NUTRITIONAL REQUIREMENT OF DIGESTIBLE LYSINE FOR COBB 500 BROILER CHICKENS

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ABSTRACT

Due to the constant evolution in the breeding programs for broiler chickens, the determination of the nutritional requirement of these birds becomes necessary to ensure enhancement. Thus, two experiments were carried out aiming at evaluating two different digestible lysine levels in the starter (10 to 21 days) and growth (22 to 35 days) phases. Male and female chickens of the Cobb 500 strain were utilized in a completely randomized blocks experimental design, in a 5×2 factorial arrangement (5 digestible lysine levels and 2 genders), with 8 replicates of 22 and 20 birds per experimental unit, for each of the previously mentioned phases. The digestible lysine levels utilized at the different phases were: from 10 to 21 days of age, 1.06; 1.12; 1.18; 1.24 and 1.30% and from 22 to 35 days of age, 0.92; 0.98; 1.04; 1.10 and 1.16% digestible lysine. It was observed that the digestible lysine requirements for maximum performance in broiler chickens are 1.22 for males and 1.24% for females at the starter phase, and 1.16% for both the genders at the growth phase. Considering the productive parameters of greatest relevance to the poultry industry, in broilers in the phase ranging from 22 to 35 days of age, the digestible lysine requirement found for breast fillet yield (1.16%) was superior to feed conversion (1.07%) and weight gain (1.05%).

KEYWORDS: nutritional requirement, lysine, broiler chicken

INTRODUCTION

In many studies, researches utilize weight gain as the sole criterion for the determination of the requirement or the relation between amino acids and weight gain, which can lead to underestimation of the necessities, once this parameter usually presents the lowest values when compared with feed conversion, breast yield and abdominal fat. For a certain amount of weight gain, some amino acids, such as lysine, can reduce lipids deposition and increase protein deposition; the latter is clearly demonstrated by Leclercq (1998). An increase in lysine concentration over the necessity of weight gain may lead to higher breast yield. Thus, the lysine requirements are higher when breast yield is utilized as criterion, rather than weight gain. Similarly, feed conversion is frequently utilized to estimate the amino acids requirements and, hence, calculate the ideal profile in protein amino acids of the diet. According to Han and Baker (1994), for many amino acids, the requirements to optimize the conversion rate are more elevated than those for weight gain.

The objective of this study was to determine the nutritional requirements of digestible lysine based on the concept of ideal protein, in male and female Cobb 500 broilers, in two different phases of rearing: starter (10 to 21 days) and growth (22 to 35 days).

MATERIALS AND METHODS

Two experiments were carried out at the Poultry Sector of the Animal Science Department of Federal University of Viçosa according to the rules of CEUA/DZO (Ethics Committee of Animal Experimentation of DZO-UFV). In the first experiment, 1760 male and female Cobb 500 broiler chicks were utilized (from 10 to 21 days). The experimental design was of randomized blocks in a 5 x 2 factorial arrangement, with 5 digestible lysine levels (1.06; 1.12; 1.18; 1.24 and 1.30%) and 2 genders (males and females), totaling 10 treatments with 8 replicates of 22 birds per experimental unit.

In the second experiment, 1600 male and female broilers from the Cobb 500 strain were utilized (from 22 to 35 days). The experimental design was a completely randomized blocks in a 5 x 2 factorial arrangement, with five digestible lysine levels (0.92; 0.98; 1.04; 1.10 and 1.16%) and two genders (males and females), totaling ten treatments with eight replicates of 20 birds per experimental unit.

For both experiments, a scheme of dilution between a low-lysine content diet and a high-lysine content diet was utilized to obtain the experimental diets, which were formulated according to Rostagno *et al.* (2005).

At the end of the two experimental periods, birds and diet leftovers were weighed, with further evaluation of weight gain, feed intake and feed conversion. At the end of the second experiment, and after approximately eight hours of fasting for emptying of the digestive tract, three birds from each experimental unit, with average weight of the replicate, were slaughtered by dislocation of the cervical vertebra for determination of weight and carcass yield values, in addition to sheer weight and prime cuts (breast with bone and skin, breast fillet, thigh and drumstick) and abdominal fat. Carcass yield was calculated in relation to live weight of birds at slaughter, whereas prime cuts and abdominal fat yields were in relation to the eviscerated carcass.

The results obtained in both experiments were submitted to statistical analysis using SAEG statistical package (UFV, 2000). Estimates of lysine requirements were established by means of linear and quadratic regression models. In the case of significant interaction, lysine levels were nestled within each gender. Subsequently, requirements were estimated based on equations of linear and quadratic response.

RESULTS AND DISCUSSION

There was quadratic effect of lysine levels on weight gain and feed conversion for males and females (Table 1). There was also linear effect of lysine levels on the feed intake of males, which indicates that, as there was elevation in the lysine level in the diet, feed intake decreased; however, when calculating lysine intake, it could be observed a linear increase of 9.01g to 10.91g of the treatment with 1.06 level to the level of 1.30%, respectively. On females, there was no significant effect on feed intake.

