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EFFECTS OF DIETARY THREONINE LEVEL, METHIONINE SOURCES, SEX OF BROILER CHICKS AND THEIR INTERACTIONS ON CARCASS TISSUE DISTRIBUTION AND CHEMICAL COMPOSITION

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ABSTRACT: A total sum of 180 Hubbard broilers chicks (46.9 ± 2.5 g) at one-day-old were used, weighed and divided into six treatments of three replicates each to investigate effects of using two levels of amino acid threonine (T) being (0.0 or 1.0 g/ kg diet) and three different methionine sources: DL- methionine (DLM), acid liquid methionine (ALM) or methionine hydroxy-analogue-calcium salt (MHA) in 2 x 3 factorial design on carcass tissue weight distribution and chemical composition for both male and female broiler chicks, fed corn-soybean meal based diets. Results obtained declared that skin and subcutaneous fat percentages of carcass parts were not altered by neither different dietary treatments nor bird sex. Also, distribution of both muscles and bones was not altered by different dietary treatments as male and female chicks appeared similar, except for muscles percentages of breast and drumstick where, males recoded significantly higher values than female chickens. Additionally, all parameters of tibia bone measurements (tibia length, tibia width, tibia Seedor index (SI) and tibia Robusticity index (RI)) were not significantly affected by different dietary treatments, while male chickens had a significant higher figures (tibia length, width, (SI) and dry tibia weight percentage (DTW %)) than female chickens. Data of chemical composition of both tibia bone and breast meat were presented insignificant effect of either different dietary treatments, or bird sex. While most of studied parameters showed insignificant response due to interactions between threonine levels (T), methionine sources (M) and sex of birds (S). According to results obtained, it would be stated that interactions between dietary threonine (T) supplementation, methionine (M) sources and sex (S), for nearly all studied parameters, were insignificant.

Key words: Bones- L-threonine- Methionine sources- Muscles sex- Skin.

INTRODUCTION

Dietary protein is used by broilers for many functions, the most important function being accretion of broiler meat. It has been recognized that poultry actually require a specific quantity and balance of the dietary essential amino acids and sufficient nitrogen for synthesis of the non-essential amino acids internally (Aftab et al., 2006). However, utilization of amino acids under the dietary conditions where an excess of amino acids is provided as free form has been questioned (Surisdiarto and Farrell, 1991). Moreover, the rate of absorption and metabolism after consumption of dietary free amino acids need to be explained in broilers (Bregendahl and Burnham, 2001; and Jiang et al., 2005).

Synthetic methionine (Met) is typically considered the first limiting amino acid, when broiler chicks are fed corn-soybean meal based diets. Co-enzyme S-adenosyl methionine (the active form of methionine) serves as an important labile methyl-group donor, which allows for the formation of many essential compounds in bird's body including choline, creatine, epinephrine, DNA, glutathione, major source of organic sulfur compounds in the body (Harper, 1965; and Fanatico, 2010).

Methionine is therefore a key dietary nutrient for maintaining growth and production of growing chicks at current broiler industry levels (Carew et al., 2003; Vieira et al., 2004; and Corzo et al., 2006). The common sources of supplemental methionine used in broiler diets in Egypt are DL-methionine (DL-Met), methionine hydroxy analogue-free acid, (Ali-Met) and methionine hydroxy analogue calcium salt (Met-HA-Ca). Several researchers found that methionine hydroxy- analogue (Ali-Met or Met-HA-Ca) has nearly equal biological activity to DL-Met (Waldroup et al., 1981; Elkin and Hester, 1983; and Garlich, 1985). In this regard, Garlich (1985) evaluated the response of broilers to graded levels of ALM in corn-soybean meal diets for 49 days compared to DL-methionine and L-methionine. The author suggested that, there were no significant differences in weight gains or feed conversions at 21, 42 or 49 days, among the three methionine sources. However, other studies have indicated that, performance of birds fed diets containing methionine hydroxy-analogue (MHA) was not equal to those fed DLM and had statistically less weight gain and poorer feed conversion (Christensen et al., 1980; Baker and Boebel, 1980; and Boebel and Baker, 1982). Similar negative impacts on body weight, feed intake, feed efficiency, uniformity and breast meat yield have been measured as well as increases in fat pad deposition and a shift in thigh and wing yield, when broiler diets are deficient in methionine as DLM (Carew et al., 2003; Vieira et al., 2004; and Corzo et al., 2006).

