Effect of adding different concentrations of the tamarind pulp to drinking water in some of the sensory traits for the meat of the two cuts (chest and thigh) for the broiler chickens carcasses (1)

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ABSTRACT

This study was conducted in the poultry field belonging to the Animal Production Department, College of Agricultural Engineering Sciences, University of Baghdad, Abu Ghraib for the period from 19/9/2016 until 30/10/2016 in order to knowing the effect of adding different concentrations of the tamarind pulp to drinking water in some of the sensory traits for the meat of the two cuts (chest and thigh) for the broiler chickens carcasses for the age of 42 days. 120 chicks of unsexed of broiler chickens (Ross 308) were used at age of one day, with an initial average weight amounted to (41.5 g). The chicks were fed on the initiator diet for the first three weeks from the age of the birds, and the finisher diet for the fourth, fifth and sixth weeks from the age. The birds were distributed on four treatments: the first treatment is control treatment (without adding, T1) and the treatments (T2, T3, T4), which represented by adding the tamarind pulp to drinking water with concentrations of (5, 15, 25 $g.L^{-1}$), The results showed: The treatments (T3, T4) obtained the highest values in the traits of the flavor, Tenderness, juiciness, overall acceptance and general appearance of the chest cuts compared with the control treatment (T1). The treatments (T3, T4) obtained the highest values in the traits of the flavor, Tenderness, juiciness and the treatment in the traits of overall acceptance and the adding treatments (T2, T3, T4) in the traits of the general appearance.

Keywords: The tamarind pulp, Sensory traits, broiler chickens.

تأثير أضافة تراكيز مختلفة من لب التمر هند الى ماء الشرب في بعض الصفات الحسية للحم قطعتي الصدر والفخذ لذبائح فروج اللحم(1)

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الخلاصة

أجريت هذه الدراسة في حقل الطيور الداجنة الكائن في قسم الإنتاج الحيواني / كلية الزراعة/ جامعة بغداد/ أبي غريب للمدة من 2016/9/19 حتى 30 /2016/10 لمعرفة تأثير اضافة تراكيز مختلفة من لب التمر هند الى ماء الشرب في بعض الصفات الحسية للحم قطعتي الصدر والفخذ لذبائح فروج اللحم والمربى لعمر 42 يوم . استخدم 120 فرخاً من فروج اللحم سلالة Ross 308 غير مجنسة بعمر يوم واحد بمعدل وزن ابتدائي بلغ 41.5 غم، غذيت الأفراخ على عليقة البادئ (initiator) للثلاثة أسابيع الأولى من عمر الطيور، وعليقة النهائي(finisher) للأسبوعين الرابع والخامس والسادس من العمر، ووزعت الطيور على أربع معاملات الأولى (1T) معاملة سيطرة (من غير إضافة) والثانية (2T) والثالثة (3T) والرابعة (4T) إضافة لب التمر هند الى ماء الشرب بالتراكيز 5، 15، 25 غم/ لتر ، وقد اظهرت النتائج :- حصلت المعاملة (3T) و(4T) على اعلى قيم في صفة النكهة والطراوة والعصيرية والتقبل العام والمظهر العام للحم قطعة الصدر مقارنة بمعاملة السيطرة(1T) ، كما وحصلت المعاملة (3T) و(4T) على اعلى قيم في صفة النكهة والطراوة والعصيرية والمعاملة (2T) في صفة التقبل العام ومعاملات الاضافة (T2 , T3، 4T) في صفة المظهر العام مقارنة مع معاملة السيطرة (1T) . يستنتج من الدراسة الحالية ان فروج اللحم المتناول تراكيز مختلفة من لب التمر هند في ماء الشرب كان الافضل في بعض صفاتها الحسية .

الكلمات مفتاحية : لب التمر هند ، صفات حسية ، لحم الفروج .

