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The Effect of Adding Different Levels of L-arginine on the Carcass Traits of Japanese Quail

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Abstract

THIS STUDY was carried out at the poultry farms of animal production department, college of agriculture, University of Kirkuk from (3/3/2022 until 16/4/2022). The study aimed to determine the effect of adding different levels of arginine amino acid to the quail weight and carcass traits (breast, thigh, back, wings, heart, liver, gizzard). Live body weight was not significantly differing among the treatments, but the carcasses were significantly differing, it was higher in treatment 2 and 3 that fed with 5% and 10% arginine (106.78, 107.35) g. The Breast, thigh and wing weight also were significantly differing between the treatments, and it were higher in T2, and T3. But the back weight didn't significantly differ between the treatments. The giblets (heart, liver, and gizzard) were did not significantly differ between the treatments. It was concluded the adding arginine amino acid with 5 and 10% more the NRC requirements increase the weight of the most of carcass weight, and did not affect on the weight of heart, liver and gizzard.

Keywords: Arginine, Quail, Carcass, Weight.

Introduction

Arginine is a semi-essential amino acid for the birds. It's essential for tissue healing and survival [1], whereas in growing animals, and for optimal growth and nitrogen balance [2]. Most mature mammals can synthesize arginine to meet their requirements, while birds cannot synthesize arginine and are therefore completely dependent on dietary arginine to meet their protein needs and other functions [3].

Some authors[4], noticed a significant decrease in the percentage of fat in the abdominal area and a significant increase in the percentage of the weight of the Breast muscles and thigh muscles from the carcass weight of a 42-day-old Japanese quail as a result of injecting it with 2% arginine at the age of one day from incubation in the hatchery. Moreover, the breast and thigh cuts in broiler chickens were significantly increased by adding arginine to the diets by 0.04% [5]. [6] Showed that feeding broilers from 1 to 42 days of age 80% of their arginine requirement resulted in a significant decrease in the weight and percentages of pectoral and thigh muscles. [7] Confirmed that carcass production and breast meat production were significantly reduced in chicken diets fed on arginine-deficient diets by (0.2%) than the needs.

In fowl species such as chicken and quail, supplemental arginine improves carcass productivity, and the ratio of pectoral and thigh muscles may be due to arginine synthesizing many vital substances including protein, Creatine, Proline, Omethine,

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polyamine, and glutamine that are necessary for growth [8]. The aim of this study is to evaluate of the effect of adding different levels of L-arginine on the carcass traits of Japanese quail.

Experimental

The current study was carried out at the poultry farms of animal production department, college of agriculture, University of Kirkuk from (3/3/2022 until 16/4/2022). The study aimed to determine the effect of adding different levels of arginine amino acid to the quail weight and carcass traits (breast, thigh, back, wings, heart, liver, gizzard).

One hundred fifty chicks one-day old were used, the arginine levels where added were (0, 5, 10) % more than of the NRC requirement [9, 10]. The crud protein for the diet was (24.16), and the ME was (2906.18) Kcal/Kg [11, 12]. All the birds had access to feed and water ad libitum. The live body weight and the carcass traits were collected according to [13, 14].

General Linear Model within the statistical program SPSS [15] was used to study the effect of adding different levels of arginine amino acid on carcass traits. Duncan Multiple Range Test [16] was conducted to diagnosing the significance differences among the means of treatments.

Result and discussion

The mean, standard error, and standard deviation of the quail live weight, carcass and the traits are shown in table 1. Live body weight was not significantly differing ($p<0.05$) between the treatments, but the carcasses were significantly differing, it was higher in treatments 2 and 3 that fed with 5% and 10% arginine (106.78, 107.35) g respectively. The breast, thigh and wing weight also were significantly differing between the treatments, and it were higher in treatment 2, and 3. But the back weight didn't significantly differ between the treatments.