On the other hand, formulating broiler diets to be adequate in threonine (third most limiting amino acid) is relatively critical, because threonine deficiency may decrease efficiency of lysine (the second most limiting amino acid) utilization. Lysine and threonine have been shown to interact in such a way that, at optimum dietary concentrations, broiler body weight gain and breast fillet yields are increased (Kidd et al., 1997; Canogullari et al., 2009; and Baylan et al., 2006). Additionally, Barkley and Wallis (2001) observed that, increasing dietary threonine concentration from 5.7 to 7.2 g/kg improved growth and feed conversion ratio of broilers. However, further increment of dietary threonine to 7.7 g/kg had an adverse effect. In addition, it was also reported that threonine requirement under stress and non-hygienic conditions was 0.81% to support growth performance (Taghinejad-Roudbaneh et al., 2013). Other researchers concluded that the threonine need to maximize growth performance was 0.71-74% on new litter and for used litter growth performance was maximized at 0.73-0.78% (Ayasan et al., 2009; Corzo et al., 2007; and Ayasan and Okan, 2006).

The combined effects of methionine sources, threonine level and bird sex and their interactions on carcass tissue distribution and chemical composition have received little attention and partitioning of bird as a response due to these effects have not been widely reported. Therefore, this study was conducted to determine the effects of bird sex, methionine source (ALM; MHA and DLM) with or without threonine (1.0 g/kg diet) addition on carcass tissue distribution and chemical composition of broiler chicks fed on corn-soybean meal based diets.

MATERIALS AND METHODS

This experiment was conducted at Poultry Experimental Unit, Agriculture Research Station, Qalyubia governorate, Faculty of Agriculture, Ain Shams University. A total number of 180 one day old Hubbard broiler chicks, with initial body weight 46.9 ± 2.5 g, were divided into 6 equal treatments groups, each of which included 3 replicates with 10 chicks each, which were housed in one cage. Experimental treatments consisted of a 3 x 2 factorial arrangement with 3 different sources of Methionine, being DL-methionine (DLM), acid liquid methionine (ALM) and methionine hydroxyl analogue Ca salt (MHA) and 2 levels of dietary L-Threonine (0.0 and 1.0 g/kg diet). DLM was used at 0.25% level, while ALM and MHA were added at 0.29 and 0.30%, respectively. As presented in Table (1) experimental diets were formulated to meet the NRC (1994) nutritional recommendations for broilers from 0-35 days of age for all nutrients. Chickens were reared in galvanized battery cages and, were fed starter diets from 1 to 21 days of age while, grower diets were fed from 22 to 35 days of age.

Six birds of five weeks of age of each sex within treatments were randomly selected and slaughtered by severing the carotid artery and jugular veins. The head was removed at the atlanto occipital articulation. Carcasses were stored at -20 °C. Prior to cutting and dissection, carcasses were then thawed for approximately 8 hours at 1 °C while being in their bags. The right sides were then jointed into the following commercial cuts: thigh, drumstick, wing and breast. In each cut, skin, substances fat, intramuscular fat, muscle and bone were dissected and weighed. The sum of muscle and intramuscular fat formed the lean. The sum of these parts over all cuts gives total side lean, total side bone and total side skin plus subcutaneous fat.

