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Impact of Utilizing Liquid Methionine in Drinking Water for Broiler Chicks' on Some Meat Traits.

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Abstract:

The present study purpose was evaluated the impact of supplying a portion of the chick's liquid methionine needed by drinking water using a commercially available source of liquid methionine on some meat traits, for this purpose the experiment will be applied on one week old chicks to the following treatments: control treatment: (adding 0.00 ml liquid methionine/liter of drinking water), T1: (adding 0.25 ml of liquid methionine/liter of drinking water), T2: (adding 0.50 ml of liquid methionine/liter of drinking water), T3: (adding 0.75 ml of liquid methionine/liter of drinking water). The results of chemical composition showed significant effect of liquid methionine in moisture, protein percentages of breast and thigh meat, and effect on fat percentages of breast meat. For physic-chemical traits results, adding liquid methionine significantly decreased cooking loss percentages and not effect on other physic-chemical traits. The results of essential amino acids percentages in breast meat showed that the meat of chicks received 0.75 ml of liquid methionine recorded the highest percentages of isoleucine, leucine, phenylalanine, lysine and arginine percentages, while the meat of chicks received 0.25 ml of liquid methionine recorded the highest percentages of methionine and valine percentages, while results of essential amino acids percentages in thigh meat, The highest percentages of isoleucine and valine recorded in meat of chicks received 0.75 ml of liquid methionine, while highest percentages of phenylalanine, lysine and methionine recorded in meat of chicks received 0.25 ml of liquid methionine, while for histidine percentage recorded in meat of control group. Results of sensory evaluator revealed adding liquid methionine significant effect ($p<0.05$) in the tenderness of breast meat, also sense there was significant positive effect ($p<0.05$) of liquid methionine in tenderness, Juiciness and overall acceptance of thigh meat. We can conclude that adding effects positively in chemical composition, physiochemical traits, amino acids profiles and sensory traits of broiler chick meat.

Keywords: liquid methionine, broiler chicks, breast meat, thigh meat, meat traits.
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Introduction

It is generally associated with improvements in nutrition and alternative sources to increase productivity and the quality of the product is supposed (Ismail and Cheah,

2003; Tion and Adeka, 2000). However, the poultry quotas become expensive and the scarcity of traditional food has challenged the provision of high-nutrient chicken meat to consumers. Because of this fact, most poultry feed is made from grains and poor are the essential amino acids for consumers, such as lysine, threonine, sulfur-bearing amino acids (methionine, cysteine) and sometimes contain tryptophan share (FAO, 2010). The supply of these amino acids in feed is costly and goes beyond the fortunes of poultry farmers. Because this is a big problem in nutrition and that is why you select the high quality alternative feed ingredients that contain the most essential amino acids (Farrell, 2010). Feed protein is used by broilers in many functions, the most important of which is broiler meat. It has been identified that poultry actually requires a certain amount and balance of essential feed amino acids and sufficient nitrogen to synthesize the essential amino acids internally (Aftab et al., 2006). Methionine (Met) is usually the first amino acid to limit when feeding broilers are fed to soy-based diets. Co-enzyme S-adenosyl methionine (an active form of methionine) is an important donor to the methyl group, which allows the formation of many essential compounds in the body of the bird including choline, creatine, epinephrine, DNA, glutathione, a major source of organic sulfur compounds in the body (Fanatico, 2010). The amount of methionine and cystine in feed is often too low to ensure its most beneficial utilization and optimal quality of broiler carcasses. Amino acids may found in two isomers and this is D- or L-isomers, or as a corporation of these two isomers. D-isomers are biologically dormant, and the L form is occurs in the majority of tissues (Lesson and Summers , 2001). However, chickens liver has been shown to be able to produce L-methionine from D-methionine (Baker, 2006) and then use it for protein synthesis and as an element of other metabolic pathways. Our studies purpose is determining the impact of supplying a portion of the chick's methionine needed via drinking water using a commercially available source of liquid methionine on some meat traits.

Materials and Methods

Distributing randomly (264) un-sexed (10 days old) to four treatments, in three replicates containing twenty-two birds each. The experiment be applied on one week old chicks to the following treatments: T1: (control treatment: adding 0.00 ml of liquid methionine/liter of drinking water), T2: (adding 0.25 ml of liquid methionine/liter of drinking water), T3: (adding 0.50 ml of liquid methionine/liter of drinking water), T4: (adding 0.75 ml of liquid methionine/liter of drinking water). The chicks will rearing using three different levels of diets as follows: Starter during the age of 1-11 days including 23% crude protein and 3000 Kcal/kg, Grower during the age of 12-25 days including 21.5% crude protein and 3100 Kcal/kg, and Finisher during the age of 26-42 days including 20% crude protein and 3175 Kcal/kg.

