IRAQI Academic Scientific Journals
العراقية المجلات الأكاديمية العلمية
ISSN:1813-1646 (Print); 2664-0597 (Online)
Tikrit Journal for Agricultural Sciences
Journal Homepage: http://tujas.tu.edu.iq
E-mail: tjas@tu.edu.iq
TJAS Tikrit Journal for Agricultural Sciences

Rauf H. Majid[1], Tariq Kh. M. Albashr[2], Zaid Kh. Khidhir[1*], Arazu A. Hamma[1]

[1] *Department of Animal Science, College of Agricultural Engineering Sciences, Sulaimani University.*

[2] *Departments of Animal Resource, College of Agriculture, Tikrit University.*

KEY WORDS:

Parsley, feed additive, broiler chicks, meat traits.

ARTICLE HISTORY:

Received: 17/02/2020

Accepted: 24/09/2020

Available online: 15/12/2020

Effect of Using Parsley (*Petroselinum crispum*) As Feed Additive on Some Meat Traits of Broiler Chicks

ABSTRACT

The present study was conducted to determine the effect of dietary additive with parsley on some meat traits of the breast and thigh meat of broiler chicks, at eight-day old, chicks will be divided equally on floor pens into 5 groups, each group contained 3 replicates (8 chicks/ each). Treatments are dividing as (T1), using basal diet free from parsley as control (T2), using basal diet plus 3 gm. parsley/Kg of diet (T3), using basal diet plus 6 gm. parsley/Kg of diet (T4), using basal diet plus 9 gm. parsley/Kg of diet (T5), using basal diet plus 12 gm. parsley/Kg of diet. In the end of this experiment all after the slaughtering the broiler, the sample will be taken from breast and thigh. Adding parsley to feed of chicks effect significantly ($p<0.01$) on chemical composition in breast and thigh meat, and high percentages recorded in meat from broiler chicks fed on parsley, adding of parsley as feed additive promote significantly ($p<0.01$) physical traits, TBA, TVN.B values, Met- myoglobin and Myoglobin value of breast and thigh meat of broiler chicks, using parsley effect significantly on some amino acids percentages in breast and thigh meat of broiler chicks, adding parsley effect significantly in Chromium, Copper, Nickel and Zinc concentrations in thigh meat, also effect on Iron concentrations in breast meat.

INTRODUCTION

Qualification of feed utilization and animal performance can promote by using Feed additives (Gudev *et al*., 2008). The pancreatic secretions such as digestive enzymes which promote digest and absorb more amino acids from digestive tract can increasing by adding herbals plants on feed (Mansoub 2011, Lee *et al.,* 2004). The medicinal herbs and plant and their extracts used in archaic pharmaceutical manufacture, which always proved safe. While, many synthesized chemicals have many side effects to animals, plants and human. The world Health organization (WHO) Recommended replaces chemicals material by medicinal herbs and plant in drug industries (back to nature) (Allam *et al.*, 1999). Parsley is good sources of minerals as calcium, potassium, iron and vitamins such as A, C, thiamin, riboflavin and niacin (Review of Natural Products, 1991) and is a good blood cleanser because it is contained of ascorbic acid. It is diuretic and relieves abdomen bloat, have some of possible medicinal traits including, bactericidal or static (Wong and Kitts, 2006), Improved blood components (Baytop, 1984), anticoagulant, antihyperlipidemic, antihepatotoxic (Ozturk et al., 1991), antioxidant (Nielsen et al., 1999) and stimulate or facilitate evacuation of the

* *Corresponding author: E-mail*: zaid.khzir@univsul.edu.iq

bowels (Kerydiyyeh et al., 2001).

Parsley is one of the antagonists to oxidize cells that protect them from cancer and develop the immune system has is because it contains a high content of vitamin C equivalent to four times the rate of the lemon, and the high levels of Flavones and special material Apignin, which works to reduce the division of cancer cells so it helps to treat the disease and reduce its spread (Nielsen et al., 1999). The present study will be conducted to determine the effect of dietary supplementation with parsley on some meat traits of the breast and thigh meat of broiler chicks.

MATERIAL AND METHODS:

This study was conducted at the high education lab, Animal science dept., College of Agricultural Engineering Sciences, Sulaimani University. The meat used from previous study that used the Parsley in broiler feed, at eight-day old, chicks divided equally on floor pens into 5 groups, each group contained 8 replicates (8 chicks/ each). Treatments were divided as follows:

(T1), using basal diet free from parsley as control
(T2), using basal diet plus 3 gm. parsley/Kg of diet
(T3), using basal diet plus 6 gm. parsley/Kg of diet
(T4), using basal diet plus 9 gm. parsley/Kg of diet
(T5), using basal diet plus 12 gm. parsley/Kg of diet

In the end of this experiment, all after the slaughtered the broiler, the meat samples from breast and thigh used for the following measurements:

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 fish 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 %=W_1/W_2 ×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 measures by a pH meter.

Cooking loss:

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

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

Water holding capacity (WHC):

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

The tube was kept at refrigeration temperature (4˚C) for 15 min, stirred again and centrifuged at 2806.1 xg (4˚C) for 15 min. The supernatant measure and amount of water retain 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:

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

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

A 100 g of the minced Shrimp sample were mixed for 1min 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 indicator. The blank was carried out using 25 ml of 7.5% Trichloroacitic 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

Thiobarbituric acid (TBA) value:

The TBA values determined according to the method described by Witte *et al*., (1970). Twenty grams of the muscle will blend with 50ml of cold solution containing 20% trichloroacetic acid (TCA) in 2M phosphoric acid. The resulting slurry transfer quantitatively to a 100ml volumetric flask with 40ml distilled water. The sample dilute to 100ml with distilled water and homogenized by shaking. A 50ml portion filter through Whatman No.1 filter paper. Five ml of filtrate transfer to a test tube followed by 5ml of fresh thiobarbituric acid (TBA) (0.005M in distilled water). The blank prepares by mixing 5ml of distilled water with 5ml of TBA. The tubes stopper and the solution mix and keep in the dark for 15-17 hr at room temperature to develop the color reaction.

