

EFFECTS OF GRADED LEVELS DIETARY LYSINE SUPPLEMENT ON BLOOD PARAMETERS OF BROILER FINISHER CHICKENS

*Yisa, A. G., Imoisi, C. O. and Dadi, R.

Federal College of Animal Health and Production Technology, National Veterinary Research Institute, Vom, Plateau State, Nigeria

*Corresponding author: amosgyisa@gmail.com (+234803 678 4413)

ABSTRACT

*This study was conducted to determine the effects of graded levels dietary lysine supplement on blood parameters of broiler finisher chickens. One hundred and fifty (150) 4 weeks old, unsexed, broiler chickens brooded on commercial broiler starter diets were divided into five (5) groups of 30 birds. Each group was further divided into three (3) replicates of ten (10) birds in Completely Randomised Design. They were then allotted to and fed five experimental diets containing 0.125, 0.100 (control), 0.075, 0.050 and 0.025 % levels of lysine supplement along with clean drinking water *ad libitum* for 4 weeks (28 days). The birds were raised in deep litter pens. At the end of the 4 weeks feeding, two birds from each replicate were selected and slaughtered and blood collected from the jugular vein for Haematological and serum analyses. Results for haematological parameters showed that there were no significant differences ($P>0.05$) in Packed Cell Volume (PCV), Haemoglobin concentration (HB), Mean Corpuscular Volume (MCV), White Blood Cell Count (WBC), Neutrophils and Lymphocytes. However, Red Blood Cell (RBC) count and Mean Corpuscular Haemoglobin Concentration (MCHC) differed significantly ($P<0.05$). The serum protein, albumin, globulin, urea and cholesterol levels were significantly different ($P<0.05$) between treatments. Only creatinine levels were not affected ($P>0.05$) by lysine supplement levels though the patterns were inconsistent. It was concluded that broiler finisher diets can be supplemented at 0.025 % lysine without any adverse effects on blood parameters.*

Key words: Broiler chickens, Blood parameters, Dietary lysine supplement

INTRODUCTION

Methionine and lysine occupy important positions in poultry nutrition and generally ranks as the first and second limiting amino acids (Meirelles *et al.*, 2003). Lysine being one of the essential amino acids that broiler chickens require for growth and development is often added to poultry feed to meet one of their dietary needs because cereal grains which form the bulk of most poultry rations are deficient in such critical amino acids (Handique *et al.*, 2019). As important as the requirement for essential amino acids is, there is the need to ensure that a precise amount is included in the diet; as deficiency can cause reduced growth and fat deposition while excessive levels of lysine can lead to health problems such as increased ammonia production, nitrogen excretion and metabolic stress (Weiner *et al.*, 2014).

Haematological and serum biochemical indices can provide important information about the overall health status of the birds and are commonly used to monitor nutritional status and identify health problems (Emiola *et al.*, 2013). Previous studies have investigated the effects of dietary lysine levels on broiler chicken performance, with varying results (Damoder *et al.*, 2008). Haematological status has been found useful in disease prognosis and for therapeutic and feed stress monitoring which observed that nutrition had significant effect on haematological values like PCV (Packed Cell Volume), HB (Haemoglobin) and RBC (Red Blood Cell). It is reported that when the haematological values fall within the normal ranges reported for the animal, it is an indication that diets ingested do not have any adverse effects on haematological parameters during the experimental period, but when the values fall below the normal range, it is an indication of anaemia or negative effect of the diet (Yakubu *et al.*, 2012). The same can be said to apply for serum parameters. This study was therefore conducted to determine the effects of varying levels of dietary lysine supplement on some blood parameters of broiler chickens.

MATERIALS AND METHODS

Experimental site

The experiment was carried out at the poultry unit of the Livestock Investigation Division, National Veterinary Research Institute, Vom which is situated in Vwang district, Jos South Local Government Area of Plateau State, Nigeria. Total area land of 510km². It has an average annual rainfall of 131.75cm and a temperature range 12 - 33°C (Bello and Yakubu, 2019).

Experimental design, diets and management of birds

One hundred and fifty (150) day old unsexed broiler chicks purchased from a reputable hatchery were housed and brooded in coal pot heated brooding house for four weeks on commercial broiler starter diets. At four weeks (28 days of age) the birds were randomly allotted to five (5) dietary treatments of 30 birds. Each, treatment was further divided into three (3) replicates of ten (10) birds in a Completely Randomised Design and given the experimental diets for 4 weeks (28 days). The broiler finisher diets were formulated to contain 0.125, 0.100 (control), 0.075, 0.050 and 0.025 % lysine supplement (Table 1). During the four weeks period, the birds were fed the experimental diets with clean drinking water *ad libitum*. The initial, weekly and final weights of the birds were also taken throughout the duration of the experiment. All necessary vaccinations and preventive medications against diseases were given to the birds. The birds were housed in deep litter pens, each measuring 1.25 x 1.32 x 2.2m (w x h x l) with wood shavings and rice bran used as bedding materials.