Table (1): Starter Chemical composition

Values	Amount	Values	Amount
		Vitamin A	13000 I.U./Kg
Crude Protein	23 %	Vitamin D3	5000 I.U./Kg
Crude fat	5.6 %	Vitamin E	50 mg/kg
Crude fiber	2.9 %	Vitamin B1	3 mg/Kg
Moisture	11.7 %	Vitamin B2	8 mg/Kg
Crude Ash	5.7 %	Vitamin B6	4 mg/Kg
Maicium	23 %	Vitamin B12	34 mcg/Kg
Crude	1%	Biotin	200 mcg/Kg
Phosphorus	0.61 %	Niacin	55 mg/Kg
Phosphorus	0.50 %	Folic acid	2 mg/Kg
(avail.)	1.33 %	Vitamin K3	3.5 mg/Kg
Lysin	0.59 %	d-	16 mg/Kg
Methionine	0.96 %	Pantothenic	400 mg/Kg
Meth+ Cyst.	0.28 %	acid	15 mg/Kg
Tryptophane	0.84 %	Choline	110 mg/Kg
Threonine	3000	Chloride	100 mg/Kg
Valine	Kcal/kg	Cu	50 mg/Kg
M.E.	0.2 %	Mn	1 mg/Kg
Sodium	505 mg/kg	Zn	0.3 mg/Kg
Antioxidant	50 mg/kg	Fe	
Coccidiostat	1500 Fyt/ton	I	
6-Phytase	1kg	SE	
Antitoxin	0.5 Kg/ton		
Avizyme			

Table (2): Grower Chemical composition

Values	Amount	Values	Amount
Energy Kcal	3100	ADDED	
AMINO		TRACE	
ACIDS	21.5 %	MINERALS	
Crude Protein	1.29 %	PER KG	
Lysine	0.99 %	Copper	16 mg
Methionine		Iodine	1.25 mg
+Cystine	0.51 %	Iron	20 mg
Methionine	0.88 %	Manganese	120 mg
Threonine	1.00 %	Selenium	0.30 mg
Valine	0.89 %	Zinc	110 mg
Isoleucine	1.37 %		
Arginine	0.21 %	ADDED	
Tryptophan	1.42 %	VITAMINS	
Leucine		PER KG	
		Vitamins A	10000 IU
		Vitamin D3	4500 IU

MINERALS	0.87 %		65 IU
Calcium	0.435 %	Vitamin E	3.0 mg
Available	0.20 %	Vitamin K	2.5 mg
Phosphorus	0.20 %	Thiamin {B1}	
Sodium	0.90 %	Riboflavin{[B2	6.5 mg
Chloride		}	60 mg
Potassium	1600 mg	Niacin	18 mg
	1.20 %	Pantothenic	3.2 mg
Choline Per		Acid	1.18 mg
Kg		Pyridonic {B6}	1.90 mg
Linoleic Acid		Biotin	0.17 mg
		Folic Acid	
		Vitamin	

Table (3): Finisher Chemical composition

Values	Amount	Values	Amount
Crud Protein	20 %	Vitamin A	10000
Crud Fat	5.3 %	Vitamin D3	I.U./Kg
Crud Fiber	2.6%	Vitamin E	4500
Moisture	11.8%	Vitamin B1	I.U./Kg
Crud Ash	1.8%	Vitamin B2	30 mg/kg
Calcium	0.85%	Vitamin B6	2 mg/Kg
Phosphorus	0.55%	Vitamin B12	7 mg/Kg
Phosphorus	0.45 %	Biotin	3 mg/Kg
(avail.)	1.16 %	Niacin	15mcg/Kg
Lysin	0.4 %	Folic acid	180mcg/Kg
Methionine	0.77 %	Vitamin K3	40mg/Kg
Meth+ Cyst.	0.18 %	d-	1.5 mg/Kg
Tryptophane	0.71 %	Pantothenic	2.5 mg/Kg
Threonine	3175	acid	13 mg/Kg
M.E.	Kcal/kg	Choline	350 mg/Kg
Sodium	0.16 %	Chloride	15 mg/Kg
Antioxidant	505 mg/kg	Cu	100 mg/Kg
Coccidia stat	50 mg/kg	Mn	100 mg/Kg
6-Phytase	1500	Zn	40 mg/Kg
Antitoxin	Fyt/ton	Fe	1 mg/Kg
Avizyme	1kg	I	0.3 mg/Kg
	0.5 Kg/ton	SE	