The absorbance read at 530 nm by using spectrophotometer (Shimdzu, Japan). The TBA value express as mg malonaldehyde (MDA)/kg muscle, and calculate by multiplying the absorbance (A) by 5.2 factor as follows:

TBA value (mg MDA/kg muscle) = $A_{530} \times 5.2$

Determination of percent met-myoglobin and myoglobin concentration:

Pigment of meat extract from muscles of each treatment using a modified procedure of KrzyWicki (1982). Muscle samples (1gm) blend with 10ml ice-cold 0.04M phosphate buffer at pH 6.8 for 10 sec in a magnetic stirrer, keep at 4˚C for 1 hr, the mixture centrifuge at 2806.1 xg for 30 min at 4˚C. The supernatant further clarifies by filtration through Whatman No.1 filter paper. The absorbance of filtrate measure at 525, 572 and 700 nm using a UV-VIS spectrophotometer (Shimadzu, Japan). The percent met-myoglobin (Met-Mb) and myoglobin concentration determine using the formula stated by KrzyWicki (1982).

$$\% \text{ Met-Mb} = [1.395 - (A_{572} - A_{700} / A_{525} - A_{700})] \times 100$$

$$\text{Myoglobin concentration (mg/g muscle)} = \frac{(A_{525} - A_{700}) \times 2.303 \times \text{dilution factor}}{\text{sample weight (gm)}}$$

Amino Acids percentages:

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

Minerals contents: mineral concentration estimated according to methods described by Rajib et.al. (2016) and Hutton et.al. (2014)

Statistical Analysis:

All data will statistically analyzing by the Completely Randomized Design (CRD) by the SAS (SAS, 2010) system and the differences between the means of groups will separating by Duncan Multiple Range Test (Duncan, 1955) statements of statistical significance are basing on ($P \leq 0.01$) except for mineral concentration we used ($P \leq 0.05$)

Table 1: Feed Composition of experiment treatments

Feed Ingredients	% 100				
	T1 (CONTROL)	T2	T3	T4	T5
Yellow corn	47.2	47	46.7	46.4	46
Soybean meal	28.5	28.4	28.4	28.4	28
Protein concentrate	6	6	6	6	6
Wheat	15	15	15	15	15.5
Sun flower seed oil	3	3	3	3	3
Salt	0.3	0.3	0.3	0.3	0.3
Parsley	0	0.3	0.6	0.9	1.2
Total	100	100	100	100	100

Table 2: Composition of 100g of parsley

Material	Quantity
Energy	315 kcal
Energy	1316 KJ
Water	20.5gm
Protein	22gm
Carbohy.	42g
Sugar	0
Fat	4gm
Saturated	0
Monoun.	1.5g
Polyun.	1.5g
Cholest.	0
Fiber	10.5gm
Vitamin A	0
Vitamin B1	0.2mg
Vitamin B2	1.2mg
Vitamin B6	1mg
Vitamin B11	-
Vitamin B12	0
Vitamin C	120mg
Vitamin D	0
Sodium	450mg
Potassium	3800mg
Calcium	350mg
Phosphor	-
Iron	95mg
Magncium	-
Copper	-
Zinc	-

RESULTS AND DISCUSSION:

The results in table 3, shows the effect of parsley on broiler chicks' meat chemical composition. adding parsley to feed of chicks effect significantly ($p<0.01$) on moisture percentages in breast and thigh meat, the highest percentages of breast meat moisture recorded in T4 (9 gm. parsley/Kg of diet) treatment, it was (75.00%), while the lowest percentages of breast meat moisture recorded in T1 (diet free from parsley) treatment, it was (72.72%), for moisture percentages in thigh meat, the highest percentage recorded in meat of T5 (12 gm. parsley/Kg of diet) it was (73.56%), in contrast the lowest percentage recorded in thigh meat of T1 (diet free from parsley) it was (67.64%). In table 3, the results shows that adding parsley effect significantly ($p<0.01$) on protein percentages on breast and thigh meat, the highest breast meat protein percentages recorded in T5 (12 gm. parsley/Kg of diet) it was (16.88%), while the lowest breast meat protein percentages recorded in T1 (diet free from parsley), it was (15.76%), for thigh meat protein percentage, the highest percentages recorded in meat of T5 (12 gm. parsley/Kg of diet) it was (16.55%), in contrast the lowest protein percentages recorded in meat of T1 (diet free from parsley), it was (15.71%). The lipid percentages in breast and thigh meat significantly differ ($p<0.01$) as a results of adding parsley to broiler chick feed (table 3), the highest breast meat lipid percentages recorded in T5 (12 gm. parsley/Kg of diet) it was (7.45%), while the lowest percentages recorded in breast meat of T1 (diet free from parsley), it was (3.01%), for lipid percentages in thigh meat, the highest percentages recorded in meat of T5 (12

gm. Parsley/Kg of diet) it was (7.49%), and lowest percentages recorded in thigh meat of T1 (diet free from parsley), it was (2.75%). The results of ash percentages (table 3) shows that adding parsley significantly affect ($p<0.01$) on ash percentages, the highest breast meat ash percentages recorded in T5 (12 gm. parsley/Kg of diet) it was (3.43%), while the lowest percentages recorded in breast meat of T1 (diet free from parsley), it was (2.97%), for ash percentages in thigh meat, the highest percentages recorded in meat of T5 (12 gm. Parsley/Kg of diet) it was (3.29%), and lowest percentages recorded in thigh meat of T1 (diet free from parsley), it was (2.53%).

