Growth Performance and Egg Quality of Layers Fed Graded Levels of Palm Oil Supplemented with Vitamin E

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Abstract

Test diets (2-5) for layers were prepared using graded levels of 5, 8, 10 and 12% levels of inclusion of palm oil supplemented with 0.11, 0.17, 0.22 and 0.27g, respectively, of vitamin E/Kg of feed. The control diet for the layers had no palm oil and vitamin E inclusions. The experimental diets were used to feed 75 Nera brown layers that were 24wks old. The birds were distributed to the diets using completely randomized design. There were five treatments and each treatment had three replicates of five birds per replicate. The experiment lasted for 12 weeks. Results of the experiment showed that the average body weight significantly increased ($P < 0.05$) for the birds on the test diets (2-5) than those on the control diet, birds on diet 2 (1.91kg) weighed the heaviest. For the egg quality parameters, averages of egg weight, hen day egg production, albumen height, albumen width and index, shell thickness, yolk height varied significantly ($P < 0.05$) among the treatments. In many yard sticks the graded levels of palm oil inclusion supplemented with vitamin E enhanced performance and egg quality of layers.

Keywords: Egg quality, layers, palmoil, vitamin E, supplementation, performance.

Introduction

In Nigeria, the state of nutrition of the populace is predominantly marked by inadequate protein intake both in quantity and quality (FAO, 1993). Food and Agricultural Organization (FAO, 1993) recommended 27g while it was 5g of animal protein intake as daily requirement per head per day for an average adult against as 5g that it was in Nigeria. In the present study, effort is geared towards using feeding trial to solve a nutritional problem. This is by creating alternative feed

compositions which can be extended to the poultry farmers for use in boosting poultry meat and egg production and consumption in Nigeria especially in the south east.

Maize form the bulk feed, therefore the main source of energy in ration formulation for birds. It is consumed by human beings as a staple food and also used in industries. These create a higher demand for maize which had led to high cost of maize as energy source in poultry diet especially in time of reduced quantity of maize after harvest.

In the long run to solve the problem in the study, palm oil is included at graded levels to partly replace maize since oil has relatively 2.3 times more energy than maize per unit value (Lehninger, 2001). Moura (2003) reported that birds fed palm oil supplemented diets performed better than those without palm oil. Moreover, by convention, palm oil is available and at a very competitive price throughout the year in the south east of Nigeria which serves as the catchment's area for the study.

Oil reduces dustiness enhances smell, taste and in turn intake of feed by animals (Crespo and Nstevé-Garcia, 2000). Oils and fats of plants or animals origin have been employed in animal diet being a more energetically convertible ingredient with low heat increment. Pigs and chickens are able to incorporate dietary fatty acid directly as unsaturated fat into adipose and muscle tissue lipid (Onibi, 1997), which may be a strategy for reducing the intake of saturated fat by consumption of poultry meat.

Lipid oxidation is frequently encountered when high amount of oil is included in a diet. Vitamin E is recognized as effective inhibitor of lipid oxidation in food and biological system (Kamal-Eldin and Appelqvist, 1996). It is an effective natural antioxidant, which is deposited in the cellular and sub-cellular fraction of muscle and adipose tissue (Onibi, 2000). Blanch *et al.* (1995) recommended optimum inclusion level of 5% oil in ration for monogastrics. Oluyemi and Robert (2000) recorded that 2.5% oil inclusion improved performance in laying birds. But in the study graded levels of palm oil supplemented with vitamin E to control lipid oxidation (Mac Donald and Edwards, 1995) at

two levels i.e., in the feed and in the chicken were used. Vitamin E (Tocopherol) is recommended as antioxidant at 56mg/kg of the body weight of birds (Anonymous, 1980). In the study palm oil and vitamin E (as antioxidant at preventive level) will be used to enhance growth and egg quality of layers.

Materials and Methods

Seventy-five, 24wks old Nera brown layers were used in the study. The experiment was conducted at the Teaching and Research Farm of Federal University of Technology, Owerri. The birds were distributed to treatments using completely randomized design. There were five treatments and three replicates per treatment of five birds per replicate. Layers diets were formulated using 5, 8, 10 and 12% palm oil supplemented with 0.11, 0.18, 0.22 and 0.27g of vitamin E respectively, for test diets 2, 3, 4 and 5. Diet 1 was the control diet without palm oil and vitamin E supplementations. The layers diets were offered at the laying phase for the period of 12 weeks having energy and protein levels of 2500 kcalME/kg and 16.50% crude protein (CP), respectively. Feed and water, were provided *ad libitum* and proper conventional management practices were strictly adhered to. The gross composition of feeds is as shown in Table 1.