Chemical composition of breast meat and tibia bone were estimated. Tibia bones of both sides were removed, cleaned of all soft tissues and weighed. Tibia length and width were determined using a digital micrometer according to the method described by Samejima (1990). The Seedor index (SI) was determined according to Seedor et al. (1991). It represents an indication of tibia density: the higher the value, the denser the tibia. Robusticity index (RI) which was calculated according to Reisenfeld (1972), also gives an indication of tibia mineral density as an absolute figure. In contrast with SI, RI indicated that the lower the value, the denser the tibia. Breast meat amino acids composition was also estimated. To determine amino acids contents the breast meat protein was deproteinized by amide breakage according to Pellet and Young (1980). Amino acids were separated by using sodium acetate buffer with UV light detection (570 nm) of individual amino acids (440 nm for proline) achieved using HPLC procedure by post-column ninhydrin derivatization.

All data obtained were statistically analyzed by the General Linear Model procedures of SAS (2002) as the following model:

$Y_{ijkl} = \mu + T_i + M_j + S_k + (T*M)_{ij} + (T*S)_{ik} + (M*S)_{jk} + (T*M*S)_{ijk} + E_{ijk}$

Where,

Y_{ijkl} = Trait measured

μ = Overall mean

M_i = Methionine source

T_j = Threonine supplementation

S_k = Sex of bird

$(T*M)_{ij}$ = Interaction between threonine level and methionine source

$(T*S)_{ik}$ = Interaction between threonine level and sex

$(M*S)_{jk}$ = Interaction between methionine source and sex

$(T*M*S)_{ijkl}$ = Interaction between threonine level, methionine source and sex

E_{ijkl} = Experimental error

When significant differences among means were found, means were separated using Duncan's multiple range tests (Duncan, 1955).

RESULTS AND DISCUSSION

The effects of dietary threonine levels (0.0 and 1.0 g/kg), methionine sources (DLM, ALM and MHA) and sex of chicken (male and female) on carcass tissue weight distribution can be shown as follows:

Skin and subcutaneous fats distribution: Data in Table (2) indicated that there were insignificant differences in skin and subcutaneous fat percentages of carcass parts (breast, thigh, drumstick and total parts) among treatments. Chicken fed diets supplemented with (threonine 1.0 g/kg) or (ALM) as: a source of methionine reflected lowest figures compared with other treatments, as their corresponding values were 7.18 and 7.0%, respectively, however, differences failed to be significant. Moreover, it is worth to note that male chicken reflected lower insignificant figures compared with female chickens being 6.99 and 7.87%, respectively. These results are logic, due to hormonal and genetic components of female body. Besides, the differences between the two sexes were insignificant.

Muscles distribution: Table (3) shows effects of dietary treatments (T levels, M source) on muscles weight distribution percentages in various cuts for the chicks of both sexes. Experimental treatments either with different levels of threonine (T) or methionine (M) sources, had no significant effect on muscles percentages of different carcass parts. The corresponding values for muscles percentages ranged between (20.52 and 21.55%) in breast, (11.15 and 12.23%) in thigh, (9.29 and 9.99%) in drumstick and (41.60 and 43.02%) in total cuts, without any significant differences. In the same order, the figures of muscles % of carcass parts indicated significant differences between male and female chicks. The corresponding figures were 21.64 versus 19.93% (breast), 11.83 versus 11.55% (thigh), 10.06 versus 9.20% (drum stick) and 43.53 versus 40.69% (total cuts) and in most cases differences were significant. Similar results were reported by Abdallah et al. (1990), Shahin et al. (1996) and Shahin and Abdelazeem (2005), they concluded that male carcass had more muscle, more fat-free carcass and higher ratio of muscle: bone than female carcasses. These findings are in contrast with the results obtained by Shahin and Abdelazeem (2005), who concluded that both breed and bird sex had not influence muscle distribution throughout different carcass parts, while carcasses of chicks fed high protein diet recorded more muscle, when compared to carcasses of chicks fed low protein diet. Other researchers found that compared with males, females had higher proportion of total muscle in breast, and recorded lower fraction of their total muscle in leg (thigh plus drumstick) (Broadbent et al., 1981; Grey et al., 1982; and Shahin et al., 1996).

Bones distribution: Bones percentages in different carcass parts in chicks for both sexes, as affected by experimental dietary treatments are illustrated in Table (4). The obtained data showed that there were insignificant differences in bone weight distribution among dietary treatments and sex in different carcass parts (breast, thigh, drumstick and total cuts).

