EFFECTS OF VARYING DIETARY ENERGY AND PROTEIN LEVELS ON GROWTH PERFORMANCE OF ISA-BROWN STARTER COCKERELS

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ABSTRACT

An experiment was carried out to assess and ascertainthe energy and protein levels required by Isa-brown cockerels reared in Southern rainforest zone of Nigeria for optimal performance. Four hundred and fifty (450) day old Isa-brown cockerels were randomly distributed to fifteen treatment groups of ten birds per replicate and three replicates per treatment for an experiment duration of six weeks.Experimental diets comprised of five (5) Metabolizable Energy (ME) levels (2600, 2700, 2800, 2900 and 3000kcalME/kgDM)and three (3) protein levels (18, 20 and 22%CP). The data obtainedwassubjected to descriptive statistics and Analysis of Variance (ANOVA) in a Completely RandomizedDesign (CRD) of 3x5 factorial arrangement and the means were separated using the Duncan MultipleRange Test (DMRT). The result obtained showed that Feed Intake (FI) reducedwith an increasing dietary energy level while Body Weight Gain (BWG) and Final Body Weight (FBW) increased with an increasingcrude protein level. Feed Conversion Ratio (FCR) was significantly (P<0.05) affected by the variations in the energy levels. The least FCR was obtained with birds fed diets containing 2900kcalME/kgDM and 22% CP (diet 12). This diet was also the most economical with cost of feed intake per KG body weight gain being ₦1099.Interaction of energy and protein level did not significantly (P>0.05) affect any of the parameters measured. Conclusively, Isa-brown starter cockerels (0 – 6 weeks) can be reared in southern rainforest zone of Nigeria with a least cost feed containing 2900kcalME/kgDM and 22%CP for optimal performance.

Keywords: Energy, Crude protein, Growth performance, Feed Intake, Body Weight Gain

INTRODUCTION

With the growing global population, it is necessary to boost the production of animal and poultry that will meet the urgent market need for animal protein (Steinfeld, 2003). One approach that can be used to accomplish this is to resurrect the cockerel industry, which is a neglected area of poultry production for commercial, smallholder, and impoverished poultry producers in rural areas.Birds eat primarily to satisfy their essential nutrients need (basically energy and protein). The availability of nutrients in diets and the digestibility of such nutrients are taken into consideration when formulating and compounding poultry feed, as amino acids and converted energy are vital in identifying the top providers of nutrients and dietary supplements (Ravindran *et al*., 2005).The main factor influencing how much food an animal consumes is the dietary energy content (Ravindran, 2013). Poultry of different classes need varying amounts of energy for their metabolic activities without which production performance will undoubtedly suffer if the right amount is unavailable (FAO, 2013). Protein requirement is one of the most essential considerations in designing any feed formula (Tuleun, 2018), yet the feedstuff (especially protein) is the most expensive and competitive for humans and other industrial users (Tuleun and Patrick, 2017).To make cockerel production more profitable and attractive to youth, poultry farmers and intending farmers in Nigeria; toward increasing protein supply to the populace and reducing malnutrition, there is need to use best or optimal levels of energy and protein in cockerel feed. It was in this view that this study was carried out to assess the growth performance of Isa-brown starter cockerels fed varying dietary levels of energy and protein for 6 weeks of age.

MATERIALS AND METHODS

The feed ingredients used were maize, palm kernel cake, wheat offal, imported fish meal, bone ash, full fat soybean meal (prepared by roasting for about 20 minutes at 100^0C temperature to reduce the moisture and eliminate the antinutritional factor. Then the roasted Soybean s was ground to meal), lysine, methionine, and a premix of vitamins and minerals. They were procured from reputable sources in Uyo metropolis. Fifteen (15) diets were formulated. The diets comprised of five (5) energy levels (2600, 2700, 2800, 2900 and 3000KcalME/kgDM) and three (3) protein levels (18, 20 and 22%CP). A total of Four hundred and fifty (450) day old Isa-brown cockerel chicks were purchase from a reliable distributor in Uyo, Akwa Ibom State, Nigeria. Two weeks to the chicks' arrival, the brooder house, feeders, and drinkers were cleaned, disinfected, and fumigated with formalin in a concentration of 35ml to 17.5g potassium permanganate per one cubic metre of space. On arrival, the chicks were

