to (5.92) mEq/g. When comparing natural *artemisinin* with commercial *artemisinin*, we find that the pH value in the commercial extract is (6.18, 6.10, 6.2) per mEq/g compared to the control factor (5.92) mEq/g. This is due to the ability of the natural *artemisinin* extract to retain water, which fills the spaces formed between the peptide chains with larger amounts of water. It thus moves the pH away from the electrically neutral point. *Artemisinin* extract works similarly

to salts. This increases the repulsive forces between protein molecules bearing the same charge (**Millier &Palumbo, 1993**). this is what we, the results of our study were consistent with a study **(Zangana & Khalaf, 2010)** which observed a slight increase in the pH value with increasing ginger solutions at a concentration of (1, 3, 5%) in which chicken meat was immersed compared to (0%). While a study **(Al-Hajo *et al*., 2008**) disagreed, the extract and powder of the chamomile plant did not affect the pH value of chicken breast meat. There were no significant differences in the peroxide value (P.V.). The results in Table no. (2) showed a significant decrease in chicken meat kofta samples treated with natural *artemisinin* extract more than commercial *artemisinin* compared to the control treatment, where the peroxide peak (P.V.) in natural *artemisinin* extracted from the *artemisia* plant reached (3.88, 3.60, 3.48) mEq/g, respectively. as for commercial *artemisinin*, the peroxide value (P.V.) ratio was (4.00, 3.80, and 3.71) mEq/g, respectively, compared to the control factor (4.15) mEq/g, the results agreed with a study **(Nasser, 2013**) of chicken meat samples to which Nomi basra waste and the probiotic were added to their diet after being stored for 30 days in the freezer. While (**Abbas, 2018**) indicated in his study an increase in the peroxide value of fat extracted from the hollow and flat types of cow, sheep, and chicken bones. The peroxide percentage was estimated at (1.33, 1.60) for the hollow bones and (1.46, 1.73) for the flat bones. The results of the leachate also showed a decrease in the liquid percentage with increasing concentration. In Table no (2) The liquid percentage in natural *artemisinin* reached (3.22, 3.05, 2.55) mEq/g compared to the control plant (4.21) mEq/g. as for commercial artemisinin, the leachate percentage reached (2.78, 3.00, 3.58) mEq/g compared to the control plant (4.21) mEq/g. agreeing with the study (**Zangana, 2015**). It was noted that there was a significant decrease ($p \leq 0.05$) in the percentage of loss in exudate fluid after treating the chicken with date vinegar, green tea extract (10%), and red onion extract (10%) and storing it for (1, 14, 28) days (**Nasser, 2013**).also conducted a study in which the waste of the manufacturing plants of Nomi Basra syrup was used at concentrations of (5 and 10%) with the addition of a probiotic at a concentration of (3%) in broiler feeds. The statistical analysis did not show any significant differences, as the average for the year reached (1.39, 1.21, 1.33). gm, respectively. When no major physical changes are made in chicken meat samples, it has a good effect on the sensory characteristics represented in flavor, palatability and color. This is due to the presence of active compounds in the wormwood plant, which have a role in preserving the physical characteristics of the chicken.

Table (2): Effect of adding natural plant *artemisinin* and commercial *artemisinin* extract on the value of pH, peroxide number (P.V.) and succulents in chicken breast kofta:

Concentration	Variables					
	PH		(kg/m.equ) P.V		(%) Mature liquid	
	A	R	A	R	A	R
Control(B)	a 0.33± 5.92	a 0.33± 5.92	a 0.28± 4.15	a 0.28± 4.15	a 0.28± 4.12	a 0.28± 4.12
2Ml (A1,R1)	a 0.41± 6.00	a 0.28± 6.02	ab0.19± 3.88	ab0.28± 4.00	b 0.22± 3.22	b 0.22± 3.58
3Ml(A2,R)	a 0.37± 6.05	a 0.44± 6.10	b 0.25± 3.60	b 0.26± 3.80	b 0.19± 3.05	b 0.18± 3.00
4Ml(A3,R3).	a 0.39± 6.10	a 0.52± 6.18	b 0.22± 3.48	b 0.18± 3.71	c 0.15± 2.55	c 0.14± 2.78
LSD p value (NS/S/HS)	NS 0.0859		S 0.0482		S 0.0326	

A: natural artemisinin, R: commercial artemisinin

Sensory evaluation of fresh local minced chicken meat:

(Table, 3) presents the results of the sensory and gustatory evaluation of the minced and fresh chicken meat treatments. The results showed that there were significant differences between the studied transactions.