The following parameters will record at the end of the experimental period:
Meat Chemical Composition, Meat Water holding capacity, Meat Cooking loses, Meat pH value, Meat Total Volatile Nitrogen, Meat palatability and Meat Amino Acids Profile.

Chemical composition:

Moisture content:

Moisture content must determine as weight loss after the samples were dried in a convection oven at 105˚C for 16 hr (Kelrich. 1990).

Protein content:

Protein content was determined according to the method of Kelrich (1990) by using micro Kjeldahl and was calculated as follows:

Protein %=nitrogen ×6.25

Fat contents

The percentage of fat in broiler meat samples was estimated by taking a known weight of dried samples and extracted with diethyl ether using the Soxhlet apparatus. The amount of fat was calculated based on the method described in Kelrich (1990).

Ash content:

Ash content was determined according to the method of Kelrich (1990) by taking a known weight of flesh and placing it in a muffle furnace at 550 ºC for 16 hrs. The ash percent was determined as follows:

Ash %=W1/W2 ×100

Where W1 = weight of ash, and W2 = initial weight

Physic-chemical traits:

pH:

pH of muscle sample measure according to the method described by Ibrahim *et al.*, (2010). Muscle samples (10gm) homogenize with 100 ml distilled water for 1 min, the pH then measure by a pH meter.

Cooking loss:

Cooking loss determined according to Murphy and Zerby (2004). Muscle samples (20gm) placed in an open aluminum boxes and cooked for 8.5 min in an oven pre-heated to 176˚C to an internal temperature of 70˚C. After cooking, the samples must dry the paper towel. Each sample cools for 30 min, cooking weight measure. The cooking loss calculates by the following formula:

$$\text{Cooking loss\%} = \frac{\text{Raw sample weight} - \text{cooked sample weight}}{\text{Raw sample weight (gm)}} \times 100$$

Water holding capacity (WHC):

Water holding capacity (WHC) determine according to Wardlaw *et al.*, (1973). 20gm of minced muscle sample place in centrifuge tube containing 30ml of 0.6M NaCl and stirred with glass rod for 1 min.

The tube keeps at refrigeration temperature (4˚C) for 15 min, stirred again and centrifuge at 2806.1 xg (4˚C) for 15 min. The supernatant measure and amount of water

retention by samples and express in percentage. The WHC report as ml of 0.6 M NaCl per 100g of muscle according to the following formula:

$$WHC\ \% = \frac{\text{Initial solution weight - final solution weight}}{\text{sample weight (gm)}} \times 100$$

Total volatile nitrogen (TVB-N) (Malle&Poumeyrol, 1989)

A 100 g of the minced samples were mixed for 1 min with 200 ml of 7.5% Trichloroacetic acid (TCA) in the blender, the mixture was filtered, 25 ml of the filtrate were transferred to macro-kjeldahl distillation apparatus of 250 ml capacity, then 5 ml of 10 % NaOH solution were added to the distillation which was carried out, and the distillate was collected in 15 ml of 4% boric acid. The distillate was titrated with 0.05 N $H_2\ SO_4$, using methyl red –bromocresol green as an indicator. The blank was carried out using 25 ml of 7.5% Trichloroacetic acid instead of the meat sample, the T.V.N. value was estimated as following:

$$\text{TVB.N.(mg N/100gm)} = \frac{V\times 14\times(200+M/100\times 100)}{25\times 100}$$

Where: V= ml of 0.05 of H_2SO_4, M=moisture content

Amino Acids percentages:

The amino acids percentages estimated according to Schuster (1988).

Sensory evaluation:

The muscle samples of LD evaluate for sensory attributes (color, flavor and aroma, tenderness, juiciness and overall acceptability). The muscle samples cook in oven at 176˚C for 8.5 min until reaching the internal temperature of 70˚C, then serve warm at 60˚C to eight trained panelists (Murphy and Zerby, 2004). Muscle samples from different treatments evaluate in each session. The samples order randomize within the session.