ISSN 2072-3875

1. INTRODUCTION

International companies specializing in the production of broiler chickens began to produce international strains with high production standards to provide the minimum requirements for food security (Valeria and Pamela, 2012), where the meat of the poultry birds can be part of a balanced and healthy food meal and global meat production has amounted to (34.8%) from global production for meat (FAO, 2015). One of the new challenges in the poultry industry is the search for the natural additions to water and food to improve poultry production efficiency, especially when the European Union prevented the use of growth-stimulating antibiotics in 2006. Sensitive and taste traits are important and have a significant impact on the quality of meat in terms of consumer acceptance (Al-Fayyad et al., 2011). The interest of researchers has increased in the field of meat manufacturing in the search for some solutions to reduce the oxidation process of chicken meat because it contains a high proportion of unsaturated fatty acids, Including the use of some medical herbs and plants as tamarind due to its good nutritional value and its abundance, as well as contains a number of active substances such as phenolic compounds presence in the plant kingdom, which are abundant in fruits such as tamarind, honey, grapes and apples, which is considered an important nutritional supplement for the Human health and anti-bacterial and antioxidant (Fu et al., 2011). Tamarind is classified within the legume family and its scientific is (Tamarindus indica L.). Its original contrary is Africa Tropical Africa, but its trees are considered from natural plants in North and South America. Tamarind is high nutritional value, where It contains 50-70% carbohydrate as well as the percentage of crude protein, which ranges between (13.3-26.9%) and (4.5-16.2%) fat, so it is a source of energy and protein (Bhattacharya and Kumar, 2008). It is used in the manufacture of juices because of its desirable flavor, as well as its large role in regulating body temperature (Havinga et al., 2010). The tamarind flowers and its leaves are considered from vegetables, salad can prepare from it (Siddhuraju et al., 1995) and one type of jams can be made from its seed embryos, which are used to improve the texture of a number of foods in Japan. The dried seeds powder was used in the production of the gel (Bhattacharya et al., 1994 a) and the roasted seed powder was used in the production of a coffee-like beverage in India. The tamarind seed extract was used to conserve some food and prolong the storage period (Rice- Evans et al., 1996; Santos-Buelga and Scalbert, 2000), where they are important sources of polyphenols, which are the antioxidant basis (Cardador-Martinez et al., 2002). Based on the above and in line with the trend towards the use of medicinal plants and the lack of studies conducted in Iraq on tamarind. This study was conducted to investigate the of adding different concentrations of the tamarind pulp to drinking water in some of the sensory traits for the meat of the two cuts (chest and thigh) for the broiler chickens carcasses raised for the age of 42 days.

2. MATERIALS AND METHODS

This study was conducted in the poultry field belonging to the Animal Production Department, College of Agricultural Engineering Sciences, University of Baghdad, Abu Ghraib for the period from 19/9/2016 until 30/10/2016 in order to knowing the effect of adding different concentrations of the tamarind pulp (0, 5, 15, 25 $g.L^{-1}$) to drinking water in some of the sensory traits for the meat of the two cuts (chest and thigh) for the broiler chickens carcasses raised for the age of 42 days. 120 chicks of unsexed of broiler chickens (Ross 308) were used at age of one day, with an initial average weight amounted to (41.5 g). The birds were distributed on four treatments with 30 chick/broiler and each chick was divided into 3 replicates (10 chick/replicate). The tamarind solution was given at the fifth day of the age after the chicks were adapted to the conditions, atmosphere, and environment of the breeding hall, with four concentrations (0, 5,15, 25 $g.L^{-1}$) to drinking water for the treatments

ISSN 2072-3875

(T1, T2, T3, T4), respectively. The birds raised ground breeding on wood sawdust within pens with an area of (0.91 × 0.75 m/pen) each containing 10 chicks. The temperature was adjusted automatically using gas incubators and air fans. The temperature was then weekly reduced at a rate of 2 °C and reached 20-22 °C. The birds were fed free feeding on an initiator diet with pellet form (Turkish origin) from local markets in Baghdad / Abu Ghraib and for 1-21 days of age, containing 22.33% crude protein and 3000 kcal metabolic energy and the growth diet for a period of 22-42 days containing 21.4% crude protein and 3100 kcal metabolic energy. Table (1) shows the chemical composition of the diets used to feed the birds of the experiment according to the ID label fixed on the feed bags.

