

ON FARM QUALITY EVALUATION OF FOUR COMMERCIAL PROTEINS CONCENTRATES USING BROWN EGG – TYPE LAYERS

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Abstract

One hundred (100) 18 weeks old ISA Brown Strain of layers were used to examine the performance and some egg quality characteristics of four commercial protein concentrates. Five experimental diets were formulated for the experiment such that diet 1 was the control formulated from primary ingredients while diets 2, 3, 4 and 5 were formulated using four commercial protein concentrates (CPC) labeled as CPCA, CPCB, CPCC and CPCD respectively. The birds were allotted after weight balancing into five treatments of five replicates with four birds to make twenty birds per treatment in a completely randomized design. The experiment lasted for 12 weeks. The results shows daily feed intake, feed cost /kg diet, feed: egg ratio and percentage hen day production were significantly ($p < 0.05$) affected by CPC. Control diet had the highest feed cost per kg (₦125.00) while CPCB had the least (₦107.93). Hen day egg production was highest in birds fed the control diet (89.68%) and lowest (77.94%) was recorded among birds fed CPCB. The external egg quality results shows that all parameters measured except egg mass were not significantly ($p > 0.05$) affected. Egg mass for birds fed the control diet (48.96), CPCB (47.51) and CPCD 46.87 were similar ($p > 0.05$) but higher than 43.20 obtained among birds fed CPCC. Although the percentage production was highest in the control, but where and when it becomes difficult to formulate layer diet from primary ingredients and the concentrates are available any of the commercial concentrates can be used.

Keywords: Quality evaluation, internal egg quality, external egg quality, Brown egg type layers

Introduction

The poultry production systems play an important role in human nutrition, employment and income generation Alam *et al.*, (2015). According to Sleman *et al* (2015), most attention is given to protein components in poultry nutrition, due to the importance of protein as a major constituent of the biologically active compounds in the body. Protein sources are the second largest component of practical poultry diets after energy and limited number of ingredients are used by the mainstream commercial poultry industry to supply protein; these are limited in distribution and are also generally more expensive an energy sources (Iji *et al* 2017). **Animal Protein concentrate** can be defined as animal dietary supplement with very high protein content extracted or prepared from vegetable or animal source. In addition to energy and protein sources there is the need for addition of feed additives (micronutrients, minerals and vitamins) in order have a balanced feed that meets daily nutrient requirements. However, with the consistent rise in the prices of primary ingredients and the need to get quality materials, most farmers have resulted to purchasing protein concentrates to be mixed with relatively available and affordable ingredients. Poor quality feeds will lead to lower performance with a negative consequence on the income of the farmers. Since protein concentrates are expected to contain high quality protein sources, vitamins, minerals, trace elements, enzymes and additives, using them in preparing good feed becomes easier.

The aim of the experiment is to compare performance and egg quality characteristics of Brown egg – type layers fed with different Commercial Protein Concentrates (CPC).

Materials and Methods

Experimental site: - The experiment was carried out at the Poultry Unit of the Teaching and Research Farm, Faculty of Agricultural Sciences of Ladoke Akintola University of Technology, Ogbomoso, Nigeria.

Test Ingredients: - Four commercial protein concentrates were used for the experiment which is labelled as CPCA, CPCB, CPCC and CPCD layer concentrate.

Experimental diets: - Five experimental diets were formulated (Table 1) as follows: Diet1: Direct formulation using primary ingredients (control), Diet 2: maize+ wheat offal+30% CPCA, Diet 3:

maize+ wheat offal+30% CPCB, Diet 4: maize+ wheat offal+30% CPCC, Diet 5: maize+ wheat offal+SBM+Limestone+5% CPCD.