weighed and recorded as their initial body weight. They were housed in a partitioned deep litter house for brooding and rearing. The chicks were brooded at day old at 35^0C and the temperature was reduced gradually by 1^0C weekly till the beginning of fourth week when they were exposed to room temperature of 28^0C in a wired open sided pen. Chick feeders and drinkers were filled few hours before the chicks arrived with formulated cockerel chick starter mash and clean water respectively. The birds had access to feed and freshwater *ad libitum* throughout the period of the study with 24 hours lighting. Birds were stocked at a spacing of $1m^2$/bird. Parameters determined werefeed intake, weight gain and feed conversion ratio. Cost indices like cost of feed intake per bird, cost of feed intake per kg body weight gain were calculated. Data obtained were subjected to descriptive statistics and Analysis of Variance (ANOVA) in a completely Randomized Design of 3×5 factorial arrangement and the means were separated using the Duncan Multiple Range Test (DMRT) of GENSTAT (2008)

RESULTS AND DISCUSSION

At the end of the experiment, it was observed that differences in energy levels significantly ($P<0.05$) influenced FI, BWG, FCR, cost of FI /bird, and cost of FI/ kg BWG. The study confirmed the assertion that energy affects the feed intake of birds and as well birds eat to meet their energy requirements as reported by Afolabi *et al.* (2012). Variations in protein levels had a significant ($P<0.05$) effect on BWG and FBW. Higher energy and protein levels were associated with higher body weight gain. This was in line with the findings of Salami *et al.,* (2003) who reported an increased in body weight gain of starter cockerels, 3-9 weeks as protein levels increases. Final body weight of Isa – brown starter cockerel was significantly influenced by the variations in the protein levels as the highest final body weight was obtained for birds on the highest protein level in the study (22% CP). The least FCR was observed with birds on 2900kcal/KgDM energy and 22% CP. Cost of feed intake required by a starter cockerel to gain 1kg body weight was with birds fed diet 12 (2900Kcal/KgDM and 22% CP), (₦1,099). This was not significantly different from what was obtained for starter cockerels on diet 14 (3000Kcal/KgDM and 20% CP), (₦1,341.20). Cockerels on these diets were the most economical and efficient feed converters to meat. Interaction of energy and protein level did not significantly ($P>0.05$) affect any of the parameters measured.

Table 1: Percentage Composition of Experimental Diets fed to Isa -brown starter cockerels

Feed	**Experimental Diets**														
Ingredients	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Maize	42.83	40.10	38.10	50.00	47.00	44.00	54.10	52.05	50.20	61.00	60.40	57.20	63.00	60.05	56.85
Palm Oil	0.10	0.10	0.10	0.20	0.40	0.40	0.50	0.50	0.50	0.50	0.20	0.50	2.00	1.90	2.10
FFSBM	16.20	23.10	29.20	18.8	25.00	31.55	20.10	26.60	34.50	22.00	27.30	33.40	22.00	28.10	34.30
IFM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.50	1.00	1.90	2.00	1.90	1.90	2.00
PKC	15.30	13.25	12.25	8.30	7.05	7.50	8.70	7.00	3.75	5.00	1.65	1.30	0.30	1.80	0.10
WO	20.02	17.90	14.80	17.15	15.00	11.00	11.05	8.30	6.00	5.95	4.00	1.05	6.25	1.70	0.10
Bone ash	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
Table Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
L-Lysine	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Methionine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
* Premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Calculated composition:															
ME	2612	2601	2605	2704	2702	2703	2805	2806	2802	2907	2901	2909	3008	3009	3001
CP	18.01	20.14	22	18.08	20.01	22.09	18.07	20.04	22.09	18.01	20.04	22.01	18.04	20.01	22.01
EE	4.76	4	3.77	3.91	3.67	3.48	3.82	3.56	3.2	3.58	3.32	3.11	3.34	3.21	2.96
CF	7.73	7.2	6.72	6.24	5.84	5.44	5.41	4.86	4.17	4.1	3.38	3.00	3.35	3.04	2.65
Ca	1.15	1.16	1.17	1.13	1.14	1.15	1.13	1.14	1.12	1.12	1.16	1.18	1.14	1.16	1.17
TP	0.93	0.95	0.96	0.89	0.91	0.92	0.86	0.87	0.87	0.81	0.83	0.84	0.81	0.82	0.83
Lysine	1.12	1.29	1.43	1.15	1.3	1.3	1.16	1.32	1.29	1.18	1.36	1.51	1.21	1.36	1.52
Methionine	0.46	0.45	0.44	0.44	0.43	0.42	0.43	0.42	0.39	0.41`	0.41	0.41	0.41	0.41	0.4