Table 1: Chemical composition of initiator and growth diets used in the experiment

Chemical Analysis*	**Initiator diet**	**Growth diet**
Crude protein (%)	22.33	21.4
Metabolic Energy (kcal/ kg feed)	3000	3100
Raw fiber (%)	2.5	3.30
Raw fat (%)	3.67	6.37
Raw ash (%)	5.59	5.08
Phosphorus (%)	0.46	0.69
Sodium (%)	0.20	0.18
Calcium (%)	1	0.88
Methionine (%)	0.66	0.5
Lysine (%)	1.35	1.32

According to the ID label fixed on the feed bags.

The used tamarind in the experiment was prepared from the local markets in Baghdad, Crown brand type, peeled and unsalted and packed in plastic bags, with a net weight of (500 g / bag), free of preservatives, the cores were isolated from the pulp and pulp spread in circular plastic dishes and left in the sun for 24 hours to dry the pulp and the soaking solution of the tamarind pulp by the following steps:

First: the pulp shall be weighed after drying with a sensitive balance and according to the experimental treatments (5, 15, 25 g) of tamarind pulp for each liter of water for the preparation of the tamarind solution (10 L of solution), which is sufficient for 1-2 days depending on the age of the birds, the concentrations placed in plastic containers (plastic pail) with a lid placed on it and leave for 24 hours at room temperature.

The second: The tamarind was then squeezed out by hand in containers containing solution (pulp + water) for the purpose of dissolving it with water and dissolving it. The extract is then filtered with a plastic filter with soft holes to get rid of the remaining tamarind. The solution gives to birds daily until the end of the experiment each treatment according to the allocated concentration to them, Table (2) shows the chemical composition for the tamarind as shown on the packaging bags used in the experiment. PH was measured for the prepared tamarind solution by the different concentrations using a pH meter device where the ball of the device is placed in the sample of the tamarind solution and left for a few seconds and recorded the reading.

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Table 2: The chemical composition for the tamarind fixed on the bag used in the experiment

Elements*	Concentration
Energy (calories)	287
Total fat (g)	0.7
Saturated fat (g)	0.3
Cholesterol (g)	0
Sodium (g)	34
Total carbohydrate (g)	75
Raw fiber (g)	6.1
Sugar (g)	68.9
Protein (g)	3.4
Calcium (mg)	88.8
Potassium (mg)	753.6

According to the ID label fixed on the tamarind bags.

Six birds were taken from each random treatment and it was then slaughtered after fasting it at four hours before slaughter. It was immersed at a temperature of 54 °C for 2 minutes and feather removal. The removing process of the internal intestines was conducted in a precise anatomical manner from the beginning of the esophagus to the end of the anus according to (Fletcher, 1999). it was then washed and cut into the main cuts (chest and thigh) and secondary cuts (back, neck and wings) according to the method of (USDA, 1998). The deboning process was conducted for the main cuts of the carcasses (chest and thigh). The meat samples were cooked after slicing into square pieces about (3 cm3) and grilling it with an electric oven at a temperature of 165 °C for 6.5 min for the purpose of conducting a sensual and tactile evaluation for each cut of chest and thigh separately, Ten persons were contributed from faculty members in the evaluation process in the Animal Production Department, Ten persons participated from faculty members in the evaluation process in the Animal Production Department, Department of Food Industries, Graduate students at the College of Agriculture, University of Baghdad, who have sufficient experience and experience to conduct the sensory evaluation process, and provided residents with detailed information about the nature of the evaluation. The following points have been taken into consideration to control the changes that may affect the degree of evaluation:

