Nigerian J. Anim, Sci. 2024, 26 (3): 166-173

Early Laying Performance of Black Harco Pullets Fed Varying Dietary Energy Levels in Sokoto Nigeria.

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Target audience: Poultry farmers, Layer producers, Poultry researchers, Poultry feed producers

Abstract

This trial was conducted using 156 Black Harco pullets to assess the influence of varying dietary energy levels on early laying performance, feed intake, water intake, egg production and egg weight were assessed. There were four treatments with 39 birds per treatment, each treatment have three replicates, with 13 birds in each replicate; treatment1;2400kcal/kg; treatment2; 2,500kcal/kg; treatment 3; 2,600kcal/kg; treatment 4 is a commercial layer diet with 2,550 kcal/kg . The experiment lasted for eight weeks (21 to 28 week of age). The data were analyzed with one-way Analysis of Variance (ANOVA) using General Linear Model (GLM) Procedure of Statistical Analysis System (SAS). Post-hoc Duncan's Multiple Range test was carried out with a P-value < 0.05 as significant.. Results of the study indicated that feed intake was higher for birds on 2,550kcal/kg compared to 2,500kcal/kg and 2,600kcal/kg. Similarly, water intake was significantly higher with birds fed 2,550kcal/kg compared to other treatments. Egg production was however significantly (P < 0.05) higher for birds fed 2,400kcal/kg compared to 2,500kcal/kg and 2,600kcal/kg. Egg weight did not differ between the 2,550 kcal/kg and those containing 2,400Kcal/kg and 2,500 Kcal/kg compared to the diet containing 2,600Kcal/kg. According to this result it could be concluded that the diet containing 2,400 Kcal/kg was the best in terms of egg production and could be adopted for the early laying pullets in the study area. Further studies are also recommended to re-evaluate the treatments as either self formulated or commercial diet.

Keywords: Feeds; Early laying performance; Black Harco; Energy levels; Egg production

Description of Problem

Feed account for 65-75% of the total layer production cost and energy can take up to 60%of the total cost of the diets in some circumstances; the accurate estimate of the real available amount of energy in feedstuffs is a necessity in order to meet bird's maximum performance and nutrients requirement. Energy is an essential component of poultry diet that ought to be supplied in adequate amount to meet up the layer requirements for maintenance, optimal growth, egg production and reproduction (1), energy content of the diets is a crucial nutrient that control feed intake and need consideration during ration formulation. Reports on the energy needs of poultry vary from one environment to another and is to be given special consideration in order to achieve high productivity in poultry production (2,3).In general, laying hens are able to adjust their feed intake, to some extent, according to their energy requirement. Nonetheless, hens reduce feed intake when dietary energy increases. However, if dietary energy content is too low, layer birds are unlikely to increase their feed intake sufficiently to overcome the shortfall (4). An increase in dietary energy content linearly decreases the average daily feed intake but has no influence on energy intake (5). Laying hens adjust more rapidly to a decrease in dietary energy than an increase in energy (6). Feeding inadequate energy levels may results in low egg production and body weight, worsen egg quality and efficiency of energy utilization may be affected (7).It has been documented that adult birds utilize energy feedstuffs to a greater extent with less variation than growing birds (8,9). As different purpose breeds for egg or meat production and age differs physiologically in their digestion and absorption of nutrients as well different energy levels values are obtained from different feed ingredients. (10).Regulating dietary energy may be the most effective dietary method to manipulate feed intake in laying hens. Most studies in literature (11,12, 13, 14) reported reducing feed intake when dietary energy increases, and improved feed efficiency. (12, 13, 16). Thus, evaluating feedstuffs by different energy systems enable nutritionist to formulate animal's diets according to nutrient requirements and so they perform to their full genetic potentials. The dietary energy and protein content have to be adjusted to make sure that hens consume adequate nutrients needed to handle growth and onset of egg production (17). Preliminary evidence has demonstrated that the increase of energy and protein levels in the prelaying diet increases their production performance (18,19). While In laying hens, protein-energy enrichment diets help maintain bone mass and bone strength before the sexual maturity (20).To the best of our knowledge up to the time of conducting this research, information is scarce on the energy requirement of layer birds that would allow egg producers to know the ideal dietary energy level required for optimal performance and even the limited available information of layer birds in the study area are highly contradicting, therefore,

The objective of this study was to evaluate the effect of production performance (feed intake, water intake, egg production, egg weight and energy used) of black harco laying pullets fed diets with varying energy levels.