Table 1: Gross composition of experimental diet (g/100)

Ingredients	Control	CPCA	CPCB	CPCC	CPCD
Maize	47.00	47.00	45.00	50.00	50.00
Soybean	15.40	-	-	-	20.00
Wheat offal	14.05	23.00	25.00	20.00	16.00
[†] Others	23.55	-	-	-	-
Limestone	-	-	-	-	9.00
Concentrate	-	30.00	30.00	30.00	5.00
Total	100:00	100:00	100:00	100:00	100:00
Analysis					
Crude protein (%)	17.15	17.16	17.40	16.80	17.87
ME (KCal/kg)	2552.31	2504.10	2482.50	2600.00	2644.20
Crude fibre (%)	4.12	4.09	7.52	4.05	3.86
Crude fat (%)	3.52	3.25	5.40	3.40	3.76
Calcium (%)	4.15	3.59	3.42	3.62	4.05

M.E= Metabolizable Energy, PKC= Palm Kernel Cake, [†]others- fish meal=3.00kg, limestone =8.00kg, Bone meal = 0.75kg, salt =3.00kg, Lysine=0.3kg, methionine=0.25kg, premix =0.25kg

Experimental animals and management: - One hundred (100) point of lay (18 weeks old) ISA brown birds purchased from a reputable farm were used for the experiment. The birds were weighed prior to the commencement of the experiment and distributed randomly after weight balancing into five (5) dietary treatment groups of five (5) replicates, each replicate had four birds. The birds were managed intensively in a two-tier battery cage system and three birds were stock per cell with dimension of 42 x 42 x 36 cm. All necessary medications and vaccinations were administered and birds were fed twice daily at 7:00hours and 12:00hours. Water was supplied *ad-libitum*. Eggs were collected twice at 12:00hours and 16:00hours for the period of the experiment which is 12 weeks.

Data Collection: Data were collected on the following parameters; initial body weight, final body weight, average feed intake, egg mass, Egg weight and hen egg day production.

External and internal egg qualities: The following egg quality traits (external and internal) were examined. Egg weight (g), yolk weight (g), albumen weight (g) and shell weight (g) were measured with analytic scale with 0.01 g accuracy. To determine the proportions of egg parts, each egg was carefully broken and shell separated. Egg shell (not dried) was weighed and the relative weight calculated by relating the shell weight to the weight of the egg. An egg separator was used to separate the yolk from the albumen. Relative yolk weight was calculated in percentages by relating the yolk weight measured to the nearest gram to the whole weight of that particular egg and multiplied by 100. The albumen weight was calculated by subtracting the yolk and shell weights from the whole egg weight. The albumen weight relative to the individual egg weight was calculated. Yolk index (%) was calculated according to the formula: Yolk index = yolk height (mm) x 100% / yolk width (mm). Haugh units were calculated according to the formula (Haugh, 1937): HU = 100 log (H +7.57 -1.7 *M^{0.37}), H – average thick white height (mm), W – egg weight (g). Eggshell thickness (mm) was measured together with shell membranes using a micrometer screw.

Laboratory analysis: The experiment diets, as well as the test ingredient were analyzed for proximate composition by the method of AOAC, (2005).

Statistical analysis: All data collected were subjected to one way analysis of variance using the GLM of SAS (2000) and the means were compared using Duncan's Multiple Range Test of the same package.

Results and Discussion

The nutrient compositions of the experimental diets were within the values recommended levels for laying hens as reported by NRC (1994). The comparative performance of brown egg-type layers fed four different commercial concentrates is presented in Table 2. Daily feed intake, feed conversion ratio and percentage hen day egg production were significantly ($p < 0.05$) influenced by the different commercial protein concentrates. This is similar with the findings of Moustafa *et al.*, (2005) who reported that feed intake and FCR were significantly affected by slight variation in dietary CP levels in the diets of laying hens.