The time of the test at 11 am, the cooking temperature, the Duration time between cooking and testing and drinking water at 25 ° C between test and other. Finally, the size of the cut for evaluation, according to (Lee and Acharon, 1997), After the evaluation of the prepared samples from the meat of two cuts (thigh and chest). The evaluator sets a score for each sample, This degree represents the amount of affinity present in the flavor or juiciness or Tenderness of the sample with natural flavor or juiciness or Tenderness for the meat of control sample. Then, the cooked meat samples were subjected to a sensory evaluation for the traits of the apparent color, flavor, juiciness, Tenderness and overall acceptance after determining the degree of sensory evaluation for flavor, juiciness, Tenderness and overall acceptance according to (Cross, 1980), Where the degrees of sensory evaluation for the flavor trait (1 = flavor is not fully present ..... 7 = very strong flavor), Tenderness trait (1 = very hard ..... 7 = very fresh), juiciness trait (1 = very dry ... 7 very good), the degree of overall acceptance (1 = very rejected ..... 7 very acceptable) and The general appearance trait (1 = very rejected .... 7 = very acceptable). The statistical analysis was conducted by applying the completely randomized design (CRD) to study the effect of treatment on studied traits by

ISSN 2072-3875

using the SAS Statistical Program (SAS, 2010). The significant differences between the averages were tested using Duncan's New Multiple Range Test (Duncan, 1955) at the level of (0.01 and 0.05).

3. RESULTS AND DISCUSSION

Figure (1) shows that the addition of the tamarind pulp to the drinking water led to a significant decrease (P <0.01) in the pH of the three treatments with concentrations of (5, 15, 25 g tamarind pulp/L water) compared to the control treatment. Figures (2, 3) show the effect of adding different concentrations of the tamarind pulp to drinking water in the sensory evaluation (Taste and appearance) for the meat of chest cut and for the carcasses of broiler chickens. where a significant increase (P <0.01) was observed in favor of adding treatments (T2, T3, T4) in both flavor and juiciness traits compared to the control treatment (T1), where the values of sensory evaluation of these two traits amounted to (5.5, 6.8, 6.8) compared to (4.3) for the first treatment while amounted to (5.7, 6.5, 6.5) compared to (4.5) for the second trait, respectively. It was also shown a significant improvement in favor of adding treatments (T2, T3, T4) compared to the control treatment (T1) in the Tenderness trait which amounted to (5.8, 6.0, 6.3, 5.5), respectively.

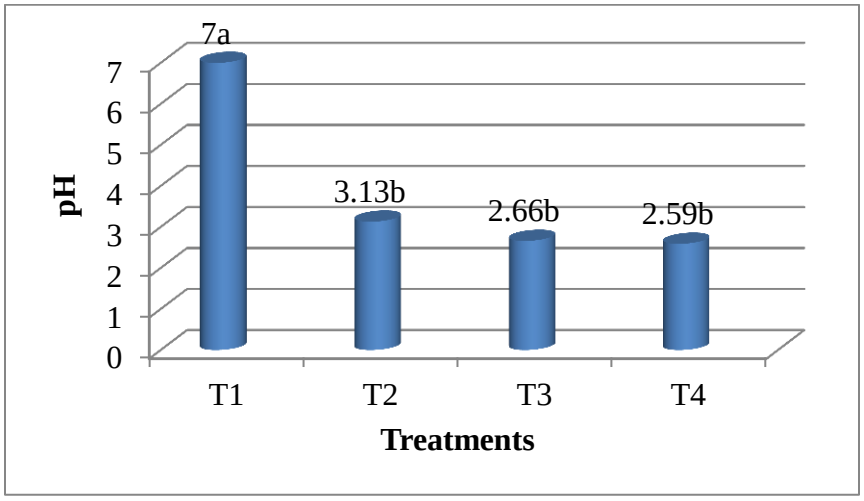

Figure 1: Effect of adding different concentrations of the tamarind pulp to drinking water in the pH of the tamarind solution.