Materials and Methods

Experimental site

The study was conducted at Usmanu Danfodiyo University, Sokoto poultry production unit. Aliyu Jodi Road Sokoto,

Birds and Experimental Designs

A total of 156 black harco layer pullets procured from ZARTECH limited Cooperation Company farm Ibadan Nigeria were used in the study, they were of medium size, weighing 1.7 to 1.8 kg, they were 21 weeks of age when stocked. The birds were housed in battery cage in a well ventilated poultry house. The cages were leveled in accordance with their treatment and their corresponding replications. Birds were randomly allotted into four treatments, with 39 birds per each treatment. Each treatment has three replicates, with 13 birds per replicate; the birds were fed diets containing varying Metabolizable Energy (ME) levels as follows: Treatment 1: 2400kcal/kg; Treatment 2; 2,500kcal/kg; Treatment 3; 2,600kcal/kg. a commercial layer diet with energy level of 2,550 kcal/kg served as treatment 4. The study lasted for eight weeks 21 to 28 weeks of age. The gross and chemical composition of the experimental diets is presented in Table 1 and 2 respectively. Treatment 4 was a commercial diet, the chemical composition of which is not all known.

Table 1: Gross and Chemical Composition of the Experimental diets

Ingredients	2400 Kcal/kg	2500 Kcal/kg	2600 Kcal/kg
Corn	17.50	28.20	38.90
Groundnut Cake	22.50	22.60	23.00
Maize Bran	45.00	34.00	22.90
Blood Meal	3.00	3.00	3.00
Limestone	9.00	9.00	9.00
Bone Meal	2.40	2.40	2.40
Premix	0.25	0.25	0.25
Salt	0.30	0.30	0.30
Methionine	0.16	0.16	0.15
Lysine	0.08	0.08	0.07
Total (kg)	100	100	100

Table 2: Chemical Composition of the experimental diets

	2400	2500	2600	*2550
Crude Protein (CP)	18.00	18.00	18.00	16.50
Lysine	0.80	0.80	0.80	-
Methionine	0.40	0.40	0.40	-
Calcium	3.90	3.90	3.90	4.60
Phosphorus	0.43	0.43	0.43	4.60
Crude fiber	3.0	3.0	3.5	3.5
Fat	4.0	4.0	4.0	4.00

*Chemical composition of commercial diets as indicated by the manufacturers

Feeding and Laying Performance Parameters

Feed and water were offered ad-libitum to the birds throughout the experimental period. Weight of feed and volume of water given to birds were measured daily. Before feeding, the leftover of feed and water offered the previous day were measured. Number of eggs produced and egg weight were also measured daily.

Data analysis

Data were analyzed by one-way ANOVA using the GLM procedure of SAS (SAS Institute Inc. Base SAS®9.4). Post hoc Duncan test was carried out with $p < 0.05$. Results were expressed as mean. Treatments were considered significantly different at $p < 0.05$

Results and Discussion

Feed intake declined though not significant,($P > 0.05$) with increasing energy levels of the diets (Table 3). Feed intake for the commercial diet (treatment 4) was significantly higher ($P < 0.05$) compared to treatment 2 and 3. Thus intake of the commercial formulated diet did not reflect its energy content, because even though it is said to contain 2,550 Kcal/kg it was consumed more than the self formulated diet containing 2,400 and 2,500 Kcal/kg. The decreased in feed intake with increase dietary energy concentrations (T1 T2 and T3) confirms most observations that increasing energy density of the diets reduced feed intake (11, 19, 12, 13,).

Similarly, water intake was higher ($P < 0.05$) for the commercial diet treatment 4 compared to other treatments (Table 4). Indeed pelleting has been reported to increase water intake of birds (20). For the commercial diets, water intake was significantly ($P < 0.05$) higher followed by the group fed 2500 Kcal/kg compared to treatments 1 and 3, indicating that water intake did not follow the trend observed for feed intake. Thus something other than the energy density of the diets have influenced water intake. This result was contrary to that of (21). That the feed and water intake are directly related that, birds that drinks less water certainly consume less feed, and, subsequently, egg production declines.