Ragab et al., (2010) found that fed parsley diet for Cobb broiler result in higher ash and lower fat, and opposite results reported by Al-Harthi (2004), while in our study highest chemical composition recorded in meat sample of broiler feed with parsley. When we back to table 2, we can find that parsley contain many types of nutrient in high percentage and this may be affected on chemical composition of meat from broiler feed with parsley (table 3).

Table 3: Effect of using Parsley (*Petroselinum crispum*) as feed additive on chemical composition of broiler chicks' breast and thigh meat. (Mean ± standard deviation)

Treatment	Moisture %		Protein%		Lipid%		Ash%	
	Breast	Thigh	Breast	Thigh	Breast	Thigh	Breast	Thigh
T1	72.72 ± 0.07 c	67.64 ± 1.36 d	15.76 ± 0.01 d	15.71 ± 0.01 e	3.01 ± 0.004 e	2.75± 0.02 E	2.97 ± 0.003 e	2.53 ± 0.004 e
T2	73.34 ± 0.45 bc	69.91 ± 0.04 c	15.84 ± 0.005 d	15.80 ±0.006 d	3.56 ± 0.02 D	3.29± .007 D	3.11 ± 0.002 d	2.76 ± 0.001 d
T3	73.97 ± 0.85 ab	72.24± 0.007 b	16.00± 0.005 c	15.92 ± 0.06 c	5.19 ± 0.04 C	5.30 ± 0.01 C	3.23 ± 0.001 c	3.03 ± 0.001 c
T4	75.00 ± 0.05 a	72.63 ± 0.13 ab	16.16 ± 0.04 b	16.15 ± 0.04 b	6.00±0.008 B	5.77 ± 0.05 B	3.40 ± 0.001 b	3.11 ± 0.002 b
T5	74.91 ± 0.66 a	73.56 ± 0.47 a	16.88 ± 0.07 a	16.55 ± 0.02 a	7.45 ± 0.01 A	7.49 ± 0.02 A	3.43 ± 0.003 a	3.29 ± 0.002 a

*Mean with different small letter (a, b) among columns (treatment) are significantly differ ($p<0.01$).

Results in table 4 revealed that adding of parsley as feed additive affect significantly ($p<0.01$) on physical traits of breast and thigh meat of broiler chicks. The results of pH value revealed that the highest breast pH value recorded in meat of T5 (12 gm. Parsley/Kg of diet) (7.13) while the lowest pH value recoded in meat of T1 (diet free from parsley) (6.35), pH value in thigh meat recorded highest value in T5 (12 gm. Parsley/Kg of diet) treatments (7.43) in contrast the lowest value recorded in thigh meat (6.50). The results of breast and thigh meat cooking loss (CL) in table 4 revealed that the highest percentages recorded in T1 (diet free from parsley) treatment, it was 56.60% for breast, whereas the highest percentage recorded in T2 (3 gm. Parsley/Kg of diet) 65.13% for thigh, while the lowest cooking loss percentages in breast and thigh meat recorded in T5 (12 gm. Parsley/Kg of diet) treatment, it were (34.71 and 32.56%) respectively. Water holding capacity (WHC) results in table 4, revealed that the breast and thigh meat highest percentages recorded in T5 (12 gm. Parsley/Kg of diet) treatment, it were (62.58 and 65.13%) respectively, while the lowest percentages recorded in breast and thigh meat of T1 (diet free from parsley) treatment, it were (40.17 and 40.43%) respectively. Warris, (2000) described that high pH increase the water-binding because it is effect on shrinkage of the contractile fibers, and this found of our study, that meat sample has higher pH which cause higher Water holding capacity and lower cooking loss (table 4). Ragab et al., (2010) indicated that high WHC recorded in chick's meat feeding P; the opposite results recorded by Lee et al., 1976

and Dransfield and Sosnicki (1999), while Young et al. (2003) found that supplementation of parsley not effect on pH, and water-holding capacity in meat.

Table 4: Effect of using Parsley (*Petroselinum crispum*) as feed additive on some physical traits of broiler chicks' breast and thigh meat. (Mean ± standard deviation)

Treatment	pH		CL%		WHC%	
	Breast	Thigh	Breast	Thigh	Breast	Thigh
T1	6.35 ± 0.09 e	6.50 ±0.01 d	56.60 ±3.68 a	61.68 ± 0.24 b	40.17 ± 0.03 e	40.43 ± 0.23 d
T2	6.51 ± 0.01 d	6.59 ± 0.04 d	46.89 ±0.88 b	65.13 ± 1.19 a	41.34 ± 0.61 de	43.00 ± 0.11 cd
T3	6.69 ± 0.01 c	6.80 ± 0.05 c	42.42 ±0.33 c	41.73 ± 0.14 c	43.96 ± 0.50 cd	45.59 ± 0.40 c
T4	6.93 ± 0.01 b	7.04 ± 0.03 b	40.60 ±0.42 c	37.17 ± 0.32 d	55.17 ± 4.86 b	61.68 ± 0.24 b
T5	7.13± 0.02 a	7.43 ± 0.13 a	34.71 ±1.46 d	32.56 ± 0.05 e	62.58 ± 0.38 a	65.13 ± 1.19 a

*Mean with different small letter (a, b) among columns (treatment) are significantly differ ($p<0.01$).