Water serves after each sample assessment. Panelists rated each sample for different attributes with five-point scales ranging between 1 and 5. The higher score values indicate a greater preference (Cross, 1978).

Statistical Analysis:

All data will statistically analyzing by the Completely Randomized Design (CRD) by the SAS (Allison, 2010) system and the differences between the means of groups will be separating by Duncan Multiple Range Test (Duncan, 1955) statements of statistical significance are basing on ($P\leq 0.05$).

Results and discussion:

The results in table 4 showed that moisture percentages of meat in breast and thigh muscles in control group differ significantly (P≤ 0.05) with percentages in meat of T1 and T2 treatment groups, the highest moisture percentages recorded in breast and thigh meat of control groups which were (76.33 and 75.53%) respectively, in contrast the lowest percentages recorded in breast meat of T1 and in thigh meat of T2, it were (73.28 and 73.78%) percentages. Protein Percentages results in breast and thigh meat in control and T3 differ significantly (P≤ 0.05) with percentages in meat of T1 and T2 treatment groups, the highest protein percentages recorded in breast and thigh meat of T1 group, it were (24.56 and 22.82% in breast and thigh meat) respectively, while the lowest protein percentages recorded in breast and thigh meat of control groups, it was (20.91 and 20.96% in breast and thigh meat) respectively. The results of fat percentages in breast meat of T3 differ significantly (P≤ 0.05) with percentages in meat of control, T1 and T2 treatment groups, the highest percentages recorded in breast meat of T3, it was (2.51%) and the lowest percentage recorded in control groups, it was (1.55%). The results of fat percentage in thigh meat and ash percentages in breast and thigh meat showed insignificant difference (P≤ 0.05) among treatment groups (Table 4). Drażbo et al. (2015) found that the providing of methionine improve some of the qualities of meat traits. Also Hickling et al. (1990), found that increased levels of methionine in the diet improves breast meat yields in birds and this also found in our study, Thawaites and Anderson, (2007), describe that broiler have been shown to be able to produce L-methionine in the liver from D-methionine, and then use it for protein synthesis and as an element of other metabolic pathways.

Table (4): Effect of liquid methionine on the chemical composition of chicken meat.

Treatments	Moisture		Protein		Fat		Ash	
	Breast	Thigh	Breast	Thigh	Breast	Thigh	Breast	Thigh
Control	76.33 a	75.53 a	20.91 b	20.96 b	1.55 b	3.10 a	0.76 a	0.54 a
T1	73.28 c	74.06 bc	24.56 a	22.82 a	1.75 b	2.90 a	0.76 a	0.52 a
T2	73.60 bc	73.78 c	23.99 a	22.50 a	1.59 b	3.33 a	0.77 a	0.53 a
T3	75.33 ab	75.13 ab	21.03 b	21.11 b	2.51 a	2.63 a	0.77 a	0.52 a

Mean with different letter (a, b) among rows (treatment) are significantly differ (p<0.05).

Results in the table (5) revealed that there were insignificant difference ($p<0.05$) among treatment groups in pH, water holding capacity traits. For Cooking loss percentages, the results indicates that percentage in breast meat in T1 differ significantly ($p<0.05$) with percentage in meat of T3, while other treatments not differ among other, the highest percentage recorded in meat of T1 group (39.74%), and the lowest percentage recorded in meat of T3 (34.32%), the cooking loss percentages in thigh meat control and T2 differ significantly ($p<0.05$) with the percentage in meat of T3, results revealed that the highest percentage recorded in meat of control group (43.97%) and the lowest percentage recorded in meat of T3 (36.21%). The total volatile basic nitrogen value results indicates that the value in breast meat of control group differ significantly ($p<0.05$) with TVB.N value in breast meat other treatments groups, the highest TVB.N value recorded in breast meat of control group (4.40 mg N/100gm), in contrast the lowest value recorded in breast meat of T1 (3.56 mg N/100gm), the results of TVB.N value in thigh meat showed insignificant difference among treatment groups. Reported by Edens (2001) also showed that the addition of methionine to the diet can decrease water loss in meat. The results of pH in our study insignificant difference among treatment groups and this lead to in significant change in water holding capacity, The acidity (pH) of meat has a major impact on meat quality, because it determines characteristics responsible for suitability for processing, nutritional properties and shelf-life (Woelfel et al., 2002). Lower breast muscle pH has been explained rise cooking loss percentages (Alnahhas et al., 2014).