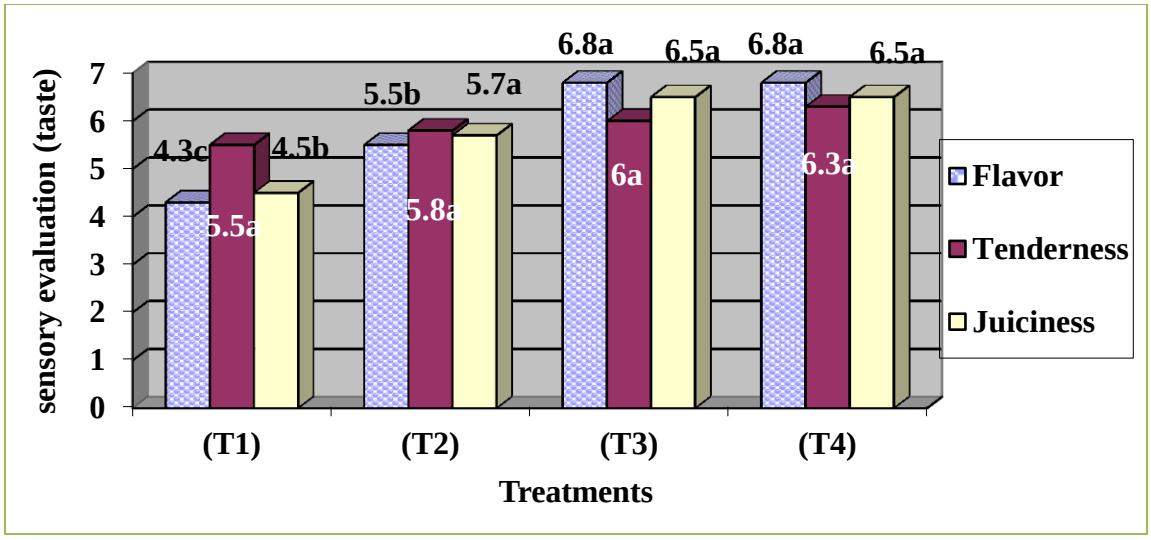

Figure 2: Effect of adding different concentrations of the tamarind pulp to drinking water in the sensory evaluation (taste) for the meat of the chest cut.

ISSN 2072-3875

The different letters within the same color mean that there are significant differences between the averages of the treatments.

Experimental treatments include: T1, T2, T3, T4: Adding the tamarind pulp to the drinking water at concentrations of (0, 5, 15, 25 $g.L^{-1}$), respectively.