Data Collection and Analysis

The initial body weights of the birds were taken before the commencement of the experiment. After which the feed intakes of the birds were also taken daily and recorded and the birds were weighed weekly to determine body weight and body weight gain. The following egg

Table 1: Gross composition of diets

Ingredients	Diet 1(-)	Diet 2(+)	Diet 3(+)	Diet 4(+)	Diet 5(+)
Maize	59.86	43.67	34.20	27.50	21.00
Groundnut cake	16.07	15.21	14.50	14.00	13.57
Wheat offal	15.65	27.87	34.80	40.10	45.00
Palm oil	0.00	5.00	8.00	10.00	12.00
Fish meal	1.00	1.00	1.00	1.00	1.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Oyster shell	3.00	3.00	3.00	3.00	3.00
Common salt	0.25	0.25	0.25	0.25	0.25
*Premix	0.25	0.25	0.25	0.25	0.25
Lysine	0.70	0.70	0.70	0.70	0.70
Methionine	0.27	0.27	0.27	0.27	0.27
Total	100.00	100.00	100.00	100.00	100.00

(approximated)

Cost of feed/kg (N) 42.53 42.51 40.60 42.04 42.11
 *Vitamin mineral premix contain per 2.5kg of the product as follows: Vitamin A, 10,000,000 IU, vitamin D₃, 3,000,000 IU, vitamin E, 10,000 IU, vitamin K, 3,000mg, vitamin B₁, 3,000mg, vitamin B₂, 6,000mg, vitamin B₆, 4,000mg, vitamin B₁₂, 20mg, biotin, 50mg, niacin, 30,000mg, pantothenic acid, 10,000mg, folic acid, 800mg, choline, 300,000mg, iron, 60,000mg, manganese, 80,000mg, copper, 25,000mg, zinc, 80,000mg, cobalt, 150mg, iodine, 500mg, selenium, 310mg, antioxidant, 20,000mg.
 Note: - no vitamin E and + with vitamin E.

Table 2: Calculated Chemical Analysis of Feeds

Diets	Energy MEKcal	Crude protein (%)	Crude fibre (%)	Calcium (%)	Phosphorus (%)
1	2500.00	16.53	3.33	3.31	0.61
2	2534.24	16.60	4.00	3.32	0.63
3	2559.17	16.51	4.37	3.32	0.64
4	2574.75	16.52	4.66	3.32	0.65
5	2624.03	16.51	4.93	3.33	0.66

parameters were determined: egg weight, hen day egg production, shell weight, shell thickness, yolk index, albumen index and Haugh unit. Electronic weighing balance was used in determining egg and shell weights while micro meter screw gauge and vernier calipers were used to determine shell thickness, albumen and yolk indices, respectively. Haugh unit (HU) was determined using the formula: $HU = 100 \log (H + 7.57 - 1.7W^{0.37})$ by Haugh (1937). Where H = Albumen height (mm) and W = Egg weight (gm). Therefore, in regard to these, egg quality parameters were determined every week by

randomly selecting 3 eggs per replicate for analysis. All data collected were subjected to analysis of variance while least significant difference (LSD) method by Njoku *et al.* (1998) was used to separate the means.

Results and Discussion

Tables 3 and 4 show the performance and egg quality parameters of the layers.

The results of the experiment showed that the average body weight was significantly increased ($P < 0.05$) for the birds on the test diets (2-5) higher than those on the control diet (1)

Performance of layers on diets containing palm oil and vitamin E

Table 3: Performance of layers

Parameters	Diet 1	Diet 2	Diet 3	Diet 4	Diet 5	SEM
Initial body weight (kg)	1.52	1.67	1.72	1.69	1.67	
Average body weight (kg)/12wk	1.57 ^c	1.91 ^a	1.77 ^b	1.70 ^b	1.75 ^b	0.04
Average body weight gain (kg)/wk	0.04	0.05	0.03	0.03	0.06	0.02
Feed intake (kg)/d	0.14	0.15	0.12	0.12	0.15	0.04

Means with different superscripts (a, b, and c) along the same row are significantly different (P<0.05).
SEM: Standard Error of Mean