The results of thiobarbuteric acids (TBA) and total volatile basic nitrogen (TVB.N) represented in table 5, results revealed that adding of parsley as feed additive affects significantly ($p<0.01$) on TBA and TVN.B values. The highest TBA value recorded in breast and thigh meat of T1 (diet free from parsley) treatment, it were (0.70 and 0.81 mg. MDA/Kg muscle) respectively, in contrast the lowest TBA value recorded in breast and thigh meat of T5 (12 gm. Parsley/Kg of diet) treatment, it were (0.44 and 0.46 mg. MDA/Kg muscle) respectively, TBA value is one of lipid oxidation indictors and is pronounced as milligrams of malonaldehyde (MA) analog kilogram meat. MA is secondary polyunsaturated fatty acids oxidation output that interact with the TBA reagent (Shahidi & Wanasundara, 2002). Parsley was a good source of antioxidants to delayed lipid oxidation (Jimenez-Alvarez *et al.,* 2008; Kery et al., (2001), and this the results of decreasing TBA values in meat samples showed in treatments contain parsley especially treatment contain higher concentration (table, 5). ICOSQC, (1987) state that the TBA not accepted if exceed 5 mg MDA/ kg meat.

The results of TVB.N shows that highest values recorded in Breast and thigh meat of T1 (diet free from parsley) treatment, it were (19.26 and 18.10 mg.N/100 gm. Muscle) respectively, in contrast the lowest values recorded in breast and thigh meat of T5 (12 gm. Parsley/Kg of diet) treatment, it were (13.19 and 11.98 mg. N/100 gm. Muscle). The numbers of both total aerobic bacteria and *Pseudomonas* spp. Effect significantly in the amount of TVB-N (Ruckhon *et al.,* 2011). Holst and Engvild, (2000) reported that one of medicinal attributes of parsley is antimicrobial, and this may be decrease TVB.N value in samples of meat from chick feed with parsley (table, 5). The Iraqi Central Organization for Standardization and quality control, IQS 1179, specified the frozen chicken TVN. Value not to exceed 20 mg N/ 100g meat (ICOSQC, 1987), meat from all treatment not exceed this value.

Table 5: Effect of using Parsley (*Petroselinum crispum*) as feed additive on some chemical traits of broiler chicks' breast and thigh meat. (Mean ± standard deviation)

Treatment	TBA (mg MDA/kg muscle)		TVN (mgN/100 gm muscle)	
	Breast	Thigh	Breast	Thigh
T1	0.70 ± 0.03 a	0.81 ±0.005 a	19.26 ± 0.06 a	18.10 ± 0.26 a
T2	0.55 ± 0.01 b	0.61 ± 0.04 b	17.22 ± 0.27 b	16.57 ±0.05 b
T3	0.51 ± 0.003 c	0.52 ± 0.003 c	16.10 ± 0.31 c	14.94 ± 0.05 c
T4	0.47 ± 0.008 d	0.49 ± 0.008 d	14.13 ± 0.03 d	14.09 ± 0.005 d
T5	0.44 ± 0.003 d	0.46 ± 0.001 d	13.19 ± 0.02 e	11.98 ± 0.35 e

*Mean with different small letter (a, b) among columns (treatment) are significantly differ ($p<0.01$).

The results in table 6 revealed that adding Parsley as feed additive affect significantly ($p<0.01$) on Met- myoglobin and Myoglobin value, the highest breast and thigh meat Met- myoglobin percentages recorded in T1 (diet free from parsley) treatment, it were (49.64 and 58.65%) in contrast the lowest Met- myoglobin percentages recorded in breast and thigh meat of T5 (12 gm. parsley/Kg of diet) treatment, it were (26.46 and 27.98%) respectively. For results of Myoglobin value in breast and thigh meat, the highest values recorded in meat of T5 (12 gm. parsley/Kg of diet) treatment, it were (4.92 and 4.66 mg/gm muscle) respectively, while the lowest value recorded in breast and thigh meat of T1 (diet free from parsley) treatment, it were (3.16 and 2.90 mg/gm muscle) respectively. One of the most important demands of Consumers and retailers are color and color stability of meat. The amount and chemical state of the pigment myoglobin impact on meat color, and unattractive colored metmyoglobin show after oxidation (Faustman and Cassens, 1990; Hoving-Bolink *et al.,*1998). Adding Parsley as feed additive improved pigment stability compared with the control which due to it contains a high content of vitamin C equivalent to four times the rate of the lemon, and the high levels of Flavones and special material Apignin, which works as antioxidants and prevent Met-myoglobin production (Nielsen et al., 1999).

Table 6: Effect of using Parsley (*Petroselinum crispum*) as feed additive on Met- myoglobin and Myoglobin value of broiler chicks' breast and thigh meat. (Mean ± standard deviation)

Treatment	Met- myoglobin %		Myoglobin (mg/gm muscle)	
	Breast	Thigh	Breast	Thigh
T1	49.64 ± 0.70 a	58.65 ± 0.99 a	3.16 ± 0.05 e	2.90 ± 0.07 e
T2	41.91 ± 1.80 b	45. 68 ± 0.62 b	3.55 ± 0.05 d	3.37 ± 0.05 d
T3	34.17 ± 0.34 c	37.99 ± 0.60 c	3.91 ± 0.01 c	3.80 ±0.01 c
T4	29.71 ± 0.98 d	33.04 ± 0.66 d	4.39 ± 0.02 b	4.11 ± 0.11 b
T5	26.46 ±0.13 e	27.98 ± 0.37 e	4.92 ± 0.03 a	4.66 ± 0.04 a

*Mean with different small letter (a, b) among columns (treatment) are significantly differ ($p<0.01$).

