

Digestible lysine and arginine levels of broilers in pre-starter ration¹

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Abstract

An experiment was carried out in order to evaluate digestible lysine and arginine levels of broilers in pre-starter ration (1 to 7 days of age). The experiment was carried out in poultry facilities of the University of Goiás, Goiânia, Brazil, allotted in a factorial arrangement 2 x 3 (2 digestible lysine levels – 1.056 and 1.305% x 3 digestible arginine levels – 1.305, 1.459 and 1.613%) with 6 treatments and 5 replicates of 11 birds each. The variables tested included performance from 1 to 7 and 1 to 21 days (mean weight gain, mean body weight, feed intake, feed-to-gain ratio and mortality) and digestibility assay from 4 to 7 days, to calculate digestibility coefficients (DIG) and nitrogen retention (RET). The results were analyzed by Tukey test (5%) and polynomial regression. Arginine affected feed intake from 1 to 7 days and feed-gain ratio from 1 to 7 and 1 to 21 days of age. No differences in digestibility were observed. To lysine, no effect on performance was observed, but digestibility coefficients (DIG) and retention (RET) for dry matter and nitrogen were reduced.

Introduction

Pre-starter ration is commonly used in Brazil poultry industries, but because of its particular characteristics, it is important to evaluate constantly the nutritional requirements. A serie of factors can justify its use in broiler production as the extreme great development of modern genetic lines after hatch, the amount of vitellin sac nutrients, feed and water intake, the levels of intestinal and pancreatic enzymes, the intestinal surface area and total digestibility of nutrients that can collaborate to improve productivity (Moran Jr., 1985, Dibner, 1996, Penz and Vieira, 1998). Digestible lysine requirements in this period are higher than other phases, result of the fast development in the first week, what indicates that chicks improve almost five times its body weight (Labadan Jr., 2001). Because of this, the improvement in lysine levels can interfere in arginine requirements, affecting bird development (Chamruspollert et al., 2002a,b). Because of this, this experiment was developed in order to evaluate digestible lysine and arginine levels of broilers from 1 to 7 days of age.

Materials and Methods

The experiment was carried out in poultry facilities of the University of Goiás, Goiânia, Brazil. A total of 352 Ross chicks were allotted in heated batteries, from one to 21 days of age, in a 2 x 3 factorial arrangement (2 digestible lysine levels – 1.056 and 1.305% x 3 digestible arginine levels – 1.305, 1.459 and 1.613%) with five replicates of 11 birds each. The experiment was developed in a completely randomized design. All corn-soybean pre-starter diets were isoenergetic and isonutritive except for the aminoacids tested and based on Rostagno et al. (2000) nutritional recommendations and feed composition. The experimental diets were furnished from 1 to 7 days of age and from 8 to 21 days, all chicks received the same starter diet with 3000kcal ME/kg and 21,1% CP. The variables tested were mean weight gain, mean body weight, feed intake, feed-to-gain ratio and mortality (transformed in arcsen). From 4 to 7 days, birds were submitted to a digestibility assay, where the excreta collection was made two times a day. Excreta and experimental diets were analyzed for dry matter and

total nitrogen. Then, the digestibility coefficients (DIG) and nitrogen retention (RET). The data were analyzed i and Tukey test (5%) was used to compare means and polynomial regression used to estimate the best levels of digestible arginine.

Results and Discussion

According to the results obtained in this experiment, arginine supplementation influenced feed intake and feed-to-gain ratio from 1 to 7 and 1 to 21 days of age (Table 1). Chamruspollert et al. (2002a,b) indicated that high levels of lysine can interfere in arginine requirements. Chamruspollert et al. (2004) tested 1.52 and 2.52% total arginine and observed that high levels as 3.52 % in starter diet (1 to 21 days of age) reduced performance. Kidd et al. (2001) indicated that NRC levels for starter ration (1.25%) are enough to support bird development from 1 to 21 days of age. For nutrient digestibility and retention (Table 2), no effects of arginine levels were observed but the highest lysine level used (1.305 %) reduced digestibility and retention of dry matter and nitrogen. It is possible to observe that when lysine levels increased, efficiency of absorption decreased, similar to the observed by Stringhini et al. (2002), when levels of 1.35% of total lysine resulted in worse retention. In Table 3, polynomial regression equations obtained are summarized, which indicates levels of 1.400 to 1.463% of digestible arginine. Rostagno et al. (2005) recommended in Brazilian Tables 1.330% for digestible lysine and 1.397 % of digestible arginine.

Table 1. Weight gain (WG), feed intake (FI), feed-to-gain ratio (FGR) and mortality rate (Mort) from 1 to 7 days and from 1 to 21 days of broilers fed different levels of arginine and lysine levels in pre-starter ration.

Arginine (%)	1 to 7 days				1 to 21 days			
	WG, g	FI, g	FGR, g/g	Mort, %	WG, g	FI, g	FGR, g/g	Mort, %
1.305	141.18	144.66	1.03b	10.00	656.85	1012.32b	1.54b	30.00
1.459	128.98	148.26	1.16a	8.00	625.11	1045.93a	1.68a	28.00
1.613	134.31	148.64	1.11ab	8.00	637.15	1048.11a	1.65a	27.33
Lysine (%)								
1.056	135.45	150.16	1.12	9.33	633.10	1030.24	1.64	29.33
1.305	134.20	144.22	1.08	8.00	646.31	1040.67	1.61	27.56
Prob.*. %	0.27	0.12	0.04	0.27	-	0.02	0.02	-
VC**. %	8.725	6.148	9.945	15.949	5.893	2.736	6.673	7.138

*Probability, **Variation coefficient.

Table 2. Digestibility coefficient of dry matter (DCDM) and crude protein (DCCP) and retention of dry matter (RETDM) and nitrogen (RETN) from 4 to 7 days of broilers fed different levels of arginine (Arg) and lysine (Lys) levels in pre-starter ration.

Arginine (%)	DCDM, %	DCCP, %	RETDM, mg/g	RETN, mg/g
1.305	71.79	68.39	717.95	28.76
1.459	72.01	68.57	720.06	29.52
1.613	72.45	66.94	724.50	28.52
Lysine (%)				
1.056	72.93a	68.95a	729.28a	29.33a
1.305	71.24b	66.99b	712.40b	28.54b
P*	0.02	0.02	0.02	0.03
CV**%	2.497	3.198	2.497	3.225

Table 3. Regression equations for feed-to-gain ratio (FGR), feed intake (FI) to broilers fed different levels of arginine in pre-starter ration.

Period(days)	Variables	Effect	Equation and estimated level	R ²
1 to 7	FGR (g/g)	Quadratic	Y=-7.592+0.0117x-0.000004x ² (1.463% Arg)	1.00
1 to 21	FGR (g/g)	Quadratic	Y=-6.7291+0.0112x-0.000004x ² (1.400% Arg)	1.00
1 to 21	FI (g)	Linear	Y = 865.905 + 0.1162x	0.80

*Variation coefficient

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