ME = Metabolizable Energy; CP = Crude Protein; EE = Ether Extract; CF = Crude Fibre; Ca = Calcium; FFSBM = full fat soybean meal; PKC = Palm Kernel Cake; WO = Wheat Offal; IFM= imported Fish meal

*Supplied per kg diet: Vit. A, 4 x 106 I.U.; Tocopherols 4 x 103 I.U; Vit. K3 800mg; Folacin, 200mg; Thiamine, 600mg; Cyanocobalamin, 4mg; Biotion, 8mg; Manganese, 3g; Zinc 20g; Iron, 3g; Choline chloride, 80g; Copper, 2g; Iodine, 480mg; Cobalt, 80mg; Selenium, 40mg; BHT, 25g and Anti-caking agent, 6g.

CONCLUSION

Isa-brown cockerels fed with diet containing 2900kcalME/kgDM and 22%CP (diet 12) had the least feed conversion ratio, the least cost of feed intake per kg body weight gain and is more economical. Therefore, this energy and proteindietary levelis recommended for Isa-brown cockerel diet from 0 – 6 weeks for optimal performance.

Table 2: Growth performance and economy of starter cockerels (0 - 6 weeks) fed varying dietary Metabolizable energy and Crude protein levels

DIET	ME	CP	Initial Body Weight (g)	Daily Feed Intake(g)	Daily Body Weight Gain(g)	Final Body Weight (g)	Feed Conversion Ratio	Daily Protein Intake	Daily Metabolizable Energy Intake	Cost of FI /Bird (₦)	Cost of FI/Kg BWG (₦)
1	2600	18	35.00	39.07^{b}	5.30^{bc}	257.77^{c}	7.44^{a}	7.03^{b}	101.58^{b}	569.75^{c}	2582.01^{b}
2	2600	20	33.33	28.02^{e}	5.94^{abc}	316.33^{ab}	4.72^{de}	5.60^{d}	72.85^{ef}	438.56^{g}	1759.05^{ef}
3	2600	22	33.33	31.07^{d}	5.66^{bc}	271.33^{bc}	5.50^{cd}	6.84^{b}	80.78^{d}	517.18^{d}	2179.98^{cd}
4	2700	18	35.00	20.00^{k}	5.44^{bc}	263.33^{c}	4.47^{e}	3.60^{g}	54.00^{i}	319.62^{i}	1702.06^{efg}
5	2700	20	31.67	32.17^{d}	5.24^{c}	251.67^{c}	6.15^{bc}	6.43^{c}	86.84^{c}	544.86^{c}	2481.70^{bc}
6	2700	22	33.33	43.28^{a}	5.77^{bc}	276.12^{abc}	7.52^{a}	9.52^{a}	116.87^{a}	775.11^{a}	3207.58^{a}
7	2800	18	35.00	36.22^{c}	5.48^{bc}	263.24^{c}	6.63^{ab}	6.52^{c}	101.42^{b}	609.13^{b}	2655.99^{b}
8	2800	20	33.33	26.83^{ef}	5.75^{bc}	275.00^{abc}	4.58^{de}	5.37^{d}	75.11^{e}	479.79^{e}	1951.86^{def}
9	2800	22	34.67	24.29^{gh}	6.02^{abc}	287.43^{abc}	4.40^{ef}	5.35^{d}	68.01^{g}	460.34^{efg}	1824.35^{def}
10	2900	18	35.07	25.61^{fg}	5.54^{bc}	264.30^{c}	4.67^{de}	4.61^{e}	74.28^{e}	461.30^{efg}	2004.11^{de}
11	2900	20	35.00	20.93^{jk}	6.18^{ab}	294.50^{abc}	3.39^{fg}	4.19^{f}	60.71^{h}	407.71^{h}	1570.50^{fg}
12	2900	22	34.00	14.99^{l}	6.78^{a}	318.89^{a}	2.25^{h}	3.30^{h}	43.46^{k}	306.97^{i}	1099.00^{h}
13	3000	18	35.00	23.21^{hi}	6.07^{abc}	280.00^{abc}	3.83^{ef}	4.18^{f}	69.62^{fg}	447.12^{fg}	1755.33^{ef}
14	3000	20	35.00	16.07^{l}	5.75^{bc}	276.10^{abc}	2.80^{gh}	3.21^{h}	48.19^{j}	323.18^{i}	1341.20^{gh}
15	3000	22	33.33	22.17^{ij}	6.75^{a}	316.67^{a}	3.31^{fg}	4.88^{e}	66.51^{g}	468.13^{ef}	1662.38^{efg}
SEM			0.28	1.20	0.09	4.32	0.24	0.25	2.99	17.78	84.69
P value			0.566^{ns}	0.001**	0.006*	0.16^{ns}	0.001**	0.001**	0.001**	0.001**	0.001**

