INTERNATIONAL JOURNAL OF SCIENCE AND NATURE

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EVALUATION OF CARCASS CHARACTERISTICS AND COST EFFECTIVENESS OF BROILER CHICKS FED SYNTHETIC LYSINE AND METHOININE SUPPLEMENTED SOYABEAN-BASED DIETS

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ABSTRACT
The objective of this study was to investigate the effects of supplemental lysine and methionine on performance, carcass characteristics and cost effectiveness of broiler starter production. Ninety six (96) one week old unsexed Cobb broiler chicks were randomly allotted to four experimental treatments in a completely randomized design and each replicate thrice. The birds were offered one of the following diets *ad-libitum*: (1) control diet (neither lysine nor methionine added), (2) diet supplemented with O.5% lysine, (3) control diet supplemented with 0.5 % methionine, (4) diet supplemented with both O.5% lysine and methionine. Body weight gain, feed intake, feed conversion and protein efficiency ratios, carcass characteristics were used as criteria of response. Inclusion of synthetic lysine and methionine significantly ($P < 0.05$) improved body weight gain, feed conversion and protein efficiency ratios of the broiler chickens. No significant ($P > 0.05$) influence was recorded in feed intake, protein intake and carcass characteristics of the broilers. Economic analysis shows that synthetic lysine and methionine supplementation of broiler starter diets was more profitable than feeding unsupplemented diets. In conclusion, it can be said that synthetic lysine and methionine supplementation of broiler starter diets produce positive results in broiler chicks and optimized the profits from broiler production.

KEYWORDS: Broiler starters, lysine, methionine, performance, carcass characteristics, cost effectiveness

INTRODUCTION

Nutrition is the most important aspect of livestock production, which can be used to enhance animal productivity and also reduce the cost of production. Within the poultry industry, 75- 80 percent of the total cost of production is attributed to feeding costs. Of this, nearly thirty percent is due to supplying protein in rations (Coon, 2002). According to Mukhtar *et al*., 2007) the ideal poultry diet should satisfy the requirement of the largest species for amino acid to achieve the maximum economic return. However, in Nigeria, the major problem facing poultry farmers is not just high cost of protein feed resources but supplying the right quantity and quality of protein (amino acid) in the diets (Okpaniezeali *et al*., 2001). In addition the proportion of lysine and methionine to all other EAA is of great concern for optimal performance of broilers. May and Vardaman (1972), stated that the most essential amino acids that are likely to be deficient in poultry diets are lysine, methionine and cystine. Unfortunately, protein from a single source is not always adequate to satisfy these essential amino acid requirements. This problem has tended to reduce the rate of growth of animals and has added to the low level of animal protein intake of Nigerians. A possible way of optimizing the productivity of our animals and maximize efficiency of protein use is by improving the dietary levels of essential amino acid.

Cereal grains and plant protein source (soyabean) which form the bulk of broiler diets are known to be low in protein and some of the essential amino-acid particularly lysine and methionine (Okpaniezeali *et al*., 2001). Lysine and methionine are now being supplemented in free form, enabling dietary crude protein to decrease below NRC (1994) levels. In addition, the animal protein feed resources such as fish/meat meal though rich in these essential amino acids are not only in short supply in Nigeria but are also very expensive. It becomes necessary that supplementary synthetic lysine and methionine be added to the diets in order to provide sufficient essential amino acids for the building of body proteins. The use of synthetic amino acids to meet the amino acid needs of broilers leads to production of cost effective diets. However, little attention has been given to the effects lysine and methionine on performance, carcass characteristics and cost effectiveness of broiler starter production in Nigeria. Thus, the present study was conducted to evaluate the performance, carcass characteristics and cost effectiveness of feeding synthetic lysine and methoinine to broiler starters.

MATERIALS AND METHODS

The study was carried at the Teaching and Research Farm (Poultry Unit of the Department of Animals Science, Ebonyi State University, Abakaliki, Ebonyi State, Nigeria. The

experiment protocol was approved by the Animal Experiments Committee of the University

Animals, Diets and Experimental Design

A total of ninety six (96) one week old unsexed Cobb broiler chicks were randomly allotted to four experimental treatments in a completely randomized design. The birds were further subdivided into three replicates of 8 birds each. The experimental diets and water were provided *ad libitum* throughout the experimental period that lasted for five weeks. Before the beginning of the experiment, the birds were weighed to obtain their initial body weight and subsequently on a weekly basis. The performance parameters measured were feed intake, body weight gain, feed conversion and protein efficiency ratios. Other poultry routine management and vaccination practices were maintained.

Four experimental diets were formulated such that diet (1 which served as the control contained neither lysine nor methionine (O %). Diets 2 and 3 contained O.5% of lysine and methionine respectively while diet 4 contained a combination of O.5% lysine and O.5% methionine (Table 1).

Carcass and economic analysis

At the end of the feeding trial 3 birds from each replicate group were randomly taken, fasted over right and slaughtered by severing the jugular vein. The birds were dressed and eviscerated. During the evisceration, the internal organs and other parts were carefully removed and weighed. Their weights were expressed as a percentage of the dressed carcass weight. Economic analysis of live weight gain of broiler chicks was calculated by deducting net expenditure cost of chick from the gross income of the live weight gain.