Bone measurements and chemical composition: Dietary treatments and sex of chickens had insignificant effect upon most of tibia bone measurements and chemical composition of tibia bone and breast meat as shown in Tables (5 and 6). The corresponding values for tibia length (cm) ranged between 6.98 and 7.24 cm, tibia width (cm) ranged between 0.48 and 0.52 cm, tibia SI ranged between 0.34 and 0.37, while tibia RI ranged between 4.08 and 4.16, and differences among treatments were insignificant. Dry tibia weight (DTW %) ranged between 0.22 and 0.27% and chicks fed diet supplemented with DLM gave highest figure while, birds fed MHA supplemented diet recorded lowest figures and differences among treatments were significant. On the other hand, sex of chicken had a significant effect upon tibia bone measurements. Generally, male chicks reflected higher figures (tibia length, width, SI and DTW %) when compared to female chickens. Besides, differences between the two sexes in some cases were significant. On the other hand, no significant differences were observed on tibia dry matter %, meat dry matter %, meat ether extract % and meat ash % due to either dietary treatments or sex of birds. However, tibia ash % figures showed that chicks fed diet supplemented with DLM reflected the highest figures compared with other treatments (ALM or MHA) and the corresponding figures were 26.64, 24.71 and 23.82%, respectively.

Breast meat protein and amino acid composition: Crude protein percentage and concentration of both methionine and threonine (mg/g) of breast meat are illustrated in Table (7). The obtained data showed that there were insignificant differences among dietary treatments and sexes. While, numerically, females have higher values compared to males. Additionally, figure (1) shows an illustration of amino acid concentrations (mg/g) of breast meat for about 15 amino acids. It would be noticed from that figure that concentrations of different amino acids were not significantly affected by either different dietary treatments or by bird sex.

CONCLUSION

Concerning present results, it would be indicated that almost all studied parameters, were insignificantly affected as presented by interactions between dietary threonine (T) supplementation, methionine (M) sources and bird sex (S) [(T*M), (T*S), (M*S) or (T*M*S)].

Table (1): Feed ingredients and calculated chemical analyses of experimental diets

Feed Ingredients	Starter Dietary Treatments (0-14 days)					
	Without Threonine			With Threonine 1 g/ Kg		
	1	**2**	**3**	**4**	**5**	**6**
Corn Grains, SBM 44% & CGM 60%	93.83	93.79	93.78	93.73	93.69	93.68
Vegetable Oil, Ca Carbonate & MCP	4.93	4.93	4.93	4.93	4.93	4.93
Lysine HCl, Salt (NaCl) & Premix	0.99	0.99	0.99	0.99	0.99	0.99
Methionine DLM	0.25	-	-	0.25	-	-
Methionine ALM	-	0.29	-	-	0.29	-
Methionine MHA	-	-	0.30	-	-	0.30
L-Threonine	-	-	-	0.10	0.10	0.10
Total	100	100	100	100	100	100
Calculated Chemical Analysis						
Crude Protein %	23.01	23.00	23.00	23.01	23.00	23.00
ME Kcal/ Kg diet	3002	3000	3000	3002	3000	3000
Calcium %	1.00	1.00	1.00	1.00	1.00	1.00
Available Phosphorus %	0.50	0.50	0.50	0.50	0.50	0.50
Lysine %	1.40	1.40	1.40	1.40	1.40	1.40
Methionine & Cysteine %	1.05	1.06	1.06	1.05	1.06	1.06
Threonine %	0.84	0.84	0.84	0.94	0.94	0.94
	Grower Dietary Treatments (15 - 35 days)					
Corn Grains, SBM 44% & CGM 60%	93.25	93.21	93.2	93.15	93.11	93.1
Vegetable Oil, Ca Carbonate & MCP	5.58	5.58	5.58	5.58	5.58	5.58
Lysine HCl, Salt (NaCl) & Premix	0.92	0.92	0.92	0.92	0.92	0.92
Methionine DLM	0.25	-	-	0.25	-	-
Methionine ALM	-	0.29	-	-	0.29	-
Methionine MHA	-	-	0.30	-	-	0.30
L-Threonine	-	-	-	0.10	0.10	0.10
Total	100	100	100	100	100	100
Calculated Chemical Analysis						
Crude Protein %	21.00	21.00	20.99	21.00	21.00	20.99
ME Kcal/ Kg diet	3101	3100	3099	3101	3100	3045
Calcium %	0.90	0.90	0.90	0.90	0.90	0.90
Available Phosphorus %	0.45	0.45	0.45	0.45	0.45	0.45
Lysine %	1.26	1.26	1.26	1.26	1.26	1.26
Methionine & Cysteine %	0.98	0.99	0.99	0.98	0.99	0.99
Threonine %	0.77	0.77	0.77	0.87	0.87	0.87