Average egg production for the whole period was significantly higher ($P < 0.05$) in a group fed the commercial diets (Treatment 4) compared to 2,500 and 2,600 Kcal/kg diets. The commercial diet had the highest feed and water intake. This might have been the reason for its highest egg production (Table 5). The result obtained in this study was in support of (22,7,23)who reported that egg production linearly decreased with increasing energy levels and that low energy levels increased egg production of laying hens. Similarly,(24, 25,6, 26) reported that egg production was not affected by increasing dietary energy levels. There was significant effect on egg weight ($P < 0.05$) laying pullets fed diet containing the lowest energy of 2,400 Kcal/kg and the commercial diet containing 2,550 Kcal/kg compared to the diet containing the highest energy of 2,600 Kcal/kg (Table 6). This result indicates that higher energy levels do not result to higher egg weight. This finding was consistent with that of (27, 28, 29, 13) that dietary energy did not influence on egg weight. While on contrary,(11, 6, 30, 31,14) obtained a positive linear effect of increasing apparent Metabolizable energy concentration on egg weight.

Conclusion and Applications

1. The result of this study indicated that feed intake was higher for birds fed diet containing2,550 Kcal/kg compared to birds fed 2,400 and 2,500 Kcal/kg
2. Water intake was significantly higher for birds fed 2,550 Kcal/kg.
3. Egg production was significantly higher for the birds fed 2,550Kcal/kg compared to the 2,500 and 2,600 Kcal/kg.
4. Therefore, based on this result it could be concluded that the diet containing 2,400 Kcal/kg was the best in terms of egg production and therefore is recommended in feeding the early laying pullets in the study area and similar climatic condition.
5. Further studies are also recommended to re-evaluate the whole treatments diets as either self formulated or commercial formulated diet.

Acknowledgment

Table 3: Feed intake (g) bird/day of layers fed diets containing varying energy levels

Treatments	2400 Kcal/kg	2500 Kcal/kg	2600 Kcal/kg	*2550 Kcal/kg
Age (Weeks)				
21	86	84	79	83
22	88	85	83	88
23	92	84	80	96
24	97	95	89	106
25	98	98	90	103
26	102	98	93	105
27	105	102	97	111
28	104	104	110	112
Mean	96.0^{ab}	93.7^{b}	90.1^{b}	100.5^{a}

*Energy levels of commercial diets as indicated by the manufacturers
a, b. Mean on same row with the same letters are not significantly different at 0.05

Table 4: Effects of water intake (mls/birds/day) of layers fed diets containing varying energy levels

Treatments	2400 Kcal/kg	2500 Kcal/kg	2600 Kcal/kg	*2550 Kcal/kg
Age (Weeks)				
21	151.43	145.13	129.50	139.73
22	225.5	235.10	237.30	242.80
23	249.70	251.63	246.40	287.50
24	256.33	255.72	254.73	294.00
25	271.96	283.00	254.43	330.77
26	306.9	362.34	344.90	320.57
27	430.66	439.00	439.30	480.33
28	416.83	459.50	453.13	471.00
Mean	293.26^{c}	303.67^{b}	297.01^{c}	32.73^{a}

*Energy levels as indicated by the manufacturers
a, b, c. Mean on the similar row with the same letters are not significantly different at 0.05

Table 5: Effects of egg Production (%) of layers fed diets containing varying energy Levels

Treatments	2400 Kcal/kg	2500 Kcal/kg	2600 Kcal/kg	*2550 Kcal/kg
Age (Week)				
21	22.80	10.27	12.76	19.85
22	41.80	22.05	24.95	29.03
23	48.00	33.53	30.90	42.13
24	52.80	53.13	35.04	56.76
25	55.30	58.87	59.20	67.28
26	54.67	67.72	65.90	73.60
27	62.97	74.16	77.00	76.70
28	77.85	82.00	81.90	85.23
Mean	51.37^{ab}	50.23^{b}	45.52^{b}	57.60^{a}

* Energy levels as indicated by the manufacturers
a, b. Mean on the same row with the same letters are not significantly different at 0.05

Table 6: Effect of Egg Weight (g) of layers fed diets containing varying energy levels

Treatments	2400 Kcal/kg	2500 Kcal/kg	2600 Kcal/kg	*2550 Kcal/kg
Age (Week)				
21	35.43	34.90	35.00	37.10
22	45.63	43.10	39.80	40.33
23	50.63	53.06	50.00	48.13
24	52.95	54.23	51.10	54.20
25	54.86	55.23	53.50	55.23
26	55.33	54.33	54.09	55.70
27	55.30	56.00	55.40	58.01
28	55.46	55.80	55.80	57.10
Mean	50.00^{a}	49.77^{ab}	48.12^{b}	50.64^{a}

* Energy levels as indicated by the manufacturers
a, b. Mean on same row with the same letters are not significantly different at 0.05

We wish to extend our appreciation to Professor Hussaini Mohammed Tukur of the Department of Animal Science, Faculty of Agriculture Usmanu Danfodiyo University, Sokoto for the supply of the experimental birds and supervision.

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