Blood Collection

At the end of the 4 weeks feeding and data collection, blood samples (2 mls) were collected from jugular veins of 2 birds randomly selected from each of the replicates using sterile syringe and needles into 2 separate sterile bottles; [H6][A G7] one containing anti-coagulant (EDTA- Ethylene Diamine Tetra-acetic Acid) for haematological and the other without anti-coagulants for the determination of serum biochemical indices. The blood samples were analysed for Red Blood Cells (RBC), Packed Cell Volume (PCV), Haemoglobin (Hb), White Blood Cells (WBC), MCHC, MCV, Neutrophils and Lymphocytes. The coagulated blood samples were also subjected to standard serum separation techniques for Total protein, globulin, albumin, urea, creatinine and cholesterol.

Data Analysis

The data generated were subjected to Analysis of variance (ANOVA) using SPSS version 25 (2017) package, were applicable, the means were separated using the Duncan's option in the same package.

Table 1: Composition of experimental of broiler finisher diets

Ingredients	Dietary levels of lysine supplement (%)				
	0.125	0.100	0.015	0.050	0.025
Maize	49.250	49.150	49.160	49.200	49.230
Wheat offal	7.385	7.370	7.370	7.380	7.380
Rice bran	4.930	4.920	4.920	4.920	4.930
Soya bean cake	34.310	34.360	34.360	34.390	34.410
Fish meal	1.000	1.000	1.000	1.000	1.000
Bone meal	1.500	1.500	1.500	1.500	1.500
Lime stone	1.000	1.000	1.000	1.000	1.000
Salt	0.250	0.250	0.250	0.250	0.250
Premix (BF)	0.250	0.250	0.250	0.250	0.250
Lysine	0.125	0.100	0.075	0.050	0.025
Methionine	0.100	0.100	0.100	0.100	0.100
Total	100.000	100.000	100.000	100.000	100.000

RESULTS AND DISCUSSION

Dietary levels of lysine supplement (LS) did not have any significant effect ($P>0.05$) on haematological parameters (Table 2) of the birds, except for Red Blood Cell (RBC) and Mean Corpuscular Haemoglobin Concentration where RBC was significantly higher for birds fed diets containing 0.025 % LS and vice versa for the MCHC where birds fed the diet containing 0.125 % lysine recorded significantly higher ($P<0.05$) values compared to the ones fed diet with 0.025 % LS. The serum biochemical indices however, were significantly different ($P<0.05$) between treatments for all parameters except for Creatinine. The highest values for serum protein and albumin were obtained for birds fed diets containing 0.075 and 0.050 % lysine supplement higher than those fed the control diet (0.100 % LS) with other treatments recording lower values at both higher and lower levels. These patterns are inconsistent and therefore the differences may not be as a result of the influence of dietary LS alone; lack of homogeneity of blood samples (Narayanan, 2005) or other errors that may occur before or during the analytical procedures may also be responsible for the inconsistencies (Igbal *et al.*, 2023).

The PCV ranges for broilers in this study fall below the normal ranges ($27 - 42 \times 10^{12}/l$) obtained for broiler chickens (except for birds on 0.025 % LS diet), Hb concentrations are within the lower limits of the normal values (7.00 – 11.00 g/dl) for birds (except for birds fed diets containing 0.075 and 0.050 % LS having values below the normal range) and the RBC values fall within the normal range of $2.2 - 4.0 \times 10^{12}/l$ (Merck, 2012). Other haematological parameters are also with normal range except for that of lymphocytes where the value for bird fed diets containing 0.100 and 0.025 % LS are higher than normal range of 20 – 50 (%) given by Merck (2012) and Barde *et al* (2022). The same pattern was obtained for the serum parameters (Table 3) except for creatinine which reveal no significant differences ($P>0.05$) between treatments.

Table 2: Haematological indices of broiler finishers fed diets containing graded levels of lysine supplement

Parameters	Levels of lysine supplement inclusion (%)					S E M
	0.125	0.100	0.075	0.050	0.025	
PCV (%)	26.33	31.00	24.00	23.66	28.00	1.15 ^{NS}
HB (g/dl)	7.80	9.17	6.83	6.80	7.90	0.37 ^{NS}
RBC ($\times 10^{12}/l$)	2.83 ^b	3.37 ^{ab}	3.40 ^{ab}	3.23 ^{ab}	3.93 ^a	0.15*
MCHC (fl)	29.63 ^a	29.40 ^{ab}	28.40 ^{ab}	28.60 ^{ab}	28.17 ^b	0.22*
MCV (fl)	94.93	85.37	71.50	73.00	73.47	3.77 ^{NS}
WBC ($\times 10^9/l$)	6.30	6.93	4.17	6.37	4.30	0.44 ^{NS}
Neutrophils (%)	53.33	41.33	52.67	34.33	36.67	4.99 ^{NS}
Lymphocytes (%)	46.33	58.67	47.00	41.33	62.67	5.16 ^{NS}

^{a, b} Means in the same row with different superscripts are significantly different ($P<0.05$)