Table 3: Effect of energy, protein and their interaction on growth performance of Isa-brown cockerel (0-6weeks) fed varying dietary energy and protein levels

DIET	ME	CP	Initial Body Weight(g)	Daily Feed Intake(g)	Daily Body Weight Gain(g)	Final Body Weight (g)	Feed Conversion Ratio	Daily Protein Intake	Daily ME Intake	Cost of FI/ Bird (₦)	Cost of FI/Kg BWG (₦)
Effect of metabolizable energy levels											
	2600		33.89	32.72^{a}	5.63^{ab}	281.81	5.89^{a}	6.49^{a}	85.07^{a}	508.51^{ab}	2173.68^{a}
	2700		33.33	31.82^{a}	5.48^{b}	263.71	6.05^{a}	6.52^{a}	85.90^{a}	546.53^{a}	2463.78^{a}
	2800		34.33	29.11^{a}	5.75^{ab}	275.23	5.09^{a}	5.75^{a}	81.51^{a}	516.42^{ab}	2144.06^{a}
	2900		34.69	20.51^{b}	6.17^{a}	292.56	3.44^{b}	4.03^{b}	59.48^{b}	392.01^{c}	1557.87^{b}
	3000		34.44	20.48^{b}	6.19^{a}	290.92	3.31^{b}	4.09^{b}	61.44^{b}	412.81^{bc}	1586.30^{b}
SEM			0.28	1.20	0.09	4.32	0.24	0.25	2.99	17.78	84.69
P Value			0.577	0.001**	0.026*	0.193	0.001**	0.001**	0.001**	0.012*	0.001**
E*ffect of protein levels*											
		18	35.01	28.82	5.57^{b}	265.73^{b}	5.41	5.19	80.18	481.40	2139.90
		20	33.67	24.80	5.77^{b}	282.72^{ab}	4.33	4.96	68.74	438.82	1820.86
		22	33.73	27.16	6.19^{a}	294.09^{a}	4.53	5.98	75.13	505.55	1994.66
SEM			0.28	1.20	0.09	4.32	0.24	0.25	2.99	17.78	84.69
P Value			0.079^{ns}	0.395^{ns}	0.010**	0.022*	0.158^{ns}	0.219^{ns}	0.300^{ns}	0.307^{ns}	0.312^{ns}
Interaction, ME × P			0.636^{ns}	0.101^{ns}	0.271^{ns}	0.597^{ns}	0.149^{ns}	0.257^{ns}	0.134^{ns}	0.246^{ns}	0.278^{ns}

$^{a-i}$Means along the same column with different superscript are significantly ($P \leq 0.05$) different. ME - Metabolizable energy (Kcal/kgDM); CP - Crude Protein, SEM - Standard error of the mean. * - significant ($P \leq 0.05$), ** - highly significant ($P \leq 0.01$), ns - non significant ($P > 0.05$)

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