Table 4: Egg quality parameters of layers

Parameters	Diet 1	Diet 2	Diet 3	Diet 4	Diet 5	SEM
Average egg weight (gm)	53.49 ^b	58.41 ^b	68.10 ^a	64.41 ^a	58.99 ^b	1.84
* Haugh unit	81.23	86.94	80.15	75.10	89.29	1.26
Hen day egg production (%)	73.33 ^a	78.33 ^a	66.41 ^a	48.06 ^b	80.00 ^a	4.80
Albumen height (mm)	6.42 ^b	7.60 ^a	6.84 ^b	5.76 ^b	7.75 ^a	0.30
Albumen width (mm)	55.23 ^c	57.94 ^{bc}	63.39 ^a	63.89 ^a	59.51 ^b	1.04
Albumen index	0.12 ^{ab}	0.13 ^a	0.11 ^b	0.10 ^b	0.13 ^a	0.01
Shell thickness (mm)	0.57 ^a	0.56 ^a	0.55 ^a	0.55 ^a	0.43 ^b	0.01
Shell weight (gm)	0.30	0.31	0.40	0.40	0.31	0.08
Yolk height (mm)	15.06 ^b	16.03 ^a	14.67 ^b	14.70 ^b	16.19 ^a	0.27
Yolk width (mm)	34.74	35.79	37.28	37.70	35.77	0.34
Yolk index	0.43	0.45	0.39	0.39	0.45	0.02

Means with different superscripts (a and b) along the same row are significantly different (P<0.05)

SEM = Standard Error of Mean

*Haugh unit of 72 and above (score AA) indicates freshness of egg (Card and Neishem, 1972).

with diet 2 being the highest. This supported the postulate by Moura (2003) that birds fed diet supplemented with oil performed better than those fed without oil addition in the diet. Averages of body weight gain and feed intake did not show nominal increases (P>0.05) for birds on diets

2 and 5 and higher than those on diet 1 while that of birds on diets 3 and 4 were less than that of birds on diet 1, but were not statistically significant (P>0.05).

For the egg qualities, averages of egg weight for birds on diets 3 and 4 were significantly

heavier ($P<0.05$) than those of the birds on diets 1, 2 and 5. The averages of hen day egg production of birds on diets 1, 2, 3 and 5 were significantly increased ($P<0.05$) than those on diet 4. The averages of albumen height increased significantly ($P<0.05$) for birds on diets 2, 3 (slightly) and 5 than those on diets 1 and 4 while albumen width was significantly increased ($P<0.05$) of those on diets 3 and 4 than the rest and those of diet 2 greater ($P<0.05$) than those on diet 1 but not those on diet 5. The averages of albumen index increased ($P<0.05$) for birds on diets 1 (slightly), 2 and 5 while shell thickness increased ($P<0.05$) for birds on diets 1- 4 and shell weight was not increased but had nominal increases ($P>0.05$) for birds on diets 3 and 4. The averages of yolk height increased ($P<0.05$) for birds on diets 2 and 5 more than those on the rest diets while yolk width and yolk index were not significantly increased ($P>0.05$) in all the diets. Thus some of the parameters measured increased significantly ($P<0.05$) with graded levels of palm oil supplemented with vitamin E. Body weight was increased and egg numbers from the hen day egg production of 80% (diet 5) as well as average egg weight of 68g (diet 3).

Contrary to lower value of oil inclusion for layers suggested by Oluyemi and Roberts (2000) higher values with vitamin E supplements improved performance of the birds in the study. According to Onibi (1997), chickens have the ability to convert fats and oil and deposit them as unsaturated fats and oil in adipose and muscular tissues. Thereby reducing the formation of cholesterol derived mainly from saturated fats and oil that may cause arteriosclerosis when such meat or product derived from birds raised with

high amount of oil in the diet is consumed by man. Although oil inclusion was used to partially replace maize and not added as extra to that of maize. The metabolic function of vitamin E as antioxidant (Mac Donald and Edwards, 1995) prevented de novo oxidation of the oil (Kamal-Eldin and Appleqvist, 1996) and initiated better digestion and absorption. Thus enhanced performance of the layers on the test diets which was observed in many of the parameters measured.

Conclusion

Graded levels of palm oil supplemented with vitamin E in diets for layers in one of the parameters improved their growth and in many parameters investigated enhanced their egg qualities. Therefore, the test diets especially diets 2, 3 and 5 are recommended for use in poultry production.

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(Received 31st Jan., 2009; Acceptewd 25th January, 2010).