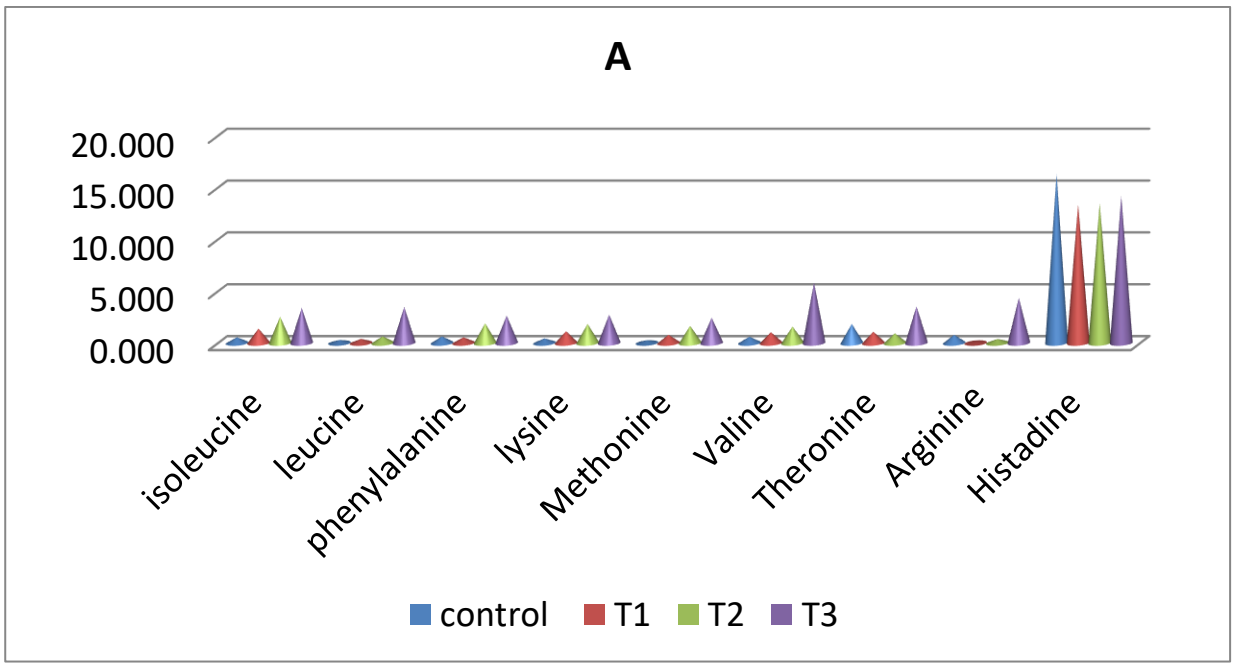
Table (5): Effect of liquid methionine on some physic-chemical traits of chicken meat.

Treatments	pH		Water Holding Capacity		Cooking Loss		Total Volatile Basic Nitrogen mg N/100gm	
	Breast	Thigh	Breast	Thigh	Breast	Thigh	Breast	Thigh
Control	5.40 a	5.62 a	35.55 a	44.33 a	35.48 ab	43.97 a	4.40 a	4.16 a
T1	5.31 a	5.59 a	34.33 a	28.76 a	39.74 a	41.73 ab	3.56 b	4.03 a
T2	5.40 a	5.48 a	32.11 a	24.32 a	36.71 ab	43.51 a	3.81 b	4.03 a
T3	5.39 a	5.06 a	29.89 a	39.77 a	34.32 b	36.21 b	3.66 b	4.00 a

Mean with different letter (a, b) among rows (treatment) are significantly differ ($p<0.05$).

The results in figure 1 A show that the essential amino acids percentages in breast meat of treatment group significantly differ ($p<0.05$) among other for all amino acids except threonine and histidine results, which show in significant differ among treatment groups, for isoleucine, leucine, phenylalanine, lysine and arginine percentages, the meat of T3 recorded the highest percentages, while for methionine and valine percentages, the meat of T1 recorded the highest percentages.