Characteristic of freshness:

The results in Table No (3). showed that there was a significant difference at the significance level (P≤ 0.05) in evaluating freshness in favor of natural *artemisinin* treatments. All of them outperformed the control factor (without addition) (A3, A2, A1). Its evaluation score reached (6.2, 5.7, 5.6) compared to the control factor, whose evaluation score reached (5.5). As for commercial *artemisinin*, the freshness evaluation scores recorded a noticeable decrease. In the treatments (R1, R2, R3), it reached (3.1, 2.9, 1.8) compared to the control factor (5.5). We note that the degree of freshness evaluation has increased in natural artemisinin treatments. This increase may be due to the increase in moisture content in the meat. Thus improving the tenderness of chicken meat. This characteristic is essential because its changes are often accompanied by denaturation of proteins in general. Changes in protein affect tenderness as a result of the interaction of various chemical and physical factors with each other. Tenderness is an essential feature in the palatability of meat. This is what (**Zangana, 2015**) stated when studying the synergistic effect of rosemary and black seed on the sensory characteristics of minced chicken meat, where the double addition contributed to an increase in the tenderness characteristic.

Juiciness:

It was observed that there were significant differences in the same table (3) for the juiciness at the significance level (P ≤ 0.05). In treatment (A1) of natural *artemisinin*, its evaluation score was (6.0), compared to the control plant, which had an evaluation score of (5.3). In the two treatments (A2 and A3), the evaluation score reached (5.9, 5.5) compared to the control treatment (5.3) for commercial *artemisinin*. There was a decrease in juiciness. The evaluation score for the treatments (R1, R2, R3) was (3.2, 2.8, 2.2) compared to the control factor's evaluation score (5.3). The increase in juiciness is due to the ability to hold water. Hence, the increase in the moisture content of chicken meat was confirmed by (**Al-Hajo *et al.*, 2008**). when adding gerbil leaf powder to chilled minced chicken meat tablets. However, the increase in the degree of juiciness decreases with increasing storage period due to the high loss

during cooking, which is reflected in the juiciness. We note that the results of the sensory evaluation of juiciness are similar to the results of the evaluation of freshness. There is a direct relationship between the quality of tenderness and the quality of juiciness. Freshness increases with increasing juiciness.

Flavor:

The results of the statistical analysis in the same table no. (3) indicated that there were significant differences at the significance level (P≤ 0.05) in the flavor characteristic. The highest value in the factor (A1) for natural *artemisinin* was (6.5) compared to the control factor (without addition); its evaluation score was (5.5). It is noted in the table that the flavor rating began to decrease with increasing concentration. The evaluation score for the two treatments (A3, A2) was(3.6, 3.2.)As for the commercial *artemisinin*, the results showed a noticeable decrease in the significance level (P ≤ 0.05). The evaluation score for the treatments (R3, R2, R1) was (1.9, 1.7, 1.3), respectively, compared to the control factor evaluation score (5.5). The reason for the decrease in the flavor evaluation score is the bitter taste present in the *wormwood* extract because it contains the substance (santonin), which has a bitter, pungent taste. The results of our study came with a study conducted at Tehran University of Medical Sciences (2012) that studied the effectiveness of the essential oil of the tarragon plant (*Artemisia dracunculus*). One of the types of wormwood grows in Iran against the bacteria found in Iranian cheese. It has been proven effective against some types of bacteria. However, when conducting a sensory evaluation, the results were low because of the annoying flavor it added to the taste. The added concentrations created disturbing sensitivity toward the acceptability of the sample (**Raeisi *et al.*, 2012**)

Color:

