Effect of L - Lysine - Monohydrochloride supplementation on body weight, feed and energy utilization in broiler chicks

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SUMMARY

The effect of feeding increasing levels of dietary lysine was studied in broiler chicks. Graded levels of L - lysine HCl: 0.0, 0.1, 0.2, 0.3 and 0.4% were used as treatments. Results showed that increasing the dietary level of L - lysine HCI increased weight gain, feed intake and improve efficiency of feed utilization. Carcass protein, fat, gain in protein and fat paralleled the trend in weight gain. Chicks given the lysine adequate diet had the best feed conver- sion ratio and the highest weight gain, feed intake, carcass protein and fat contents, whereas those given the basal diet had the poorest feed conversion ratio and the lowest weight gain, rem intake, carcass protein and fat contents.

INTRODUCTION

The amino acid lysine is an essential constituent of chicks diets and its ad- verse effects on chicks growth have been studied (Solberg, 1971; Velu et. a.l., 1972 and Sibbald and Wolynetz, 1986). Since poultry diets in the Sudan are based on sorghum grains (low in lysine), practical implications of this amino acid are inevitable.

The experiment described here was designed to study changes in chicks growth, feed conversion ratio, body tissue chemical composition and efficiency of energy utilization associated with different levels of lysine addition to a low lysine diet. .

MATERIALS AMD METHODS

One hundred and fifty day - old unsexed broiler chicks (Lohmann) were randomly allocated to 5 treatments after a preparatory period of ten days dur- mg which the ChlCkS were fed a low lysine diet (basal) (table 1) to deplete their body lysine stores.

Table 1: Composition of the basal diet:

Ingredient	%
Sorghum (Feterita)	63.20
Groundnut meal	14
Sesame meal	14
Super concentrate*	5
Oyster shell	1.4
Salt (NaCl)	0.3
Minovit super **	0.2
L - lysine monohydrochloride	0.2
DL - methionine	0.2
Vegetable oil	1.5

Calculated composition:			
Metabolizable energy (MJ/ kg)	12.66	Lysine %	0.71
Crude protein %	22.56	DL - methionine %	0.46
Cacium %	1.47	Methionine + cystine %	0.77
Phosphorus %	0.7		

Determined composition:	
Metabolizable energy (MJ/ kg)	12.37
Crude protein %	21.88

* Super concentrate composition:			
Crude fibre %	2.52	Methionine + cystine %	1.73
Crude protein %	41	Lysine %	1.95
Total phosphorus %	4.8	Threonine %	1.37
Calcium %	12.3	Tryptophane %	0.24
Metabolizable energy (MJ/ kg)	8.37	Linoleic acid %	0.22
Methionine %	0.36		

** *Vitamin and mineral supplement supplied by Bladel, Farvet Laboratories, Holland.*

In each treatment there were three replicates, each of ten chicks. The chicks of each replicate were housed in pens (1 square meter) in an open - sided deep litter house. A basal diet was formulated to contain adequate levels of all nu- trients known to be required by

chicks with exception of lysine. (National Re- search Council, 1984). the "increasing levels of L - lysine HCI were added as follows:

1. Basal diet.

2. Basal diet + 0.1% L - lysine.

3. Basal diet + 0.2%‘ L - lysine.

4. Basal diet + 0.3% L - lysine.

5. Basal diet + 0.4% L - lysine.

Feed and water were offered ad. libitum. The light was continuous throughout the experimental period of 7 weeks. Chicks of each replicate were group weighed at.weekly intervals and feed consumption by each group was determined at the time of weighing. At end of the experiment period, 3 birds from each replicate were sacrified. The carcasses were frozen pending, pro- tein, ash, ether extract and moisture analysis. Another twenty birds (4 birds/ each of the 5 treatments) were selected and kept in metal cages for determination of apparent metabolizable energy by total collection method. Excreta were collected over 3 days. Gross energy was determined by a Parr oxygen bomb calorimeter. Proximate analysis of the experimental diets and excreta were de- terrnined according to the methods of the Association of Official Analytical Chemists (A.O.A.C., 1975). Energy gains were computed from fat and pro- tein gains using a value of 0.0233 MJ/ g for body protein and 0.0386 MJ/ g for body fat.

RESULTS AND DISCUSSION

The results of the present study are presented only for the 7-week old chicks. The data obtained weekly were very similar to those for 7 weeks, in- dicating the same explanation for the reaction to dietary L - lysine HCl addi- tron.

