GROWTH PERFORMANCE OF ISA-BROWN COCKERELS FED VARYING DIETARY PROTEIN LEVELS

***Ekanem, N. J., Afolabi, K. D., Elijah, N. A., Simeon, U.U. and Edem, B.P.**
Department of Animal Science, University of Uyo, Uyo, Nigeria
****Corresponding author:** ekanemndi@gmail.com **Phone: 08172759210***

ABSTRACT
This study was carried out to investigate the growth performance and economy of production of Isa-brown starter cockerels (0-6weeks) fed varied dietary protein levels. A 6-week feeding trial was done in a completely randomized experimental design of three treatments (18, 20 and 22% crude protein levels with constant metabolizable energy level, 2900Kcal/kgDM), replicated three times with 10 birds per replicate and 30 birds per treatment. Measured growth performance traits were as follows; Daily Feed Intake (DFI), Daily Body Weight Gain (DBWG), Final Body Weight (FBW), Daily Metabolizable Energy Intake (DMEI), Daily Protein Intake(DPI), Feed Conversion Ratio(FCR), Protein Efficiency(PE) and Energy Efficiency(EE). At the end of the feeding trial, economy of production was assessed. DFI, DPI, FCR and DMEI of Isa-brown starter cockerel decreased significantly (P<0.05) with increasing dietary levels of crude protein (CP) whereas FBW, PE and EE increased with increasing dietary CP levels. It was concluded that feeding Isa brown cockerel with diet containing 22% CP and 2900kcalME/kgDM for 6 weeks gave optimal performance for live weight (318.89g) with the least cost of feed intake per Kg BWG (₦1,099).
Keywords: Growth performance, Isa-brown cockerel, dietary protein, economy analysis, feed Intake

INTRODUCTION

As most farmers' focus is on broiler farming for meat, cockerel production has not received the attention it deserves over the years. With increasing global human population, it is necessary to boast the production of animal and poultry that will meet the urgent market need for animal protein (Steinfeld, 2003). One approach to tackle this is to stimulate the cockerel industry, the neglected area of poultry production.

Protein is a crucial component of chicken diet. It has essential metabolic roles in the body as seen in the functions of blood plasma protein, hormones, enzymes, and antibodies, each of which has a distinct function (McDonald *et al.,* 2022). With significant levels of vital amino acids like lysine and methionine, pullet diets are always designed to include 18-19% CP for starters and 15-16% CP for layers (NRC, 1994). Research shows that proteinous feedstuff used in feed formulation incurred 45% of the total cost of poultry production (Ahmad *et al*., 2006). Farmers' profit margin from cockerels' production can be increased by optimizing productivity through the use of efficient levels of protein in their feed, particularly during the starter phase of production when protein is needed for the development of the body's supporting and structural tissues. The performance of Ugandan chickens reared under intensive conditions was impacted by variations in their diet's protein content (Magala *et al*., 2012). According to Tadelle *et al*. (2003) and Kingori *et al*. (2007), the environmental factors (nutrition and management) can have a significant impact on the growth performance of chicken raised locally.

It is in this view that this study was carried out to investigate the dietary levels of protein with the same energy levels that will enhance growth performance and at the same time reduce the cost of production of Isa Brown starter cockerels fed for six weeks.

MATERIALS AND METHODS

Experimental site: The experiment was carried out at the Poultry Unit of Teaching and Research Farm, University of Uyo, Akwa Ibom State, Nigeria. Uyo is located in a rainforest zone between latitude 4°57'N and longitude 7°53'E with average monthly rainfall of 200 to 800mm. It has an annual relative humidity, monthly temperature and annual sunshine of 71-88%, 28-36°C and 1400-1500hours per year respectively (WWO, 2021).