Data analysis

Data analysis was done using analysis of variance technique of Steel and Torries (1980) while significant differences in means were separated using the method of Duncan's Multiple Range Test as outlined by Obi (2002). SPSS10 version for Windows (1999) was used for all statistical tests.

RESULTS

The effect of lysine and methionine supplementation on the performance of broiler chicks is as presented in Table 2. There were significant ($P < 0.05$) variations in body weight gain, feed conversion and protein efficiency ratios of the birds. Inclusion of synthetic lysine and methionine was accompanied by a significant ($P < 0.05$) improvement in final body weight and daily weight gain of broiler chickens; so that the final weight of birds fed the diet supplemented with a mixture of lysine and methionine (T_4) was significantly higher than birds fed the other diets. There was no significant ($P < 0.05$) difference in weight gain of birds fed sole lysine (T_2) and methionine (T_3) supplemental diets. Birds fed unsupplemented diet recorded the lowest weight gain ($P < 0.05$).

The result of the carcass characteristic of the birds is shown in Table 3. The result showed that lysine and methionine supplementation had no significant ($P < 0.05$) effect on the carcass yield and organ weight of the birds. However, there was a marginal numerical increase in the breast yield of birds fed supplemented diets especially lysine.

DISCUSSION

The observed improvement ($P < 0.05$) in weight gain of the birds fed T_4 (combine lysine and methionine) might be due to combined effect of lysine and methionine in improving feed and nutrient digestibility and utilization and more availability of lysine and methionine. This corroborates with the finding of El Amin and El zubeir (1989) and Bawa *et al*. (2008) that consumption of lysine and methionine resulted in significant ($P < 0.05$) increase in weight gain. This could also be due to more balanced nutrient combination since adequate amount of the essential amino acids is necessary for protein synthesis which results in increased weight gain. The result also suggests that their levels of inclusion (0.05%) met the requirement of the animals and is within the tolerable limits of the animals. Abebe and Moris had earlier reported a decrease in weight gain of birds fed above their optimum requirement. The observed depressed ($P < 0.05$) weight gain of birds fed T_2 (lysine) and T_3 (methionine) compared to T_4 (combined lysine and methionine) is probably due to poor amino acid profile and high concentration of the sole lysine or methionine supplemented diets. This finding is in agreement with the reports of Al-saffar and Rose (2002) that a very high dietary concentration of a single amino acid in broiler diets depressed body weight gain.

The significant ($P < 0.05$) reduction in weight gain of birds fed unsupplemented diets compared to those fed supplemented diets suggest insufficiency of lysine and methionine in the diet for optimum growth and an indication that the birds could not compensate for their nutrient deficiency. This observation strengthens the findings of Okpaniezeali *et al*. (2001); Etuk *et al*. (2004) and Razaei *et al*. (2004). The finding also lends credence to the fact that protein in the diet must be enough to supply sufficient essential amino acid needed for the building up of body protein. The finding is also in agreement with the reports of Auckland (1972) that suboptimal protein levels negatively influence growth.

Supplementation of synthetic lysine and methionine had no significant ($P > 0.05$) influence on the feed and protein intake of the broilers fed the experimental diets. This observation is not surprising since the metabolizable energy concentration of the diets is similar as birds eat to satisfy their energy requirements. However, there was marginal numerical decrease in feed consumption of birds fed unsupplemented amino acid diet which may be due to insufficient amino acid content of the diet. Jackson *et al*. (1982) reported that essential amino acids imbalances in diet decreases biological value of the diet and hence decrease feed intake.

Inclusion of synthetic lysine and methionine significantly ($P < 0.05$) enhanced the feed conversion and protein efficiency ratios of the birds fed supplemented diets over those fed the unsupplemented diets. This observation is in agreement with the report of NRC (1977) that the efficiency of feed

utilization for monogastric animals is influenced by the levels of lysine and methionine in the diet. The feed conversion and protein efficiency ratios of birds fed lysine and methionine supplemented diets indicated better feed utilization. This may have contributed to the observed enhanced weight gain of the birds fed these diets. Generally, differences between the weight gain and performance of birds fed supplemented and unsupplemented diets were expected because lower amino acids (lysine and methionine) contents affect weight gain and performance (NRC, 1994, Auckland, 1972). The marginal numerical increase in the breast yield of birds fed supplemented diets especially lysine could be due to increase lysine and methionine content of the diets. According to Han and Parsons (1990) lysine is the most effective factor to produce breast muscles.

Economic analysis (Table 4) revealed that synthetic lysine and methionine supplementation of broiler starter diets was more profitable than feeding unsupplemented diets. The economic data clearly indicated that mixture of lysine and methionine (T_4) diet was more encouraging, feasible and economical to obtain maximum profitability from broiler production. The higher weight gain and better feed efficiency of the supplemented diets are two major possible inluences which resulted in decreased cost of production and consequent increased profitability of the birds fed these diets. Many researchers had earlier reported positive economic responses of adding synthetic methionine (Harms *et al*., 1988; Waldroup and Hellwig, 1995) and lysine (Roland *et al*., 2000; Liu *et al*., 2005) to diets.