The results in figure 1 and 2 shows that using parsley effect significantly on some amino acids percentages in breast and thigh meat of broiler chicks, using of parsley effect on glutamic acids, serine, threonine, arginine, alanine, tyrosine, methionine, phenylalanine, isoleucine, leucine, histidine, lysine and aspartic acid percentages in breast meat of broiler chicks (figure 1), also adding parsley effect on glutamic acid, serine, glycine, threonine, arginine, tyrosine, cysteine, valine, methionine, isoleucine, leucine, histadine and aspartic acid in thigh meat of broiler chicks (figure 2). The parsley concentrations used in this study may be not sufficient to clearly affect on amino acids percentages

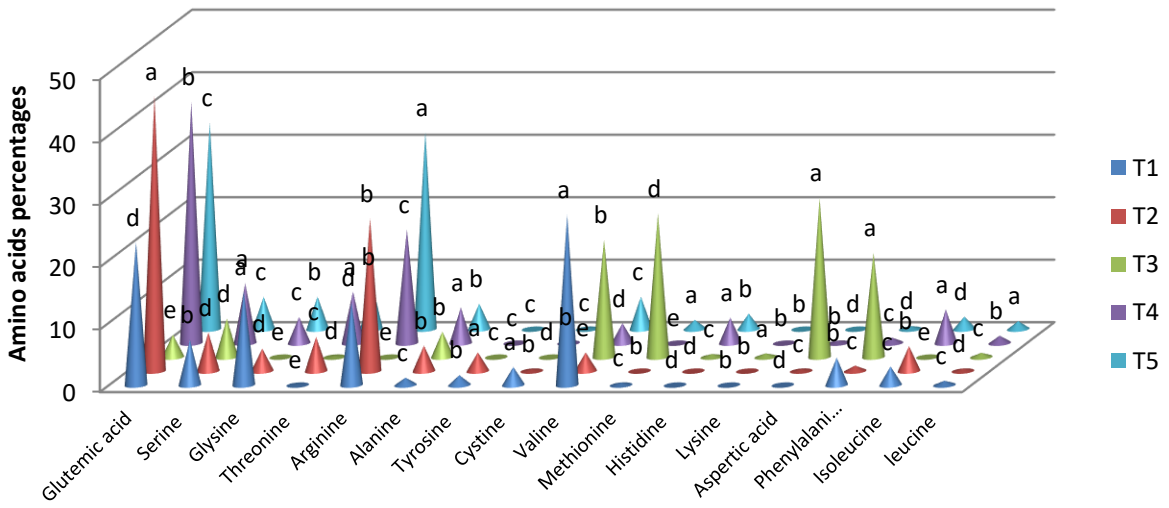

Figure 1: Effect of using Parsley (*Petroselinum crispum*) as feed additive on Amino acid percentages of broiler chicks breast meat

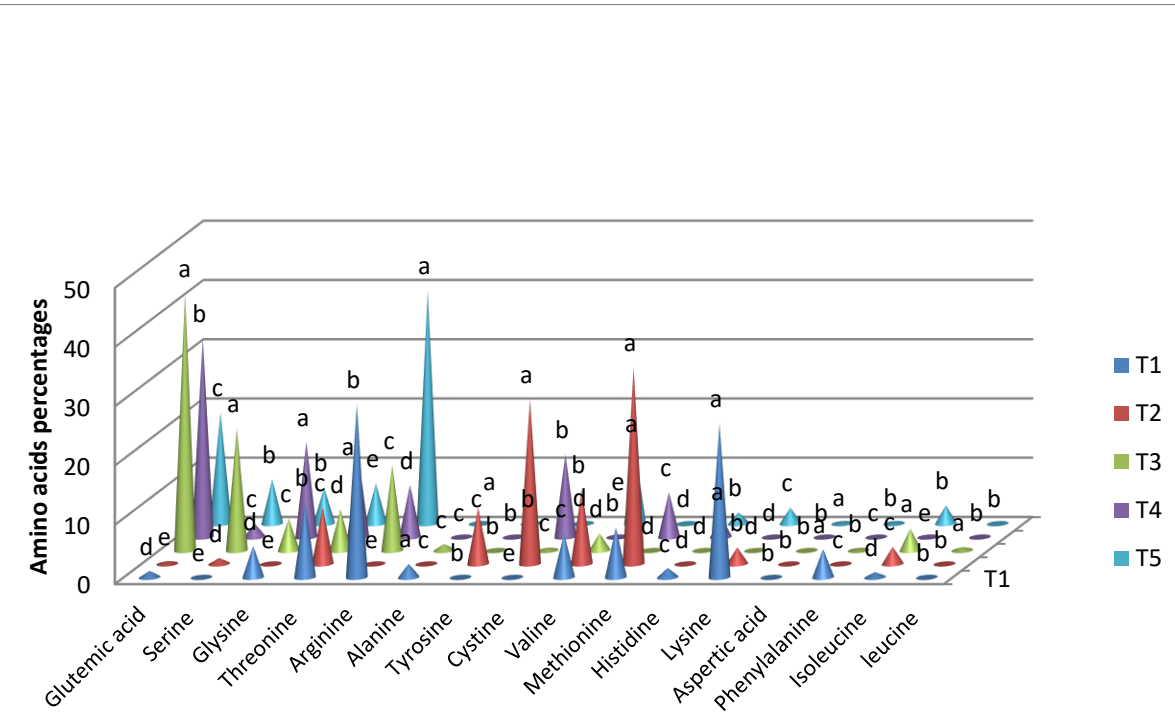

Figure 1: Effect of using Parsley (*Petroselinum crispum*) as feed additive on Amino acid percentages of broiler chicks thigh meat