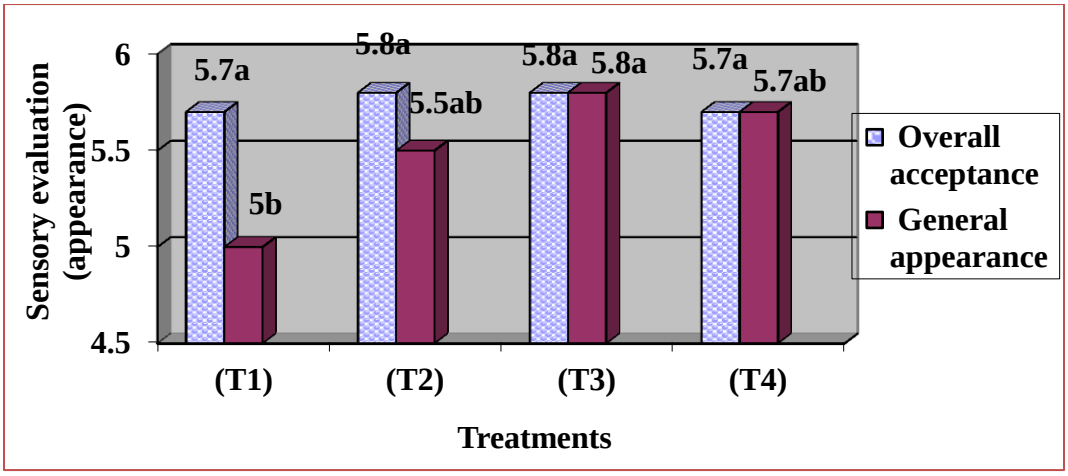

Figure 3: Effect of adding different concentrations of the tamarind pulp to drinking water in the sensory evaluation (taste) for the meat of the chest cut.

The different letters within the same color mean that there are significant differences between the averages of the treatments.

Experimental treatments include T1, T2, T3, T4: Adding the tamarind pulp to the drinking water at concentrations of (0, 5, 15, 25 $g.L^{-1}$), respectively.

Figures (4, 5) show the effect of adding different concentrations of the tamarind pulp to drinking water in the sensory evaluation (Taste and appearance) for the meat of chest cut and for the carcasses of broiler chickens. where a significant increase ($P < 0.01$) was observed in favor of adding treatments (T2, T3, T4) in both flavor traits which amounted to (5.7, 6.8, 7.0) compared to the control treatment (T1) which amounted to (5.0), respectively. It is also shown a significant increase ($P < 0.05$) in favor of the two treatments (T3, T4) compared to the control treatment (T1) in the Tenderness which followed by the T2 treatment, which did not differ significantly from the control treatment (T1), While a high significant superiority occurred ($P < 0.01$) for the T4 treatment compared to the adding treatment (T2) and the control treatment (T1) in the juiciness trait which followed by the T2 treatment, which did not differ significantly from the T2 treatment and the control treatment (T1). Figure (5) shows a significant increase ($P < 0.05$) in the trait of overall acceptance in favor of treatment (T2) which amounted to (6.3) compared to control treatment (T1) which amounted to (5.2), followed by the treatments (T3, T4), which did not differ significantly from the control treatment (T1). It is also shown a high significant superiority ($P < 0.01$) for the treatments (T2, T3, T4) in general appearance which amounted to (6.0, 5.7, 5.7) compared to the control treatment (T1) which amounted to (4.3).

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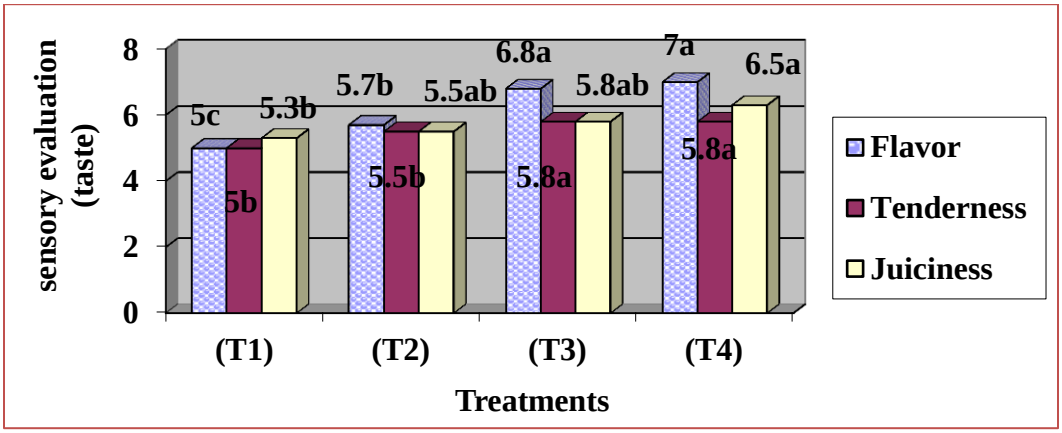

Figure 4: Effect of adding different concentrations of the tamarind pulp to drinking water in the sensory evaluation (taste) for the meat of the thigh cut.