The results of amino acids percentages in thigh meat (figure 1 B), results recorded significant difference ($p<0.05$) among treatment groups for isoleucine, phenylalanine, lysine, methionine, valine and histidine percentages, while the percentages of leucine, threonine and arginine showed insignificant differ among treatment groups. The highest percentages of isoleucine and valine recorded in the meat of T3 group, while highest percentages of phenylalanine, lysine and methionine recorded in meat of T1 group, while for histidine percentage recorded in meat of control group. Methionine may act as a lipotropic agent through its role as an amino acid in balancing protein or through its role as a methyl donor and involvement in choline, betaine, folic acid and vitamin B12 metabolism (Chen, 1993).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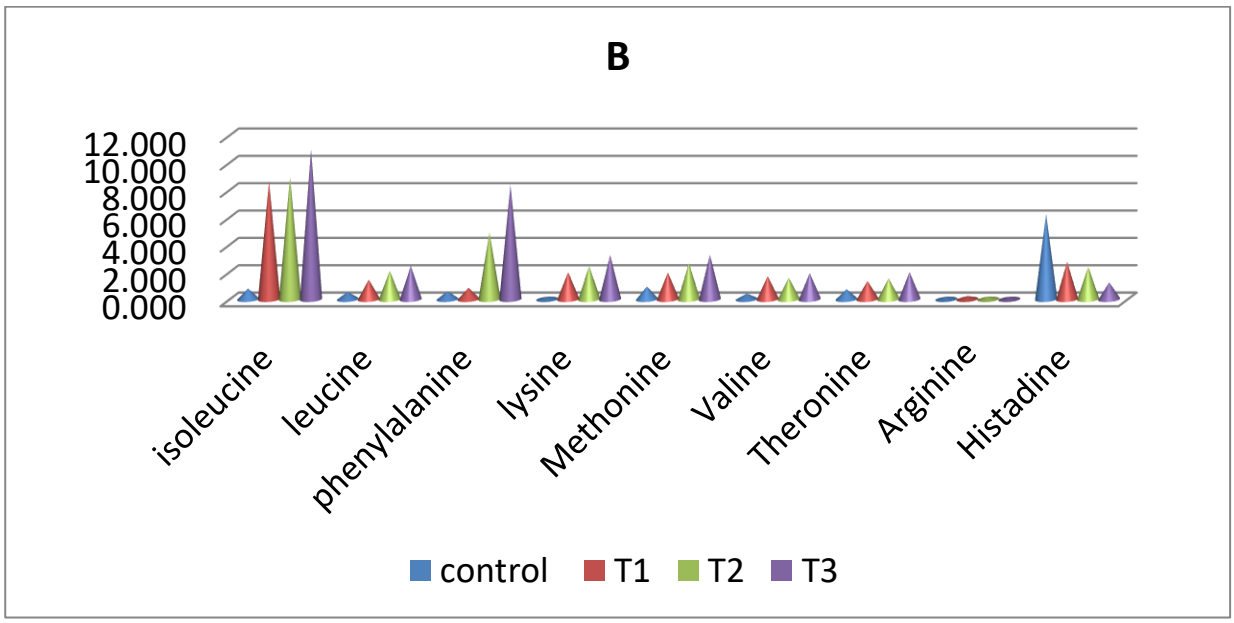
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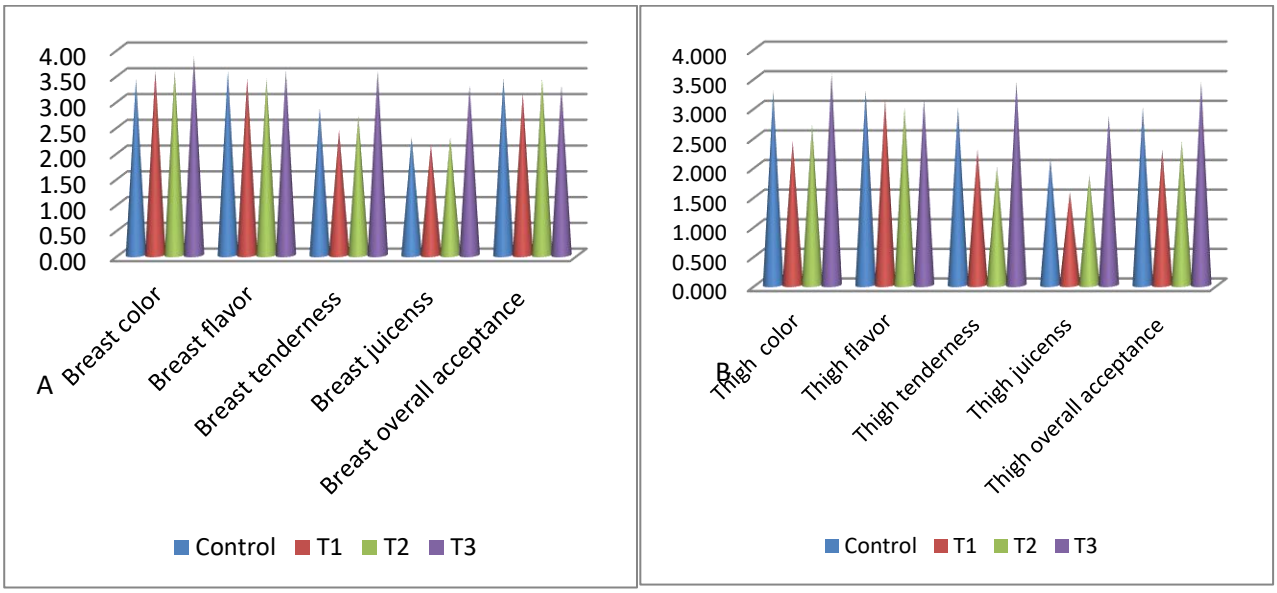
Breast (A)									
Treatment	isoleucine	leucine	phenylalanine	lysine	Methonine	Valine	Theronine	Arginine	Histadine
control	0.55 b	0.3 b	0.65 b	0.45 c	0.27 c	0.610 b	1.85 a	0.8 ab	16.325 a
T1	1.4 b	0.4 b	0.54 b	1.15 bc	0.8 a	1.05 b	1.1 a	0.1 b	13.4 a
T2	2.55 b	0.65 b	1.915 ab	1.85 ab	1.665 bc	1.6 b	0.95 a	0.400 ab	13.5 a
T3	3.4 b	3.5 a	2.655 a	2.75 a	2.45 ab	5.85 a	3.55 a	4.35 a	14.2 a
Thigh (B)									
Treatment	isoleucine	leucine	phenylalanine	lysine	Methonine	Valine	Theronine	Arginine	Histadine
control	0.8 b	0.55 a	0.6 c	0.2 c	0.95 b	0.425 b	0.75 a	0.20 a	6.25 a
T1	8.65 a	1.45 a	0.850 a	2.0 b	1.975 ab	1.71 a	1.35 a	0.25 a	2.75 b
T2	9.0 a	2.1 a	4.9 b	2.45 ab	2.65 a	1.59 a	1.55 a	0.20 a	2.4 b
T3	11.0 a	2.45 a	8.4 c	3.25 a	3.25 a	1.93 a	2.0 a	0.15 a	1.25 b