Experimental design, animals and management: Ninety day old Isa brown cockerels were purchased from a reliable distributor in Uyo, Akwa Ibom State, Nigeria. The brooder house, drinkers, and feeders were cleaned, sanitized, and fumigated two weeks prior to the chicks' arrival. After being weighed to determine their initial body weight upon arrival, the chicks were kept in a deep litter pen that were divided into sections with a temperature of 35°C. This temperature was progressively lowered each week until the start of the fourth week, at which point the birds were placed in an open-sided pen with wires and exposed to a room temperature of 28°C.Three experimental diets which contained 18%, 20% and 22% crude protein (CP) levels with 2900KcalME/kgDM were formulated and used throughout the duration of the study (6 weeks).The experimental diets represented the treatments, and each treatment was replicated three times with 10 birds per replicate and 30 birds per treatment in a Completely Randomized Design (CRD). Gross composition of the experimental diet is as shown in table 1. The birds had access to fresh water ad-libitum throughout the period of study. Birds in all treatment groups received similar standard routine management practices. The birds were vaccinated against Newcastle disease, infectious bursal disease and fowl pox disease as per routine vaccination schedule.

Table 1 : Gross compositions of experimental diets with varying dietary protein levels

Treatments	**1**	**2**	**3**
Protein levels (%)	**18**	**20**	**22**
Ingredients (%);			
Maize	61	60.4	57.2
Palm oil	0.5	0.2	0.5
Full fat soyabean	22	27.3	33.4
Fish meal	1	1.9	2
Palm kernel cake	5	1.65	1.3
Wheat offal	5.95	4	1.05
Bone ash	3.6	3.6	3.6
Table salt	0.25	0.25	0.25
L-Lysine	0.2	0.2	0.2
DL-Methionine	0.25	0.25	0.25
Premix	0.25	0.25	0.25
Total	**100**	**100**	**100**
Calculated composition			
ME	2907	2901	2909
CP	18.01	20.04	22.01
EE	3.58	3.32	3.11
CF	4.1	3.38	3
Ca	1.12	1.16	1.18
TP	0.81	0.83	0.84
Lysine	1.18	1.36	1.51
Methionine	0.41`	0.41	0.41

ME=Metabolizable Energy; CP= Crude Protein; EE= Ether Extract; Ca= Calcium; TP=Total phosphorus. *supplied per Kg diet: Vit. A 4×106 I.U, Tocopherols 4×103 I.U, Vit. K3 800mg, Folacin 200mg, Thiamine 600mg, Cyanocobalamin 4mg, Biotin 8mg, Manganese 3kg, Zinc 20g, iron 3g, choline chloride 80g, copper 2g, iodine 480mg, Cobalt 80mg Selenium 40mg BHT 25g and Anti – caking agent 6g.

Data collection: Birds were weighed on commencement of the feeding trial as the initial body weight and afterward, the birds' weight was taken weekly for six weeks. This was used to estimate the Daily Body Weight Gain (DBWG). At the end of the feeding trial, weights of the birds were taken for Final Body Weight (FBW).Daily Feed Intake (DFI) was calculated. Feed Conversion Ratio (FCR) was obtained using the ratio of DFI to DBWG. Daily Protein Intake (DPI) was calculated by multiplying the %CP in feed by the DFI and the ratio of DBWG to protein consumed was used to calculate the Protein Efficiency (PE). Daily Metabolizable Energy intake (DMEI) was calculated by multiplying the metabolizable energy per kg in the feed by DFI (in kg) and the ratio of DBWG to metabolizable energy consumed was used to calculate the Metabolizable Energy Efficiency (MEE). Economic analysis of Isa-brown starter cockerels' production was based on the prevailing market price of feed

ingredients and diets at the time of purchase which was used to compute the cost of feed intake per bird, and the cost of feed intake per kg body weight gain.

Statistical analysis: Data obtained were subjected to Analysis of Variance (ANOVA) and their means were separated using the Duncan Multiple Range Test of GENSTAT (2008).