S E M = Standard Error of Mean, N S = Not Significant ($P>0.05$),

* = Significant ($P<0.05$)

Table 3: Serum biochemical indices of broiler chickens fed diets containing varying levels of lysine supplement

Parameters	Levels of dietary lysine supplement inclusion (%)					S E M
	0.125	0.100	0.075	0.050	0.025	
Total protein (g/l)	38.75 ^c	40.52 ^b	42.38 ^a	39.03 ^c	38.40 ^c	0.27*
Total albumin (g/l)	24.74 ^b	22.48 ^c	25.67 ^{ab}	26.70 ^a	19.85 ^d	0.47*
Total globulin (g/l)	12.80 ^c	18.26 ^{ab}	16.71 ^b	12.33 ^c	18.55 ^a	0.46*
Urea (mg/dl)	37.17 ^{bc}	39.29 ^b	35.34 ^c	35.48 ^c	45.90 ^a	0.78*
Creatinine (mg/dl)	0.43	0.46	0.48	0.41	0.47	0.01 ^{NS}
Cholesterol (mg/dl)	116.77 ^b	116.83 ^b	120.87 ^a	111.10 ^c	109.20 ^c	0.76*

^{a, b, c, d} Means in the same row with different superscripts are significantly different ($P<0.05$)

S E M = Standard Error of Mean, N S = Not Significant ($P>0.05$),

* = Significant ($P<0.05$)

CONCLUSION

From this study, varying levels of dietary lysine supplement did not have any significant effect on haematological and serum biochemical indices of broiler finisher chickens. Thus, broiler diets can be supplemented at 0.025 % lysine without any adverse effects on blood parameters

REFERENCES

- Barde, I. J., Habila, S. L., Ishaku, L. E., Leo, S. N., Isa, S., Rimfa, A. G., Shekaro, A., Ahmed, J. S., Ugbe, A. D., Barde, D. J., Dashe, Y. G. and Ngulukun, S. S. (2012). Haematological and Serum biochemical parameters of broilers slaughtered at Bukuru live bird market of Jos South Local Government, Plateau State, Nigeria. *Acta Scientific Veterinary Sciences* 4.6 (2022): 05 – 11
- Bello, T. O., & Yakubu, R. (2019). Land use patterns and agricultural productivity in Plateau State: Challenges and opportunities. *African Journal of Geography and Environment*, 15 (3): 67–79.
- Damoder, E., Ajayi, O. O. and Olamide, M. D. (2012). Carcass and Haematology parameters of broiler chicken reared on sun card sesame supplemented sesame diet. Proceedings of the 17th Annual Conference of Animal Science Association of Nigeria (ASAN). Merit House/ Raw Materials and Research Development Council (RMRDC), Maitama, Abuja, FCT. Pp. 381-388.
- Emiola I. A., Ojedian, T. K. and Ajayi, I. A. (2013). Biochemical and haematological indices of broiler chickens fed differently processed legume seed meals. *International Journal of Applied Agricultural and Apicultural Research*, 9 (1&2): 140 – 149

- Emiola I. A., Ologhobo, A. D., Akinlade, J., Adedeji, O. S. and Bamigbade, O. M. (2003). Effect of inclusion of differently processed *Mucuna* seed meal on performance characteristics of broilers. *Trop. Anim. Prod Invest.* 6:13-21
- Handique, B., Yenkhom, R. and Maurya, L. K. (2019). Lysine and methionine supplementation in commercial broiler chicken: A Review. *Journal of Entomology and Zoology Studies*, 7 (3): 193 – 196
- Igbal, M. S., Tabassum, A. Arbaeen, A. F., Qasem, A. H., Elshemi, A. G. and Almasmoum, H. (2023). Preanalytical errors in a Haematology Laboratory: An experience from a tertiary care center. *Diagnostics (basel)*. 13 (4): 591.doi:103390/diagnostics13040591
- Meirelles, H. T., Albuquerque, R., Borgatti, L. M. O., Souza, L. W. O., Meister, N. C. and Lima, F. R. (2003). Performance of broilers fed with different levels of methionine hydroxy analogue and DL-methionine. *Brazilian Journal of Poultry Science*, 5:69-74.
- Merck Manual (2012). Haematological Reference Ranges (Merck's Veterinary Manual (2012): 234 - 240
- Narayanan, S. (2005). Preanalytical issues related to blood mixing. acutearetesting.org
- SPSS (2017). Statistical Package for Social Sciences. Pc Version 25. SPSS Inc. 444 N. Michigan Avenue Chicago, United States of America.
- Weiner, D., Mitch, W. E. and Sands, J. M. (2014) Urea and Ammonia metabolism and the control of renal nitrogen excretion. *Clinical Journal of the American Society of Nephrology*, 10 (8): 1444 - 1458
- Yakubu, B., Yusuf, H. B. and Yisa, A. G. (2012) Performance Evaluation of Cockerels fed varying levels of partially germinated Masakwa sorghum cultivar. *Adamawa State University Journal of Agricultural Sciences*. 2(2):50 – 56.