[17] Observed that increasing the level of arginine in diets not significantly improved carcass cuts as well as significantly reduced the fat content of the belly of heavy meat broilers from 42 to 56 days of age, as noted by [18] A significant improvement in the weight of breast meat, the weight of breast fillet, its thickness, and the diameter of muscle fibres in broiler chickens when fed on diets that contain added percentages as feed additives that are higher than the needs of the bird at a level of 0.1, 0.2, and 0.3% at the age of one day. Studies showed that feeding chickens on diets containing (96%) of the requirements of arginine led to a significant decrease in the production of breast and thigh meat, as well as in the muscle Creatine of the cuts [19]. Creatine is a unique organic compound involved in protein metabolism and involved in the muscle energy storage system [20].

The mean, standard error, and standard deviation for the heart, liver, and gizzard weight are shown in table 2. The three giblets traits (heart, liver, and gizzard) were did not significantly differ ($p<0.05$) between the treatments. Our results were agreed with [21] how observed that adding the different levels of arginine did not effect of the heart, liver and gizzard significantly.

Table 3 was shown the correlation among the live body weight and the carcass treats for the three treatments. Most of the traits were highly positive significant between the traits in the treatment 1 (Arginine 0%). It was not significant among the Breast weights with liver weight, thigh weight with gizzard weight, and the wing weight with liver weight. Moreover, the correlation it was negative among thigh weight with liver weight, back weight with gizzard weight. The treatment 2 (Arginine 5%) the traits were negatively correlated among the back weight with gizzard weight, back weight with liver weight, and heart weight with liver weight. But the other traits were significantly positive correlated between the traits. In the last treatments (Arginine 10%) the negative correlation was just between the heart weight and liver weight. The results agreed with [22] who found by his study the coefficient of variation among the carcass traits vary, according to the genetic lines of the quail, and the bird sex. Therefore, our correlation results vary among the levels of L-arginine.

Conclusion

It was concluded that adding arginine amino acid with 5 and 10% above the NRC requirements increase the weight of the most of carcass weight, and did not affect the weight of heart, liver and gizzard.

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Authors contributions

All named authors have made an active contribution to the conception and design and analysis and interpretation of the data and the drafting of the paper and All have critically reviewed its content and have approved the final version submitted for publication.

Conflicts of interest

The authors declared no competing interest.

TABLE 1. The mean, standard error, and standard deviation of the quail live weight, carcass and the traits weight

Traits (g)	0% Arginine		5% Arginine		10% Arginine		Sig
	Mean± SE	SD	Mean± SE	SD	Mean± SE	SD	
Body weight	165.87±3.11	24.48	174.00±3.16	26.03	172.17±3.94	30.30	0.206
Carcass weight	101.18±1.85^{b}	13.85	106.78±1.76^{a}	13.28	107.35±2.09^{a}	15.07	0.041
Breast weight	29.13±0.58^{b}	4.28	30.92±0.56^{a}	4.23	31.56±0.68^{a}	4.97	0.016
Thigh weight	17.55±0.40^{b}	2.97	18.74±0.28^{a}	2.20	19.32±0.36^{a}	2.60	0.002
Back weight	14.19±0.34	2.52	14.42±0.30	2.25	14.81±0.40	2.88	0.451
Wings weight	4.56±0.08^{b}	0.63	5.07±0.12^{a}	0.96	4.96±0.12^{a}	0.84	0.003

Means not having a common letter within each row differ significantly (P<0.05).

TABLE 2. The mean, standard error, and standard deviation for the heart, liver, and gizzard weight

Traits (g)	Arginine 0%		Arginine 5%		Arginine 10%		Sig.
	Mean± SE	SD	Mean± SE	SD	Mean± SE	SD	
Heart weight	1.14±0.03^{a}	0.20	1.19±0.03^{a}	0.21	1.17±0.03^{a}	0.22	0.395
Liver weight	3.10±0.17^{a}	1.24	3.26±0.18^{a}	1.36	3.09±0.17^{a}	1.25	0.730
Gizzard weight	3.09±0.11^{a}	0.83	3.08±0.08^{a}	0.64	3.13±0.09^{a}	0.62	0.905

Means not having a common letter within each row differ significantly (P<0.05).