The different letters within the same color mean that there are significant differences between the averages of the treatments.

Experimental treatments include T1, T2, T3, T4: Adding the tamarind pulp to the drinking water at concentrations of (0, 5, 15, 25 $g.L^{-1}$), respectively.

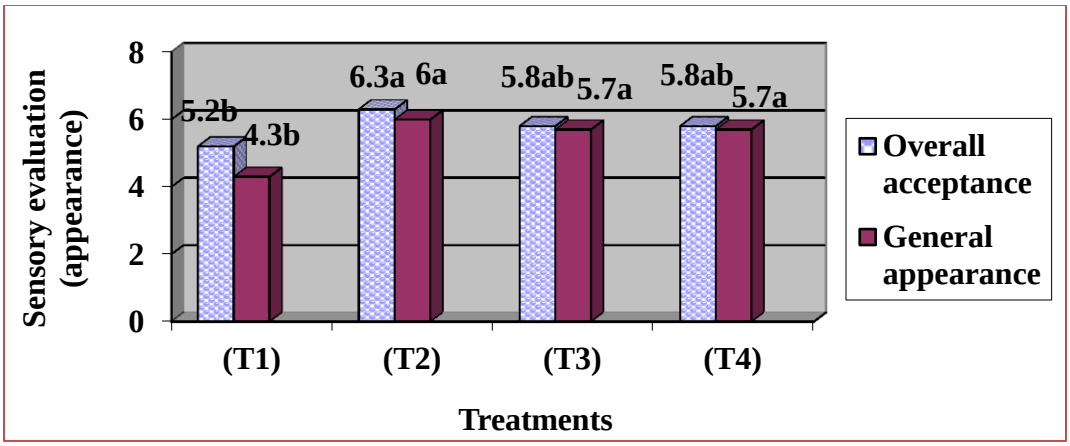

Figure 5: Effect of adding different concentrations of the tamarind pulp to drinking water in the sensory evaluation (taste) for the meat of the thigh cut.

The different letters within the same color mean that there are significant differences between the averages of the treatments.

Experimental treatments include T1, T2, T3, T4: Adding the tamarind pulp to the drinking water at concentrations of (0, 5, 15, 25 $g.L^{-1}$), respectively.

The rise of flavor and Tenderness of the thigh meat compared to chest meat may be attributed to the high percentage of fat deposited in the thigh meat compared to chest meat due to the rise of concentration of volatile compounds in fat, especially carbonyl compounds. Chan et al., (2011) indicated a high concentration of carbonyl compounds in the thigh cut which amounted to (0.0726 $\mu mol.g^{-1}$) compared to the chest cut which amounted to (0.0374 $\mu mol.g^{-1}$), with the percentage of (48%), While the rise of the juiciness for the thigh meat compared to chest meat to the rise of fat percentage, which in turn works in preventing the loss of more moisture and maintaining on the meat moisture and its juiciness during the cooking process (Al-Fayadh et al., 2011). In addition, the juiciness in the thigh meat is higher than the

ISSN 2072-3875

chest because of its content of fat, which increases the sensation of taste by stimulating salivary glands (Taher, 1983). These results agree with (Al-Fadil, 2013) who showed that the rise of the Tenderness of thigh meat compared to the chest meat because its sarcomere fiber is longer than chest meat Sarcomir fiber and the analysis of its proteins by the Calpin enzymes larger compared to chest meat. The improvement in the Tenderness of chicken meat may be due to the role of tamarind solution with low pH added to drinking water (Table 3), which has led to the breakdown of muscle fibers and to increase the efficiency of Cathepsins enzymes which have a role in the decomposition and breakdown of muscle lipid proteins, the Improvements in taste sensory traits, which include Tenderness , flavor, and juiciness, have contributed to the improvement of appearance sensory traits.

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ISSN 2072-3875