SBM: Soybean Meal, CGM: Corn Gluten Meal, DLM: DL methionine, ALM: Acid liquid methionine, MHA: methionine hydroxy-analogue calcium salt, MCP: mono-calcium phosphate. Each 3 Kg of premix contains: Vitamins: A, 12000000 IU; D3, 2000000 IU; E, 10000 mg; K3, 2000 mg; B1,1000 mg; B2, 5000 mg; B6,1500 mg; B12, 10 mg; Biotin, 50 mg; Choline chloride, 250000 mg; Pantothenic acid, 10000 mg; Nicotinic acid, 30000 mg; Folic acid, 1000 mg; Minerals: Mn, 60000 mg; Zn, 50000 mg; Fe, 30000 mg; Cu, 10000 mg; I, 1000 mg; Se, 100 mg and Co, 100 mg.

Table (2): Effect of treatments on skin & subcutaneous fats distribution

Treatments		skin & subcutaneous fats percentages of carcass parts			
		Breast	Thigh	Drum Stick	Total
Without T	T1	2.84	2.78	2.06	7.68
With T 1g/ Kg	T2	2.72	2.75	1.71	7.18
DLM	M1	3.04	2.74	1.68	7.47
ALM	M2	2.41	2.58	1.99	7.00
MHA	M3	2.87	2.96	1.99	7.82
Male	S1	2.61	2.57	1.80	6.99
Female	S2	2.94	2.95	1.97	7.87
Probability					
Threonine (T)		0.83	0.93	0.10	0.55
Methionine (M)		0.65	0.61	0.40	0.72
Sex (S)		0.56	0.24	0.43	0.31
T * M		0.76	0.30	0.16	0.32
T * S		0.26	0.29	0.25	0.16
M * S		0.96	0.79	0.74	0.91
T * M * S		0.93	0.54	0.78	0.92

DLM: DL-Methionine; ALM: Acid Liquid Methionine; MHA: Methionine Hydoxy-analogue; T: Threonine; M: Methionine; S: Sex

Table (3): Effect of treatments on muscles distribution

Treatments		muscles percentages of carcass parts			
		Breast	Thigh	Drum Stick	Total
Without T	T1	20.52	12.23	9.55	42.31
With T 1g/ Kg	T2	21.05	11.15	9.70	41.91
DLM	M1	21.55	11.47	9.99	43.02
ALM	M2	20.64	11.77	9.29	41.71
MHA	M3	20.16	11.83	9.60	41.60
Male	S1	21.64^{a}	11.83	10.06^{a}	43.53^{a}
Female	S2	19.93^{b}	11.55	9.20^{b}	40.69^{b}
Probability					
Threonine (T)		0.50	0.08	0.68	0.75
Methionine (M)		0.36	0.86	0.32	0.59
Sex (S)		0.04	0.62	0.03	0.04
T * M		0.56	0.79	0.04	0.58
T * S		0.31	0.60	0.98	0.68
M * S		0.35	0.08	0.14	0.71
T * M * S		0.39	0.67	0.70	0.74

$^{a, b}$ Means within the same parameter with different superscripts are significant1y different.
DLM: DL-Methionine; ALM: Acid Liquid Methionine; MHA: Methionine Hydoxy-analogue; T: Threonine; M: Methionine; S: Sex