TABLE 3. The correlation between the live body weight, and the carcass traits

Arg.	Traits	LBW	CW	BrW	ThW	BW	WW	HW	GW	LW
0 %	LBW	1								
	CW	0.890***	1							
	BrW	0.739***	0.789***	1						
	ThW	0.584***	0.641***	0.760***	1					
	BW	0.476***	0.390**	0.584***	0.690***	1				
	WW	0.679***	0.677***	0.740***	0.731***	0.531***	1			
	HW	0.513***	0.437***	0.549***	0.460***	0.659***	0.344**	1		
	GW	0.463***	0.523***	0.305*	0.185ns	-0.186ns	0.383**	0.001ns	1	
	LW	0.265*	0.365**	0.092ns	-0.003ns	-0.386**	0.202ns	-0.293*	0.665***	1
5 %	LBW	1								
	CW	0.861***	1							
	BrW	0.766***	0.837***	1						
	ThW	0.614***	0.742***	0.778***	1					
	BW	0.398**	0.442***	0.277*	0.292*	1				
	WW	0.688***	0.672***	0.732***	0.553***	0.217ns	1			
	HW	0.383**	0.357**	0.166ns	0.197ns	0.685***	0.039ns	1		
	GW	0.406**	0.388**	0.527***	0.381**	-0.121ns	0.591***	-0.300*	1	
	LW	0.322**	0.340**	0.424***	0.389**	-0.353**	0.510***	-0.434***	0.586***	1
10 %	LBW	1								
	CW	0.872***	1							
	BrW	0.706***	0.877***	1						
	ThW	0.419**	0.699***	0.780***	1					
	BW	0.772***	0.752***	0.570***	0.346**	1				
	WW	0.380**	0.539***	0.605***	0.741***	0.107ns	1			
	HW	0.498***	0.565***	0.462***	0.370**	0.555***	0.250*	1		
	GW	0.549***	0.496***	0.505***	0.301*	0.234*	0.492***	0.202ns	1	
	LW	0.367**	0.402**	0.353**	0.236*	0.048ns	0.510***	-0.122ns	0.656***	1

LBW=live body weight, CW=Carcass weight, BrW=Breast weight, ThW=Thigh weight, BW=Back weight, WW=Wing weight, HW=heart weight, GW=Gizzard weight, LW=liver weight.

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تأثير إضافة مستويات مختلفة من الأرجنين في صفات الذبيحة لطائر السمان الياباني

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أجريت هذه الدراسة في حقل الدواجن التابعة لقسم الإنتاج الحيواني في كلية الزراعة جامعة كركوك للفترة من (٢٠٢٢/٣/٣ ولغاية ٢٠٢٢/٤/١٦). هدفت الدراسة إلى تحديد تأثير إضافة مستويات مختلفة من الحمض الأميني الأرجينين على وزن القطعيات (الصدر، الفخذ، الظهر، الأجنحة، القلب، الكبد، القانصة).حيث بينت هذه الدراسة عدم وجود فرق معنوي بين المعاملات لوزن الجسم الحي، ولكن القطعيات كانت تختلف معنويا، وكانت أعلى في المعاملة ٢ و ٣ التي تمت تغذيتها بـ ٥% و ١٠% أرجينين (١٠٦,٧٨، ١٠٧,٣٥) غم. كما كان وزن الصدر والفخذ والجناح مختلفاً معنوياً بين المعاملات، لكن وزن الظهر لم يختلف بشكل كبير بين المعاملات. كذلك ولم تختلف الأحشاء (القلب والكبد والقوانص) بشكل كبير بين المعاملات. تم التوصل إلى أن إضافة الحمض الأميني الأرجينين بنسبة ٥ و ١٠% أكثر من متطلبات NRC يزيد من وزن معظم اوزان القطوعات، ولم يؤثر على وزن القلب والكبد والقوانص.

الكلمات الدالة: أرجينين، السمان، الذبيحة، الوزن.