The adopted model was; $mY_{ij} = \mu + t_i + e_{ij}$

Where, μ = overall mean; t_i = Effect of dietary protein treatment; e_{ij}= Error incurred while applying the treatment

RESULTS AND DISCUSSION

The growth performance of Isa-brown starter cockerels fed varying dietary protein levels from 0-6 weeks is as shown in table 2. The initial body weights (34 -35g) of chicks were similar ($p>0.05$) across diets. DFI (14.99-25.61g) decreased significantly with increasing levels of dietary CP. This agrees with the findings of Salami *et al*. (2003) who reported that starter cockerels fed 16% and 18% CP diets consumed more feed than those on high protein diets so as to meet their CP requirements for maintenance and production. Birds on diet with the highest protein level, 22 % had significantly ($P<0.05$) higher DBWG (6.78g), FBW (318.89g), PE (2.07) and MEE (0.16). According to the report of Afolabi *et al*. (2022) and Ghersari *et al*. (2015), DBWG and FBW of broilers increased significantly with increased levels of dietary levels of CP. This was in line with the result of this study. FCR (2.25 – 4.67) varied significantly ($P<0.05$)across treatments. The least FCR value (2.25) was obtained for birds fed diet containing 22% CP. Results indicated that starter cockerels on this diet utilized feed more efficiently than those on lower CP level diets. Similar CP level diet (22%) for best FCR was reported by Kumar *et al*.(2009) and Salami *et al*.(2003) for starter cockerels, 0-8weeks and starter cockerels, 3-9weeks respectively.

Table 2 : Growth performance of Isa-brown starter cockerels (0 - 6 weeks) fed varying dietary protein levels

Treatments	1	2	3	SEM
Crude protein levels (%)	**18**	**20**	**22**	
Performance parameters:				
Initial Body Weight (g)	35.07	35	34	0.28
Daily Feed Intake(g)	25.61[a]	20.93[b]	14.99[c]	1.20
Daily Body Weight Gain(g)	5.54[bc]	6.18[ab]	6.78[a]	0.09
Final Body Weight (g)	264.30[bc]	294.50[ab]	318.89[a]	4.32
Feed Conversion Ratio	4.67[a]	3.39[b]	2.25[c]	0.24
Daily Protein Intake	4.61[a]	4.19[b]	3.30[c]	0.25
Protein Efficiency	1.23[c]	1.47[b]	2.07[a]	0.06
Daily Metabolizable Energy Intake	74.28[a]	60.71[b]	43.46[c]	2.99
Metabolizable Energy Efficiency	0.08[c]	0.10[b]	0.16[a]	0.01

[a – c] Means along same Column with different superscript are significantly ($P \leq 0.05$) different. SEM - standard error of mean

The economy of Isa brown starter cockerel fed varying levels of protein is as shown in table 3. The cost of feed intake per bird (₦306.97- ₦ 461.30) decreased significantly ($P<0.05$) across treatment as the dietary protein levels increased. The least cost of feed intake per Kg BWG (₦ 1,099) was obtained for birds on 22% CP. Birds on this diet had the least FCR, highest FBW, DBWG, PE and MEE.

Table 3: The economy of Isa-brown starter cockerels (0 - 6 weeks) fed varying dietary protein levels.

Treatments	1	2	3	SEM
Crude protein levels (%)	**18**	**20**	**22**	
Economic parameters (₦):				
Cost per kg Feed	428.84	463.73	487.72	6.60
Cost of Feed Intake Per Bird	461.30[a]	407.71[b]	306.97[c]	17.78
Cost of Feed intake per Kg BWG	2004.11[a]	1570.50[b]	1099.00[c]	84.69

[a – c] Means along same Column with different superscript are significantly ($P \leq 0.05$) different.
SEM - standard error of mean; BWG = Body weight gain.

CONCLUSION

Feeding Isa-brown starter cockerel with diet containing 22% CP and 2900kcalME/KgDM for 6 weeks gave optimal performance of live weight (318.89g) with the least cost of feed intake per Kg body weight gain (₦1,099).

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