Table (4): Effect of treatments on bones distribution

Treatments		bones percentages of carcass parts			
		Breast	Thigh	Drum Stick	Total
Without T	T1	15.99	12.09	3.88	31.96
With T 1g/ Kg	T2	16.68	12.76	3.76	33.21
DLM	M1	15.59	12.27	3.60	31.47
ALM	M2	17.32	12.43	3.92	33.68
MHA	M3	16.10	12.57	3.93	32.61
Male	S1	16.77	11.78	3.75	32.31
Female	S2	15.90	13.07	3.89	32.87
Probability					
Threonine (T)		0.39	0.39	0.77	0.17
Methionine (M)		0.22	0.95	0.75	0.15
Sex (S)		0.29	0.11	0.73	0.52
T * M		0.06	0.90	0.17	0.23
T * S		0.74	0.32	0.86	0.22
M * S		0.75	0.40	0.67	0.53
T * M * S		0.42	0.72	0.78	0.35

DLM: DL-Methionine; ALM: Acid Liquid Methionine; MHA: Methionine Hydoxy-analogue; T: Threonine; M: Methionine; S: Sex

Table (5): Effect of treatments on bone measurements

Treatments		Tibia bone measurements				
		Tibia Length (cm)	Tibia Width (cm)	Tibia SI	Tibia RI	DTW %
Without T	T1	7.12	0.51	0.35	4.16	0.24
With T 1g/ Kg	T2	7.17	0.50	0.37	4.08	0.24
DLM	M1	7.21	0.51	0.37	4.15	0.27^{a}
ALM	M2	7.24	0.52	0.36	4.10	0.23^{b}
MHA	M3	6.98	0.48	0.34	4.11	0.22^{b}
Male	S1	7.20	0.53^{a}	0.38^{a}	4.05^{b}	0.25
Female	S2	7.09	0.48^{b}	0.34^{b}	4.19^{a}	0.24
Probability						
Threonine (T)		0.75	0.42	0.27	0.32	0.93
Methionine (M)		0.44	0.13	0.24	0.86	< 0.01
Sex (S)		0.52	0.01	0.02	0.12	0.46
T * M		0.41	0.08	0.02	0.87	0.03
T * S		0.32	0.42	0.32	0.18	0.22
M * S		0.87	0.27	0.67	0.91	0.35
T * M * S		0.82	0.16	0.93	0.56	0.91

$^{a, b}$ Means within the same parameter with different superscripts are significant1y different.
DLM: DL-Methionine; ALM: Acid Liquid Methionine; MHA: Methionine Hydoxy-analogue; T: Threonine; M: Methionine; S: Sex. TSI: Tibia Seedor Index, TRI: Tibia Robusticity index, DTW: Dry Tibia Weight

Table (6): Effect of dietary treatments on bone and meat composition

Treatments		Tibia bone and breast meat composition				
		TDM %	**Tibia Ash %**	**Meat DM %**	**Meat EE %**	**Meat Ash %**
Without T	T1	51.05	25.25	27.37	9.51	5.80
With T 1g/ Kg	T2	48.77	24.86	27.00	9.37	6.16
DLM	M1	52.07	26.64[a]	27.29	9.85	5.78
ALM	M2	48.48	24.71[b]	27.40	8.21	6.38
MHA	M3	49.17	23.82[b]	26.86	10.26	5.77
Male	S1	49.27	25.09	27.22	8.98	6.44
Female	S2	50.54	25.01	27.14	9.90	5.51
Probability						
Threonine (T)		0.28	0.27	0.50	0.89	0.68
Methionine (M)		0.33	< 0.01	0.69	0.23	0.80
Sex (S)		0.54	0.81	0.87	0.36	0.29
T * M		0.79	< 0.01	0.84	0.29	0.46
T * S		0.88	0.01	0.34	0.31	0.70
M * S		0.93	0.22	0.38	0.07	0.81
T * M * S		0.58	0.85	0.48	0.97	0.63

[a, b] Means within the same parameter with different superscripts are significant1y different.
DLM: DL-Methionine; ALM: Acid Liquid Methionine; MHA: Methionine Hydoxy-analogue; T: Threonine; M: Methionine; S: Sex.
TDM: Tibia Dry Matter, DM: Dry Matter, CP: Crude Protein, EE: Ether Extract.