Figure 1 A: Effect of liquid methionine on essential amino acids of chicken breast meat.
B: Effect of liquid methionine on essential amino acids of chicken thigh meat.

The figure 2 A results revealed that sensory evaluator not senses significantly differ ($p<0.05$) among treatment groups in color, flavor and aroma, juiciness and overall acceptance of breast meat, while sense there were significant differ ($p<0.05$) in tenderness among treatments groups, the lowest tenderness score sense in breast meat of T1 (2.429) and the more acceptable score sense in breast meat of T3 (3.571). In figure 2 B, the evaluator not senses significantly differ ($p<0.05$) among treatment groups in color, flavor and aroma of thigh meat, in contrast sense there were significant differ ($p<0.05$) in tenderness, Juiciness and overall acceptance, the more acceptable score for tenderness, Juiciness and overall acceptance recorded in thigh meat of T3, it were (3.42, 2.85 and 3.42) respectively in contrast the less acceptable score sense in thigh meat of T2 for tenderness (2.00), and in T1 for Juiciness and overall acceptance were (1.57 and 2.28) respectively.

The overall acceptance affected by tenderness scores during the evaluating of the different culinary recipes of chicken meat (Moraes et al. 2016). In opposite to our study, Zonenberg and Drażbo (2018) found that addition of methionine to feed for broiler chickens had no significant effect on the sensory quality of the breast muscle. According to Zhai et al. (2016), an increased level of methionine in combination with lysine may favorably affect characteristics associated with the acceptability of the

product for the consumer, also Gardzielewska et al. (2005), found that addition of methionine caused an increase in red color and thus a darker muscle.