For the phase of 22 to 35 days, males presented quadratic effect (Table 2) both for weight gain and for feed conversion, corresponding to the estimated requirement of 1.05 and 1.07% digestible lysine, respectively. On females, there was linear effect on weight gain and feed conversion for a 1.16% digestible lysine requirement.

The results for carcass evaluation are shown in Tables 3 and 4. It was observed linear effect for the main parameters of carcass (weight and yield) evaluated, which corresponds to the 1.16% digestible lysine requirement.

Table 1. Effect of digestible lysine level on performance of male (M) and female (F) broilers at the starter phase (10-21 days of age)

Dig. lysine level	Weight gain (g)		Feed intake (g)		Feed conversion	
(%)	M	F	M	F	M	F

1.06	579	522	856	785	1.479	1.504
1.12	583	527	857	775	1.469	1.470
1.18	589	533	842	780	1.431	1.464
1.24	575	538	839	787	1.458	1.465
1.30	581	530	839	775	1.450	1.461
Mean	581.7[a]	530.2[b]	846.7[a]	780.4[b]	1.457[b]	1.473[a]
Regression	Q	Q	L	ns	Q	Q
Requirement, %	1.15	1.22	1.30	1.06	1.22	1.24
CV (%)	1.74		1.81		1.68	

[a,b] Means followed by different letters on the same row are different (P<0.05); ns = non-significant.; CV = coefficient of variation.

Table 2. Effect of digestible lysine level on performance of male (M) and female (F) broilers at the growth phase (22-35 days)

Dig. lysine level	Weight gain (g)		Feed intake (g)		Feed conversion	
(%)	M	F	M	F	M	F
0.92	1191	994	2100	1802	1.771	1.814
0.98	1210	1007	2077	1809	1.717	1.797
1.04	1236	1016	2093	1813	1.694	1.785
1.10	1197	1052	2065	1817	1.726	1.759
1.16	1204	1039	2069	1826	1.721	1.758
Mean	1207.6[a]	1021.7[b]	2081.2[a]	1813.7	1.726[a]	1.783[b]
Regression	Q	L	ns	ns	Q	L
Requirement, %	1.05	1.16	0.92	0.92	1.07	1.16
CV (%)	1.60		1.92		1.72	

[a,b] Means followed by different letters on the same row are different (P<0.05); ns = non-significant.; CV = coefficient of variation.

Table 3. Effect of digestible lysine level on the carcass (C), fat, thigh-drumstick (TD), breast (B) and breast fillet (BF), of male (M) and female (F) broilers, at 35 days of age

Dig. lysine level (%)	C (g)		Fat (g)		TD (g)		B (g)		BF (g)	
	M	F	M	F	M	F	M	F	M	F
0.92	1366	1173	18.9	22.5	398	324	435.8	388.8	324.0	277.7
0.98	1373	1194	18.8	19.4	388	333	445.0	392.4	332.3	289.1
1.04	1370	1201	20.3	17.5	384	327	448.0	399.0	328.1	296.4
1.10	1369	1200	18.1	18.3	391	336	456.7	399.6	335.6	299.2
1.16	1376	1209	17.2	15.7	382	343	465.5	405.3	351.5	300.6
Mean	1370.8[a]	1195.4[b]	18.7	18.7	388.4[a]	332.6[b]	450.2	397.0	334.3	292.6
Reg.	ns	ns	ns	L	L	L	L	L	L	L
Requi.%	----	----	----	1.16	1.16	1,16	1.16	1.16	1,16	1.16
CV (%)	3.83		23.35		4.00		4.91		6.40	

[a,b] Means followed by different letters on the same row are different (P<0.05); ns = non-significant; CV = coefficient of variation.

Table 4. Effect of digestible lysine level on the carcass (C), fat, thigh-drumstick (TD), breast (B) and breast fillet (BF), of male (M) and female (F) broilers, at 35 days of age

Dig. lysine level (%)	C (%)		Fat (%)		TD (%)		B (%)		F (%)	
	M	F	M	F	M	F	M	F	M	F
0.92	71.1	70.3	1.33	1.91	29.1	27.6	32.2	33.1	23.8	23.7
0.98	71.4	71.0	1.37	1.62	28.3	28.0	32.4	32.7	24.2	23.8
1.04	70.5	71.5	1.47	1.45	28.0	27.2	32.8	33.2	24.0	24.7
1.10	71.2	70.7	1.32	1.52	28.6	28.0	33.4	33.3	24.5	24.9
1.16	70.4	70.9	1.24	1.39	27.8	28.2	33.8	33.4	25.6	24.8
Mean	70.9	70.9	1.34[b]	1.58[a]	28.3[a]	27.8[b]	32.9	33.2	24.4	24.4
Reg.	ns	ns	ns	L	L	ns	L	ns	L	L
Requi.	----	----	----	1.16	1.16	----	1.16	----	1.16	1.16
CV (%)	2.29		22.38		3.13		3.16		4.82	

[a,b] Means followed by different letters on the same row are different (P<0.05); ns = non-significant; CV = coefficient of variation.

CONCLUSION

The digestible lysine requirements for maximum performance of Cobb 500 broilers are 1.22% for males and 1.24% for females at the starter phase (10 to 21 days of age) and 1.16% for both genders at the growth phase (22 to 35 days).

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