As seen in table 5, the adding parsley effect significantly in Chromium, Copper, Nickel and Zinc concentrations in thigh meat, also effect on Iron concentration in breast meat. Results showed that all meat from broiler chicks fed on parsley recorded highest content in comparison to control groups. The highest concentration of Chromium recorded in thigh meat of T5 (12 gm. parsley/Kg of diet) treatment (0.125 ppm) while lowest concentration recorded in T1 (control) treatment (0.085

ppm), Cr utilized in diabetes medications because it assist to maintain normal blood glucose level (Broadhurst et al., 2006), Food and Nutrition Board (FNB) at the Institute of Medicine (IOM) of the National Academies recommended that daily adequate intakes (AI) of 25 µg for adult female and 35 µg for male (IOM, 2001). For Copper concentration, the highest concentration recorded in thigh meat of T4 (9 gm. parsley/Kg of diet) and T5 (12 gm. parsley/Kg of diet) (0.099 ppm), while the lowest concentration recorded in T1 (control) (0.085 ppm), Some types of anemia occurs as a results of deficiency of iron element in case of low Cu intake, because Cu is a component of metabolism enzymes of Iron (McDowell, 2003). The highest Nickel concentration recorded in thigh meat from broiler chicks of T5 (12 gm. parsley/Kg of diet) treatment (0.105 ppm), While the lowest concentration recorded in meat from broiler chicks of T1 (control) (0.085 ppm), Nickel is useful to human health, an important helper for different enzymes and accelerates the natural chemical reactions take placed in the body (Acu-cell Nutrition, 2000). Zinc concentration recorded in thigh meat from broiler chicks of T2 (3 gm. parsley/Kg of diet) treatment highest concentration (3.650 ppm), in contrast the meat from chicks of T3 (6 gm. parsley/Kg of diet) treatment recorded lowest concentration (2.200 ppm), Zinc is one of the heavy metal necessary to normalize cells functions, including protein metabolism, carbohydrates, cell growth, and cell division (Saeed, 1998). The highest Iron concentration recorded in breast meat from chicks of T3 (6 gm. parsley/Kg of diet) treatment (0.645 ppm) and lowest concentration recorded in meat of T5 (6 gm. parsley/Kg of diet) treatment (0.480 ppm), iron trace element is a constant concern of public health. Iron deficiency may be the most popular organic disorder in clinical medicine (Skikne, 1988)

Table 5: Effect of using Parsley (*Petroselinum crispum*) as feed additive on mineral concentration (ppm) of broiler chicks' breast and thigh meat. (Mean ± standard deviation)

Minerals	Meat type	T1	T2	T3	T4	T5
Cr	Breast	0.085 ±0.007 a	0.100 ± 0.00 a	0.113 ± 0.025 a	0.545 ±0.007 a	0.115 ±0.007 a
	Thigh	0.085 ± 0.007 c	0.110 ± 0.01 ab	0.105±0.008abc	0.095 ±0.004 bc	0.125± 0.007 a
Cu	Breast	0.085 ± 0.007 a	0.090 ±0.013 a	0.098 ±0.001 a	0.096 ± 0.001 a	0.099 ±0.0 a
	Thigh	0.085 ± 0.007 b	0.094 ± 0.006 a	0.096 ±0.001 a	0.099 ± 0.001 a	0.099 ±0.0 a
Cd	Breast	0.045 ± 0.007 a	0.048 ± 0.003 a	0.049 ± 0.001 a	0.049 ± 0.001 a	0.049 ±0.0 a
	Thigh	0.045 ± 0.007 a	0.049 ± 0.001 a	0.049 ± 0.001a	0.049 ±0.001 a	0.049 ±0.0 a
Pb	Breast	0.10 ± 0.0 a	0.088 ± 0.004 a	0.0115 ±0.007 a	0.525 ± 0.601 a	0.100 ±0.001 a
	Thigh	0.130 ± 0.028 a	0.099 ± 0.001 a	0.115 ± 0.021 a	0.098 ± 0.003 a	0.125 ± 0.007 a
Ni	Breast	0.085 ± 0.007 a	0.105 ± 0.021 a	0.105 ± 0.008 a	0.097 ± 0.005 a	0.100 ± 0.001 a
	Thigh	0.085 ± 0.007 b	0.097± 0.001 ab	0.098± 0.003 ab	0.095± 0.001 ab	0.105 ± 0.008 a
Zn	Breast	3.250 ± 0.212 a	3.0 ± 0.141 a	3.750 ±0.071 a	3.050 ±0.778 a	2.750 ± 0.919 a
	Thigh	3.00 ±0.283 ab	3.650 ±0.071 a	2.200 ± 0.141 b	3.10 ± 0.707 ab	2.850± 0.071 ab
Fe	Breast	0.535± 0.078 ab	0.575± 0.007 ab	0.645 ± 0.007 a	0.585± 0.007 ab	0.480 ± 0.085 b
	Thigh	0.600 ± 0.028 a	0.485 ± 0.007 a	0.515 ± 0.007 a	0.555 ± 0.106 a	0.595 ± 0.120 a

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

REFERENCES

Acu-cell Nutrition. Nickel and cobalt with vitamin C, E, B12, B15 [document on the Internet]; 2000 [updated 2014 Jan 15; cited 2014 Feb 8] Available from: www/acu-cell.com/nico.html.