The results of the statistical analysis in Table no. (3) indicated that there were significant differences at the significance level (0.05≤P) in the color attribute between the treatments (A3, A2, A1). If the evaluation scores reached (5.7, 5.4, 4.3) respectively, compared to the color characteristic of the control plant, its evaluation score reached (6.2), the highest value in the color characteristic of natural *artemisinin* was in the (A1) plant, reaching (5.7) compared to the control plant. As for the commercial *artemisinin* treatments, a decrease in all treatments compared to the control factory is observed if the evaluation score for the color characteristic in (R1) reaches (4.4), then followed by the two treatments (R3, R2) with their evaluation scores (4.4, 3.6). It is noted that the decrease in the degree of evaluation of the color characteristic is a result of the increase in the concentration of the extract. This was confirmed by **(Jumaili,2005**) when adding 20% wet soy protein with different percentages of aged beef and chicken meat.

General acceptance:

The results of the statistical analysis in the same (table,3) showed that there were significant differences in the degrees of general acceptance at the significance level (P≤ 0.05) in the natural *artemisinin* treatments (A1, A2, A3), compared to the control factory whose evaluation score reached (5.4). As for natural *artemisinins*, they reached (5.1, 4.5, 4.0), respectively. As for commercial *artemisinin*, the general acceptance rating in the treatments (R1, R2, R3) reached (3.4, 3.3, 2.6). The quality of acceptability is linked to the quality of flavor and color. The decrease in the overall acceptance rating is a result of the decrease in the rating of flavor and color. Thus, it was concluded that *wormwood* extracts are effective against some types of pathogenic bacteria. It can also be used as a food preservative, as adding medicinal plant extracts found in nature has an effect in reducing the process of fat oxidation,

preserving cell membranes and nutritional values, and improving sensory qualities. this was supported by **(Al-Alwani, 2017**) and agreed with what (**Al-Salmani, 2020**)

Table (3): Sensory evaluation results of chicken meat kofta treated with natural artemisinin extract from the wormwood plant and commercial artemisinin.

Transaction	Sensory evaluation results				
	Tenderness	Juiciness	Flavor	color	Acceptance
Control(B)	5.5±0.25 a	5.3 ±0.24 a	5.5 ±0.27 a	6.2 ±0.32 a	5.4 ±0.26 a
A1 (2ml)	6.2±0.34 a	6.0 ±0.33 a	5.7 ±0.31 a	5.7 ±0.26 a	5.1 ±0.19 a
A2 (3 ml)	5.7±0.30 a	5.9 ±0.28 a	3.6 ±0.19 b	5.4 ±0.22 a	4.5 ±0.18 a
A3 (4 ml)	5. 6 ±0.29 a	5.5 ±0.26 a	3.2 ±0.14 b	4.3 ±0.18 b	4.0 ±0.13 ab
R1 (2 ml)	3.1 ±0.16 b	3.2 ±.11 b	1.9 ±0.05 c	4.4 ±0.15 b	3.4 ±0.09 b
R2 (3 ml)	2.9 ±0.08 b	2.8 ±0.08 b	1.7 ±0.03 c	4.4 ±0.20 b	3.3 ±0.11 bc
R3 (4 ml)	1.8 ±0.07 c	2.2 ±0.07 b	1.3 ±0.03 c	3.6 ±0.15 b	2.6 ±0.07 c
LSD p value (NS/S/HS)	4.383 0.008 HS	4.233 0.009 S	3.662 0.039 S	3.611 0.041 S	3.398 0.028 S

A: natural artemisinin, R: commercial artemisinin

CONCLUSION

Through these results, we concluded that chicken meat treated with the natural artemisinin extract extracted from the wormwood plant led to an improvement in its qualitative characteristics compared to the synthetic artemisinin extract. This improvement was demonstrated by decreased exudate loss, lower pH, and pronounced inhibition of the growth of psychrophilic bacteria. With regard to sensory evaluation, it was found that the results of the (A1) treatment were close to the results of the control treatment. Treatment (no additives).

ACKNOWLEDGEMENTS

I would like to extend my thanks and gratitude to all who helped me to complete this paper especially professors of the Department of Home Economics Faculty of Education for girls.

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