Table (7): Effect of dietary treatments on breast meat analysis

Treatments		breast meat selected amino acid composition		
		Meat CP %	Methionine (mg/g)	Threonine (mg/g)
Without T	T1	60.41	5.01	11.12
With T 1g/ Kg	T2	64.55	4.64	10.45
DLM	M1	62.54	5.33	11.45
ALM	M2	63.98	5.03	11.89
MHA	M3	60.92	4.12	9.01
Male	S1	61.16	4.67	10.45
Female	S2	63.80	4.98	11.12
Probability				
Threonine (T)		0.24	0.44	0.54
Methionine (M)		0.76	0.13	0.10
Sex (S)		0.44	0.52	0.54
T * M		0.98	0.17	0.15
T * S		0.88	0.11	0.18
M * S		0.92	0.16	0.19
T * M * S		0.56	0.50	0.49

DLM: DL-Methionine; ALM: Acid Liquid Methionine; MHA: Methionine Hydoxy-analogue; T: Threonine; M: Methionine; S: Sex. CP: Crude Protein.

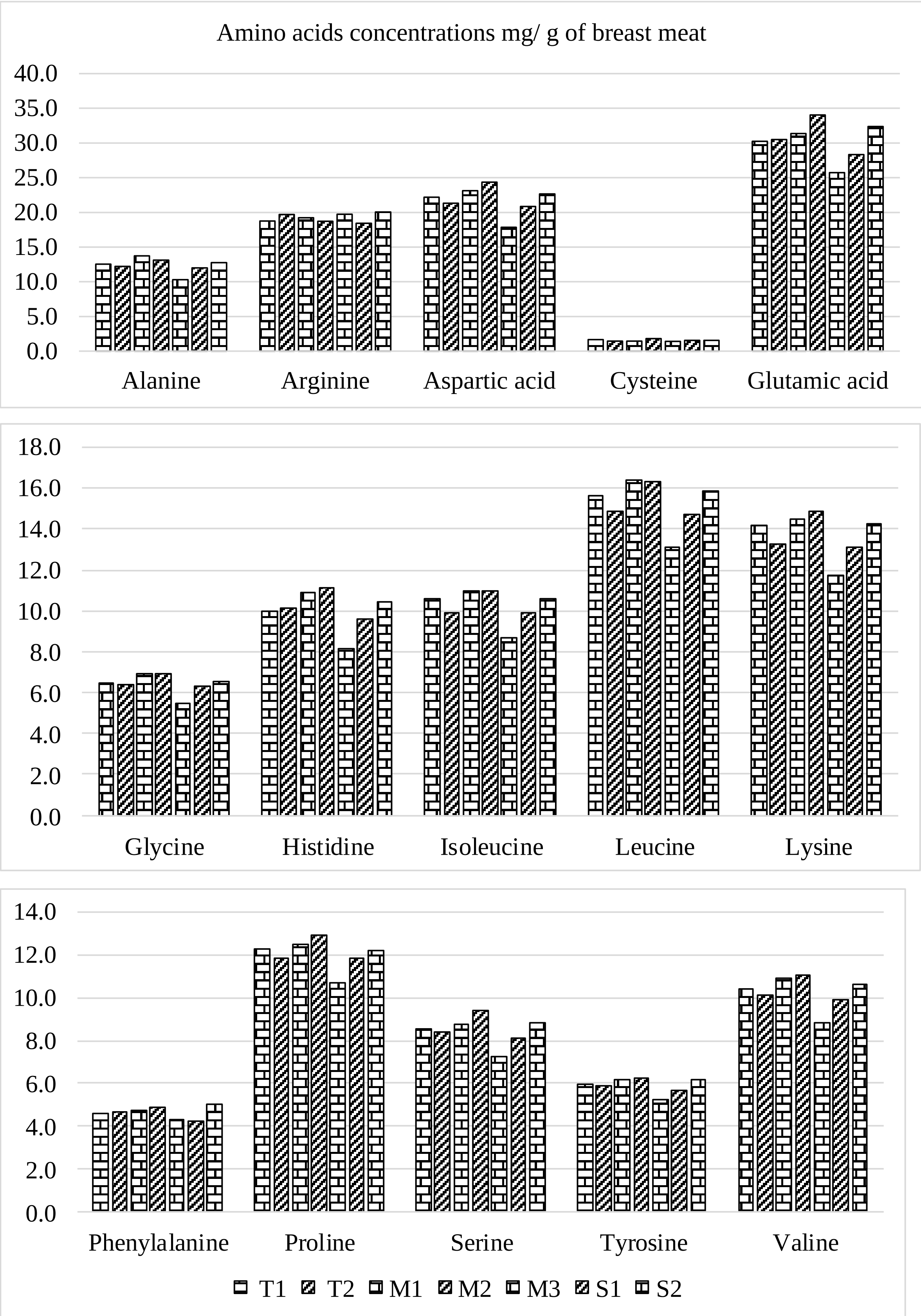

Figure (**1**): Effect of different dietary treatments amino acid composition of breast meat (mg/g).

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الملخص العربى

تأثيرات مستوى ثريونين العليقة، مصادر المثيونين، جنس بدارى التسمين والتداخل بينهم على توزيع أنسجة الذبيحة والتركيب الكيميائى

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تم إستخدام عدد 180 كتكوت هبرد عمر يوم واحد فى هذه التجربة بحيث تم تقسيمهم إلى 6 معاملات، فى ثلاث تكرارات لكل معاملة، لدراسة تأثير إستخدام أحد مستويي الحمض الأمينى ل-ثريونين (صفر و 1 جم /كجم) مع أحد المصادر