Al-Harthi, M. A. (2004). Efficiency of utilizing some spices and herbs with or without antibiotic supplementation on growth performance and carcass characteristics of broiler chicks. Egypt. Poult. Sci., 24: 869-899.

Allam, S.M.; Hoda M. El Hosseiny; A.M. Abdel Gawad; S.A. El-Saadany and A.M.M. Zeid (1999). Medicinal herbs and plants as feed additives for ruminants. 1. Effect of using some medicinal herbs and plants as feed additives on Zaraibi goats performance. Egypt. J. Nutrition and feeds, 2, (special Issue): 349-365.

Baytop T (1984). Therapy with medicinal plants in Turkey (Past and Present), Istanbul University Yayinlari, Turkey, p.3255.

Broadhurst, C.L. and P. Domenico, Clinical studies on chromium picolinate supplementation in diabetes mellitus - A review. Diabetes Technol Ther, 2006. 8(6), 677-87.

Dransfield, E. and Sosnicki, A. A. (1999). Relationship between muscle growth and poultry meat quality. Poult. Sci. 78:743–746.

Duncan, D. B. (1955). Multiple range and multiple F-tests. Biometrics 11, l-42. *JMF Abreu, AM Bruno-Soares/Animal Feed Science Technology 70 (1998) 49-57 Sl.*

Faustman, C. and R. G. Cassens (1990) "The biochemical basis for discoloration in fresh meat: a review", *J. Muscle Foods*, 1:217-243.

Gudev, D., S. Popova-Ralcheva1, P. Moneva1 and M. Ignatova (2008). Effect of the probiotic "Lactona" on some biological parameters and non specific resistance in neonatal pigs. Biotec. Anim. Husb., 24(1-2): 87-96.

Holst, P. B., & Engvild, K. C. (2000). Natural chlorinated compounds. *Natural chlorinated compounds.*, (23), 87-95.

Hoving-Bolink, A. H., G. Eikelenboom, J. Th. M. Van Diepen, A. W. Jongbloed and J. H. Houben (1998) "Effect of dietary vitamin E supplementation on pork quality", *Meat Sci*., 49:205-212

Hutton L.A . , O'Neil G.D., Read T.L. , Arest Z.J. ,Newton M.E. and Macpherson J.V.(2014).Electrochemical X – ray Fluorescence spectroscopy for trace heavy metal Analysis : Enhancing X- ray Fluorescence Detection Capabilities by Four Orders of Magnitude .Anal.Chem.86

Ibrahim, H. M., Abou-Arab, A. A., & Salem, F. M. A. (2010). Effects on Lamb Patties Quality. *Journal of Food Technology*, *8*(3), 134-142.

ICOSQC; Iraqi Central Organization for Standardization and quality control (1987). IQS 1179/4. Frozen chicken and chicken products/ part 4. Iraq. (In Arabic).

IOM, Dietary reference intakes for vitamin A, vitamin K, arsenic, boron, chromium, copper, iodine, iron, manganese, molybdenum, nickel, silicon, vanadium, and zinc, 2001, Food and Nutrition Board, Institute of Medicine (IOM), USA: Available online:http://www.iom.edu/Reports/2001/Dietary-Reference-Intakes-for-Vitamin-A-Vitamin-K-Arsenic-Boron-Chromium-Copper-Iodine-Iron-Manganese-Molybdenum-Nickel-Silicon-Vanadium-and-Zinc.aspx.

Jimenez-Alvarez, D., Giuffrida, F., Golay, P. A., Cotting, C., Lardeau, A., & Keely, B. J. (2008). Antioxidant activity of oregano, parsley, and olive mill wastewaters in bulk oils and oil-in-water emulsions enriched in fish oil. *Journal of agricultural and food chemistry*, *56*(16), 7151-7159.

Kelrich, K. ur.(1990). Official methods of analysis. *Arlington, VA: Association of Official Analytical Chemists/AOAC,*.

Kreydiyyeh, S.I.; Usta J, Kaouk I and Al-Sadi R (2001). The mechanism underlying the laxative properties of parsley extract. J. Phytomed., 8(5): 382-8.

Krzywicki, K. (1982). The determination of haem pigments in meat. *Meat Science*, *7*(1), 29-36.

Lee, K.W.; Everts, H. and Beynen, A. C. (2004). Essential oils in broilernutrition. *Int. J. Poult. Sci., 3: 738-752.*

Lee, Y. B.; Hargus, G. L.; Hagburg, E. C. and Forsythe, R. H. (1976). Effect of antemortem environmental temperature on postmortem glycolysis and tenderness in excised broiler breast muscle. J. Food Sci. 41:1466–1469.

Malle, P. and Poumeyrol, M. (1989). A new chemical criterion for the quality control of fish: trimethylamine/total volatile basic nitrogen (%). *Journal of food protection*, *52*(6), 419-423.

Mansoub, N.H. (2011). Comparison of effects of using Nettle (Urtica dioica) and probiotic on performance and serum composition of broiler chickens. Global Veterinaria, 6(3): 247-250.

McDowell, L.R., Minerals in Animal and Human Nutrition. 2nd ed, 2003, Amsterdam, The Netherlands: Elsevier Science. 660 p.

Murphy, M. A., & Zerby, H. N. (2004). Pre-rigor infusion of lamb with sodium chloride, phosphate, and dextrose solutions to improve tenderness. *Meat Science*, *66*(2), 343-349.

Nielsen SE, Young JF, B Daneshvar, ST Lauridsen, P Knuthsen and B Sandstrom (1999). Effect of parsley intake on urinary apigenin excretion, blood antioxidant enzymes and biomarkers for oxidative stress in human subjects. Br. J. Nutr., 81: 447-455.