Each treatment of L - lysine HCl up-to the requirement level increased feed intake, weight gain and feed conversion ratio (table 2). Weight gain increased ($p < 0.0$ l) with increasing the dietary level of L - lysine HCl (table 2).

Table 2: Weight gain, feed intake and feed conversion ratio of 7 - week old chicks.

	Basal diet	L - lysine additions				Regression equations
	0%	0.1%	0.2%	0.3%	0.4%	Regression equations
Weight gain* (g/ bird)	911 ± 127	1152 ± 109	1282 ± 93	1471 ± 78	1535 ± 13	Y= - 0.5849 + 6.1796 X R = 0.97 sig. at 0.01
Feed intake* (g/ bird)	3434 ± 325	3660 ± 162	3760 ± 47	4025 ± 136	4112 ± 42	Y = - 1.9565 + 5.677 X R = 0.98 sig. at 0.01
Feed conversion ratio* (feed intake/ gain)	3.86 ± 0.14	3.2 ± 0.19	2.96 ± 0.14	2.75 ± 0.11	2.69 ± 0.03	Y = 1.1612 - 0.3108 X R = 0.88 sig. at 0.01

* = *are mean values of three replicates/ treatment.*

A similar effect was noted for feed intake and feed conversion efficiency (table 2). These findings are in agreement with those of Velu et. al. (1972) and Sibbald and Wolynetz (1986).

An increase in the concentration of carcass protein; fat, gain in protein and gain in fat was observed when L - lysine HC1 was incermentally increased from 0.0 to 0.4% of the diet (table 3 and 4). This differs from the findings of Sibbald and Wolynetz (1986) who observed that at a given feed intake the en- ergy stored as protein would increase and the energy stored as fat would de- crease as the dietary L - lysine HC1 concentrationiapproaches the requirement level of broiler chicks. The type of the diet, strain and sex oi the birds used by the latter workers may probably explain the difference. l_Q_aWtalgiy»e”t1\\i;iWt_able 4 indicate that carcass fat content was not maximized at lower levels of dietary f-lysine”HCl iwhichmsi not in line with finding of Velu et. al. (1972). Nitro- gen retention (table 5) paralleled the trend in carcass protein. Carcass moisture content was not affected by the dietary treatments (table 3). Energy intake and efficiencyof energy utilization were high in chicks fed on lysine adequate diet (table 6).

From the results of the present study it can be concluded that adding in- creasing levels of L - lysine HC1 to low lysine diet caused a sequential growth response in broiler chicks.

Table 3 : Effect of L - lysine on body tissue and energy gain.

Treatment	Gain in protein		Gain in fat		Total gain
	g	MJ	g	MJ	MJ
Basal diet	183.3 [a]	4.26	92.46 [a]	3.57	7.83
Basal + 0.1 lysine	241.9 [b]	5.63	133.4 [b]	5.14	10.77
Basal + 0.2 lysine	280.4 [c]	6.52	140.25 [c]	5.41	11.93
Basal + 0.3 lysine	355.2 [d]	8.26	154.01 [d]	5.94	14.20
Basal + 0.4 lysine	376.1 [e]	8.75	154.72 [e]	5.97	14.71

Values in the same column with different superscripts differ significantly ($p < 0.01$)

Table 4 : Effect of L - lysine on carcass chemical composition.

Diet	Moisture %	Protein %	Fat %
Basal	65.43 [a]	58.20 [a]	29.36 [a]
Basal + 0.1 lysine	65.00 [a]	60.00 [b]	33.10 [b]
Basal + 0.2 lysine	66.25 [a]	64.80 [c]	32.41 [b]
Basal + 0.3 lysine	67.58 [a]	74.49 [d]	32.30 [b]
Basal + 0.4 lysine	66.94 [a]	74.11 [e]	30.47 [a]

Values in the same column with different superscripts differ significantly ($p < 0.01$)

Table 5 : Determined metabolizable energy and nitrogen retention.

L - lysine addition	Apparent metabolizable energy MJ/ kg	Nitrogen retained% (Correction X 8.22)
0	12.37	44.20
0.1	12.27	57.46
0.2	12.41	79.32
0.3	12.30	99.71
0.4	12.42	74.23

Table 6 : Effect of L - lysine on metabolizable energy intake and energy utilizattion.

L - lysine addition	ME intake MJ/ 7 WKs	ME utilization% *
0	42.49	18.43
0.1	44.92	23.98
0.2	46.65	25.57
0.3	49.50	28.69
0.4	51.08	28.80

** Energy gain/ ME intake.*

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