In conclusion it can be said that synthetic lysine and methionine supplementation of broiler starter diets produce positive results in broiler chicks. It also enhances the productivity and cost effectiveness of broiler rearing. For optimizing the profits from broiler production synthetic lysine and methionine may be incorporated to the diets of commercial broiler chicks.

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Table 1. Composition of the experimental broiler starter diets.

Ingredients	T_1	T_2	T_3	T_4
Yellow maize	50. 00	50. 00	50. 00	50. 00
Soyabean meal	24. 50	24. 00	24. 00	23. 50
Palm kernel cake	5. 00	8. 00	8. 00	8. 00
Maize offal	10. 00	10. 00	10. 00	10. 00
Fish mill	4. 00	4. 00	4. 00	4. 00
Bone meal	3. 00	3. 00	3. 00	3. 00
Premix *	0. 25	0. 25	0. 25	0. 25
Salt	0. 25	0. 25	0. 25	0. 25
Lysine	-	0. 50	-	0. 50
Methionine	-	-	0. 50	0
Chemical composition				
Nutrients				
Crude protein	21. 69	21. 47	21. 47	21. 21
Crude fibre	4. 92	4. 89	4. 89	4. 87
Either extract	5.33	5.30	5. 30	5. 28
Weight/kg)	2862. 32	2850. 23	2850. 23	2838. 18

*Vitamin-mineral premix (mg/kg diet): vitamin A, 1200IU; vitamin D3, 1500IU; Vitamin, 30; vitamin k3, 5,; Vitamin b13; vitamin B2 6; vitamin B6, 5; vitamin B12 0-03; Nicotine amide, 40; calcium D-Pantothenate, 10; Folic acid, 0.75; D-biotin, 0.075; Choline-chloride, 375mg, Antioxidant, 10; Mn, 80; Fe, 80; Zn, 60; Cu, 8; I, 0-5; Co, 0-2; Se, 0.15.

Table 2: Effects of synthetic lysine and methionine supplementation on the performance of starter broiler.

Parameters	T_1	T_2	T_3	T_4	SEM
Initial body weight (g)	55.00	54.10	54.40	55.70	
Final body weight g	959.40^{c}	1039.30^{b}	1083.13^{b}	1160.18^{a}	3.96
Body weight gain (g)	904.40^{c}	985.25^{b}	1028.73^{b}	1104.48^{a}	3.98
Daily weight gain (g)	25.84^{c}	28.15^{b}	29.39^{b}	31.55^{a}	2.29
Total feed intake (g)	2387.46	2416.75	2413.60	2451.05	5.85
Daily feed intake	68.21	69.05	68.96	70.03	4.65
Feed conversion ration	2.64^{c}	2.45^{b}	2.34^{ab}	2.22^{a}	0.76
Daily protein intake	14.79	14.83	14.81	14.85	0.43
Protein efficiency ratio	1.75^{c}	1.90^{b}	1.98^{b}	2.12^{a}	0.23

^{a,b,c,} Means with different superscripts on same row differ significantly ($P < 0.05$)

Table 3: Effects of synthetic lysine and methionine supplementation on the carcass characteristics of starter broilers.

Parameters	T_1	T_2	T_3	T_4	SEM
Height	21.28	21.33	27.62	21.88	0.36
Breast	18.21	18.89	18.44	18.72	0.79
Shank	7.29	7.30	7.23	7.26	0.53
Head	5.93	6.04	5.96	5.94	0.46
Neck	5.32	5.49	5.39	5.50	0.39
Wing	12.84	13.00	13.15	13.28	0.33
Liver	2.37	2.37	2.39	2.35.	0. 08
Heart	0.60	0.59	0.68	0.59	0. 06
Kidney	0.48	0.46	0.47	0.49	0. 09
Gizzard	3.38	3.39	3.37	3.59	0. 03

Table 4: Economic analysis of broiler starters fed synthetic lysine and methionine

Parameters	T_1	T_2	T_3	T_4
Total feed intake (g)	2387. 46	2416. 75	2413. 60	2451. 05
Cost of feed/ kg (₦)	48. 64	48. 95	49. 28	49. 54
Cost of feed consumed (₦)	166. 13	118. 30	118. 94	121. 55
Cost of birds (₦)	150. 00	150. 00	150. 00	150. 00
Cost of medication (₦)	45. 00	45. 00	45. 00	45. 00
Labour and exigencies (₦)	65. 23	65. 23	65. 23	65. 23
Cost of production / bird (₦)	376. 66	378. 83	374. 47	382. 08
Body weight gain (g)	904. 40	985. 25	1028. 76	1104. 48
Cost of /kg meat (₦)	650. 00	600. 00	600. 00	600. 00
Revenue /bird (₦)	542.64	540.15	617. 26	662. 69
Profitability /index bird (₦)	165. 94	212. 32	237. 79	280. 61