الثلاثة من الحمض الأمينى مثيونين [د-ل-مثيونين (DLM) ومثيونين سائل حامضى (ALM) ومثيونين هيدروكسى أنالوج-ملح الكالسيوم (MHA)] فى تجربة عاملية (2 × 3) على توزيع الأنسجة فى الذبيحة والتركيب الكيميائى لكل من الذكور والإناث لبدارى التسمين المغذاة على علائق مكونة من الذرة الصفراء وكسب فول الصويا.
وقد أوضحت النتائج عدم تأثر النسبة المئوية للجلد والدهون تحت الجلد فى القطعيات المختلفة للذبيحة بالمعاملات الغذائية أو جنس الطائر. كما أنه لم تتأثر النسبة المئوية للعضلات أو العظام للقطعيات المختلفة للذبيحة بالمعاملات الغذائية إلا أن الذكور سجلت % للعضلات أعلى من الإناث لقطعيات الصدر والدبوس. كذلك لم تتأثر جميع قياسات عظم الساق (طول، عرض، معامل Seedor أو معامل المرونة) بالمعاملات الغذائية المختلفة إلا أن الذكور سجلت أعلى قيم معنوية لكل من قياسات (طول وعرض عظم الساق وكذلك قيمة النسبة المئوية للوزن الجاف و معامل Seedor لها). أوضح التركيب الكيميائى لعظمة الساق ولحم الصدر عدم وجود تأثير معنوى سواء للمعاملات الغذائية أو جنس الطائر. لم تُظهر معظم القياسات المدروسة خلال التجربة أى إستجابة معنوية للتداخل بين مستوى ل-ثريونين (T) ومصادر المثيونين (M) وجنس الطائر (S). وإعتماداً على النتائج المتحصل عليها فإنه يمكن وصف التداخل بين إضافة الحمض الأمينى ل-ثيريونين (T)، مصدر الحمض الأمينى مثيونين (M) و جنس الطائر (S)، بأنه لم يتأثر معنوياً فى معظم الصفات والقياسات المدروسة للمعاملات التجريبية المختلفة.