Treatment	Breast color	Breast flavor	Breast tenderness	Breast juiciness	Breast overall acceptance
Control	3.42 a	3.571 a	2.857 ab	2.286 a	3.429 a
T1	3.57 a	3.429 a	2.429 ab	2.143 a	3.143 a
T2	3.57 a	3.429 a	2.714 b	2.286 a	3.429 a
T3	3.85 a	3.571 a	3.571 a	3.286 a	3.28 a
	Thigh color	Thigh flavor	Thigh tenderness	Thigh juiciness	Thigh overall acceptance
Control	3.286 a	3.286 a	3.0 ab	2.143 ab	3.0 ab
T1	2.429 a	3.143 a	2.286 b	1.571 b	2.286 b
T2	2.714 a	3.0 a	2.0 b	1.857 ab	2.429 b
T3	3.571 a	3.143 a	3.429 a	2.857 a	3.429 a

Figure 2 A: Effect of liquid methionine on sensory traits of chicken breast meat.
B: Effect of liquid methionine on sensory traits of chicken thigh meat.

Conclusion:

We can conclude that adding effects positively in chemical composition, physiochemical traits, amino acids profiles and sensory traits of broiler chick meat.

تأثير استخدام الميثيونين السائل في مياه الشرب لافراخ اللحم في بعض صفات اللحوم.

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الخلاصة:

الغرض من الدراسة الحالية تقييم تأثير تجهيز جزء من الميثيونين السائل لافراخ فروج اللحم الذي تحتاجه مياه الشرب باستخدام مصدر متاح من الميثيونين السائل تجارياً في بعض صفات اللحوم ، ولهذا الغرض تم تطبيق التجربة على فراخ عمرها أسبوع واحد وكانت المعاملات كالاتي: معاملة المقارنة: (إضافة 0.00 مل ميثيونين السائل / لتر من مياه الشرب) ، المعاملة الاولى: (إضافة 0.25 مل من الميثيونين السائل / لتر من مياه الشرب)، المعاملة الثانية: (إضافة 0.50 مل من السائل الميثيونين / لتر من مياه الشرب)، المعاملة الثالثة: (إضافة 0.75 مل من الميثيونين السائل / لتر من مياه الشرب). أظهرت نتائج التركيب الكيميائي تأثيرًا كبيرًا للميثيونين السائل في نسبة الرطوبة ، نسبة البروتين من لحم الصدر والفخذ ، والتأثير في نسبة الدهن في لحم الصدر. بالنسبة لنتائج الصفات الفيزيائية والكيميائية ، فإن إضافة الميثيونين السائل قد أدى إلى انخفاض كبير في نسب فقدان اثناء الطبخ وعدم التأثير في الصفات الفيزيائية والكيميائية الأخرى. أظهرت نتائج النسب المئوية للأحماض الأمينية الأساسية في لحم الصدر أن لحوم افراخ اللحم الذي جهز ب 0.75 مل من الميثيونين السائل سجل أعلى النسب المئوية للإيزوليوسين والليوسين والفينيلألنين واللايسين والأرجينين ، بينما لحوم افراخ اللحم المجهزة ب 0.25 مل من الميثيونين السائلة سجلت أعلى النسب المئوية للميثيونين والفالين ، في حين أظهرت نتائج النسب المئوية للأحماض الأمينية الأساسية في لحم الفخذ ، اعلى النسب المئوية للإيزوليوسين والفالين المسجلة في لحوم الافراخ المجهزة ب 0.75 مل من الميثيونين السائل ، في حين كانت النسب المئوية الأعلى للفينيلألنين ، لايسين و الميثيونين في لحوم الافراخ المجهزة ب 0.25 مل ميثيونين سائل ، بينما اعلى نسبة للهستيدين المسجلة في لحم معاملة المقارنة. أظهرت نتائج التقييم الحسي ان إضافة الميثيونين السائل له تأثير كبير ($P < 0.05$) في نتائج التقييم، واستشعر المقيم أنه كان هناك تأثير إيجابي كبير ($P < 0.05$) للميثونين في الطراوة والعصارة والتقبل العام للحوم الفخذ. يمكننا أن نستنتج أن إضافة الميثونين كان له تأثيرات إيجابية في التركيب الكيميائي ، والصفات الكيميائية الفيزيائية ، والأحماض الأمينية والصفات الحسية للحوم افراخ اللحم.

الكلمات المفتاحية: الميثيونين السائل ، افراخ اللحم ، لحم الصدر ، لحم الفخذ ، صفات اللحم.

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