Table 2: Comparative performance of brown-egg type layers fed four different commercial protein concentrates

Parameters	Control	Biacom	Livestock	Animal care	Hendrix	SEM	P value
Initial weight (kg)	1.63	1.54	1.46	1.61	1.63	0.03	0.25
Final weight (kg)	1.66	1.58	1.49	1.65	1.66	0.03	0.23
Feed to egg ratio	0.12 ^b	0.15 ^a	0.16 ^a	0.15 ^a	0.12 ^b	0.00	0.01
Feed cost(₦/kg)	125.00 ^a	108.20 ^d	107.93 ^e	110.16 ^c	116.80 ^b	0.36	0.01
Daily feed intake (g)	104.51 ^b	106.38 ^a	106.21 ^a	107.14 ^a	105.83 ^{ab}	1.02	0.02
%Hen-day production	89.68 ^a	87.19 ^b	77.94 ^d	82.39 ^c	84.52 ^c	0.08	0.02

^{abcde}Means on the same similar row with superscripts are not significantly different ($P > 0.05$)

Layers fed on diets formulated from commercial protein concentrates had higher DFI compared with birds fed control diet. This may be due to the type of protein sources and amino acid profile of the commercial protein concentrates used. %HDEP (89.68) was highest in birds fed control diet. Among birds fed supplemented concentrate diets, CPCA had a better %HDEP (87.19). However, %HDEP for birds fed control, CPCA, CPCC and CPCD diets were within desirable range of $\geq 80\%$ HDEP (Agritech, 2018). The external and internal egg quality parameters are presented in Tables 3 and 4 respectively. The egg size is a function of quality and quantity of feed, stage of lay and management system (Onyimonyi and Ugwu 2007) and the amount of protein in the feed (Scott *et al.*, 1976). In this study the egg weights are similar across the treatments.

Table 3: External Egg quality parameters of Brown Egg type layers fed protein concentrates

Parameters	T1	T2	T3	T4	T5	SEM	P-value
Egg weight(g)	54.80	55.21	55.85	54.78	55.20	0.18	0.34
Egg length (cm)	4.32	4.38	4.36	4.35	4.27	0.53	0.97
Egg width (cm)	3.78	3.83	3.83	3.83	3.84	0.15	1.00
Egg mass (g)	48.96 ^a	47.51 ^a	43.20 ^b	44.73 ^b	46.87 ^a	0.50	0.00
Egg shape index	0.82	0.81	0.82	0.81	0.84	0.02	0.98
Shell thickness (mm)	0.41	0.41	0.40	0.40	0.41	0.00	0.57

^{ab}Means on the same row with similar superscripts are not significantly different ($P > 0.05$)

Stadelmen and Owen, (1997) reported that shell thickness of 0.33mm is needed for egg is to have more than 50% chance of moving through normal market without breaking. The egg shell thickness obtained in this study is higher than the recommended 0.33mm, this improvement in shell thickness may be consequence increased mineral and protein absorption.

Table 4: Internal Egg quality parameters of Brown Egg-type layer fed protein concentrates

Parameters	T1	T2	T3	T4	T5	SEM	P-value
Albumen length (cm)	6.41	6.49	6.33	6.46	6.49	0.09	0.98
Egg weight(g)	54.80	55.21	55.85	54.78	55.20	0.18	0.34
Albumen weight (g)	37.71	36.55	36.15	37.13	37.45	0.19	0.05
Percentage albumen weight	68.99 ^a	66.60 ^a	64.89 ^b	67.94 ^a	68.19 ^a	0.41	0.02
Yolk weight (g)	13.30	13.31	13.06	13.42	13.52	0.07	0.26
Yolk height (cm)	1.83	1.79	1.80	1.80	1.86	0.02	0.75
Yolk length(cm)	2.94	3.12	2.89	2.94	2.96	0.04	0.33
Yolk index	0.64 ^a	0.59 ^b	0.63 ^a	0.66 ^a	0.63 ^a	0.01	0.02
Yolk percentage (%)	24.58	24.20	23.47	24.55	24.57	0.12	0.02
Haugh unit	87.97	88.45	88.02	89.39	88.82	0.32	0.61

^{ab}Means on the same row with similar superscripts are not significantly different (P > 0.05)

Conclusion and recommendation

All the commercial protein concentrates used were able to meet up the nutrient requirements for layers based on their recommended mixing instructions. They can therefore be used in formulating laying diets where available and when it is relatively difficult to formulate from common fed ingredients.

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