Ozturk Y, CHK Baser and S Aydin (1991). Hepatoprotective (antihepatotoxic) plants in Turkey. Proceedings of the 9th Symposium on Plant Drugs. Eskisehir Turkey, pp.40-50.

Ragab, M. S., Magda, R. A., & Farahat, G. S. (2010). Effect of molukhyia or parsley feeding on carcass characteristic, glutathione peroxidase enzyme activity and meat quality of two broiler strains. *Poult. Sci*, *30*, 353-389.

Rajib A. , SaifulIslam A.T.M. , Ahmed R., Rahman T. , Rahman A. , Ismail A.B. (2016).Detection of chromium (Cr) using X-ray Fluorescence Technique and Investigation of Cr Propagation

from poultry Feeds to Egg and chicken Flesh .American Journal of Engineering Research (AIER) vol5.Issue 7 , pp. : 243-247

Review of Natural Products, 1991. Facts and Comparisons, parsley monograph. St. Louis, MO.

Rukchon, CH.; Trevanich, S.; Jinkarn, T. and Suppakul, P.(2011) Volatile Compounds as Quality Indicators of Fresh Chicken and Possible Application in Intelligent Packaging. The 12th. Proc. ASean Food Conference, 2011, 16 -18 June, BITEC Bangna, Bangkok, Thailand.

Saeed HM. Hamdard medicus, Vol. XII. Pakistan: Bait-al-Hakimah; 1998

SAS Users Guide (2010). *SAS Inst*., Inc. Cary, NC.

Schuster, R. (1988). Determination of amino acids in biological, pharmaceutical, plant and food samples by automated precolumn derivatization and high-performance liquid chromatography. *Journal of Chromatography B: Biomedical Sciences and Applications*, *431*, 271-284.

Shahidi, F. and Wanasundara, U.N. (2002) Methods for Measuring Oxidative Rancidity in Fats and Oils. In: C.C. Akoh and D.B. Min (eds.). Food lipids: chemistry, nutrition and biotechnology. New York, NY: Marcel Dekker.

Skikne, B.S. 1988. Current concepts in iron deficiency anemia. Food Reviews International. 4(2): 137-173.

Wardlaw, F. B., McCaskill, L. H., & Acton, J. C. (1973). Effect of postmortem muscle changes on poultry meat loaf properties. *Journal of Food science*, *38*(3), 421-423.

Warris, P. D. (2000). Meat science. An introductory text. New York: CABI Pub. Inc.

Witte, V. C., Krause, G. F., & BAILEY, M. E. (1970). A new extraction method for determining 2-thiobarbituric acid values of pork and beef during storage. *Journal of food Science*, *35*(5), 582-585.

Wong, P. Y. Y. and Kitts, D. D. (2006). Studies on the dual antioxidant and antibacterial properties of parsley (*Petroselinum crispum*) and cilantro (Coriandrum sativum) extracts. *Food Chemistry 97:505–515.*

Young, J. F.; Stagsted, J.; Jensen, S. K.; Karlsson, A. H. and Henckel, P. (2003). Ascorbic Acid, α-Tocopherol, and oregano supplements reduce stress-induced deterioration of chicken meat quality. Poult. Sci. 82:1343–1351.

تأثير استخدام المعدونس (*Petroselinum crispum*) كاضافة للعلائق في بعض صفات لحوم فروج اللحم

رووف حسين مجيد[1]، طارق خالد محمد بشر[2]، زيد خلف خضر[1] ، ارازو عبدالله حمة[1]

[1]قسم علوم الحيوان، كلية علوم الهندسة الزراعية، جامعة الزراعية.

[2]قسم الثروة الحيوانية، كلية الزراعة، جامعة تكريت.

المستخلص

اجريت الدراسة لغرض دراسة تاثير اضافة المعدنوس للعلائق في بعض صفات لحوم الصدر والفخذ لفروج اللحم. بعمر ثمانية ايام قسمت الافراخ بشكل متساوي الى خمس معاملات، كل مجموعة تحتوي على ثلاثة مكررات (8 افراخ/ مكرر)، المعاملات شملت معاملة المقارنة (استخدمت العليقة الاساسية بدون اضافات)، المعاملة الثانية (العليقة الاساسية اضافة الى 3 غرام من المعدنوس)، المعاملة الثالثة (العليقة الاساسية مع اضافة الى 6 غرام من المعدنوس)، المعاملة الرابعة (شملت العليقة الاساسية اضافة الى 9 غرام المعدنوس) والمعاملة الخامسة (شملت العليقة الاساسية اضافة الى 12 غرام من المعدنوس). في نهاية التجربة تم ذبح افراخ كافة المعاملات، واخذت عينات من لحوم الصدر والفخذ. فوجد ان اضافة المعدنوس اثر معنويا ($p<0.01$) في التركيب الكيميائي للحوم الصدر والفخذ، واعلى النتائج سجلت في الافراخ التي تغذت على المعدنوس، اضافة المعدنوس عزز معنويا ($p<0.01$) الصفات الفيزيائية، قيمة حامض الثايوباربيوتريك، النتروجين الكلي المتطاير، ميتميكلوبيولين والميكلوبين في لحوم الصدر والفخذ لفروج اللحم. ادت اضافة المعدنوس الى تاثير معنوي في نسب الاحماض الامينية في لحوم الصدر والدجاج، وكذلك اثرت في تركيز الكرميوم، النحاس، نيكل والزنك في لحم الفخذ وكذلك نسبة الحديد في لحم الصدر.

الكلمات المفتاحية: المعدنوس، اضافة غذائية، فروج اللحم، صفات اللحم.