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Effect of various levels of Moringa Leaf Meal on the Egg Quality of Isa Brown Breed of Layers

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Abstract
The effect of various levels of *Moringa oleifera* leaf meal on the laying performance and egg quality of Isa brown pullets was investigated using one hundred and twenty Isa Brown pullets randomly assigned to four dietary treatments (0%, 2.5%, 5.0% and 7.5%) with 30 birds per treatment and three replicates of 10 birds per replicate in a 3 x 4 CRD design were used for the experiment which lasted for 8 weeks. The result showed that birds on T_2 performed significantly ($P<0.05$) better in terms of egg production and egg quality. . Numerical values are 159 ± 1.52egg/wk, 66.25 ± 7.69g, 5.58 ± 0.24cm, 8. 63 ± 1.01g and 76.62 respectively for mean weekly egg collection, egg weight, egg length, shell weight and egg surface for birds on T_2, while the respective values are 131 ± 1.34egg/wk, 60.48 ± 8.05g, 5.39 ± 0.18cm, 8.67 ± 1.39g and 72.11 for those on T_3 and 133 ± 1.54 egg/wk, 58.33 ± 7.61g, 5.41 ± 0.26cm, 8.17 ± 0.92g and 70.23 for those on T_4. Egg width, shell thickness and egg shape index did not show any significant difference ($P > 0.05$). The result of the internal characteristics of the birds followed a similar trend with birds on T_2 having significantly ($P < 0.05$) better indices of internal egg quality. The respective values are 23.13 ± 3.55g, 1.5cm, 32.71 ± 3.29g, 34.89 for yolk weight, yolk height, albumen weight and yolk ratio for birds on T_2, while those on T_3 and T_4 had 19.90 ± 2.77g, 1.4cm, 29.62 ± 3.94g 32.9 and 15.58 ± 1.89g, 1.4cm, 29.71 ± 3.4 and 27.22 for the parameters indicated. Inclusion of Moringa leaf meal at lower levels is therefore recommended.
Keywords : Moringa oleifera, laying performance, Isa Brown Layers

Introduction

Poultry industry is a predominant source of animal protein in both developed and developing countries. Adenjimi et al. (2011) emphasized that the expansion of the poultry industry depends largely on the availability of good quality feed in sufficient quantity and at prices affordable to both producers and consumers. This is very important for intensive enterprise especially for layers which are very sensitive to nutrition such that inadequacies in nutrient supply often lead to fall in egg production and even cessation of lay. With the present trend of rising prices of feed ingredients, there has been a search for non conventional feedstuff with potentials of improving poultry performance at reduced cost. Of such non conventional feed sources, leaf protein concentrates has been reported in many literatures (Farinu, et al. 1999) including those of cassava leaf *Leuceana leucocephala* (Mellau 1999 and Bhatnagar 1996), amaranthus. Among the leaves with nutritional and health benefits to man and livestock, *Moringa oleifera* leaf meal has captured research interest. A large number of reports on the nutritional quality of *Moringa oleifera* has earned it the name "a tree of life". Jed (2005) opined that the protein quality of Moringa leaves is comparable to that of milk and eggs. Sarwatt et al. (2004) reported that Moringa leaves are potentially inexpensive protein for livestock feeding containing 80% DM, 29.7% CP, 22.5% CF, 4.38% EE, 27.8% Ca and 0.26% phosphorus. Apart from nutritional benefits, health benefits of *Moringa oleifera* are also enormous*;* Olugbemi et al. (2010) reported hypocholesterolemic properties of *Moringa oleifera* leaves, Fahey et al. (2001) reported the antimicrobial properties while Greg (2008) reported on the natural digestive enzyme in Moringa leaves. Although there are lots of information on the utilization of Moringa by man and animals, there is a dearth of information on its effect on laying performance of poultry birds. This paper therefore investigates the effect of *Moringa oleifera* leaf meal at various levels of inclusion on the egg laying performance and egg quality of Isa Brown breed of layers.

Materials and Methods

One hundred and twenty, sixteen week old Isa Brown pullets were used for this study which lasted eight weeks.

i. Source of *Moringa oleifera* and Processing

The leaves of *Moringa oleifera* used for the study were collected from Faculty of Agriculture, Ifite Ogwari campus of Nnamdi Azikiwe University where the leaves were plenteous. The leaves harvested were dried under

shade at room temperature for one week, so they can be crispy for easy milling. The leaves were then ground into a leaf meal using a hammer mill of mesh size 3mm.

ii. Experimental Diets

Four experimental diets at isocaloric and equiprotein composition were formulated, such that Diet 1 which served as the control had no *Moringa oleifera* leaf meal (0%), Diet 2 had 2.5% Moringa, Diet 3: 5% and Diet 4: 7.5%, the ingredient composition of the experimental diets are shown in Table 1.

iii. Experimental Animals/ Experimental Design

One hundred and twenty Isa Brown pullets used in the study were procured from Zartex Farms, Ibadan. At the time of starting off the experiments the pullets had received various vaccinations including Gumboro, Lasota, Fowl pox, NDV kamorov. The birds were randomly allocated to four dietary treatment groups such that each treatment had three replicates comprising 10 pullets per replicate and 30 pullets per treatment in a 3 x 4 CRD design. The pullets in each replicate were housed in self designed, improvised metabolic cages of 2 x 4 x 2m. Each replicate has an underlying pan where feacal materials were collected. The birds were fed for the first four weeks with Guinea growers mash until they started dropping eggs before they were subjected to the experimental diets for twelve weeks. During the eight week period of the study, the birds were subjected to similar managerial and sanitary conditions and equal quantities of feed and water were provided daily, such that the only source of variation was the levels of Moringa leaf meal in the diets.

iv. Data Collection and Analysis

At the onset of the experiment (i. e. 20th week of the birds), the initial weight of the birds were taken to the nearest 0.01g. Egg collected were also recorded, weighed to the nearest .01g using electronic weighing balance while the linear measurements were taken with Vernier calipers to the nearest 0.01cm. The internal egg characteristics were measured by the destructive procedure: Egg contents were poured into a flat plate, weighed and then measurements (Yolk height, yolk width, albumen height, and albumen width) were taken using Vernier caliper. Thereafter, the albumen was separated from the yolk using a separation funnel and weighed using 0.01g sensitive electronic weighing balances. The egg shell were air dried under room temperature for 48 hours after which the shell weight was taken using the 0.01g electronic weighing balance and the shell thickness measured with micrometer screw guage (Skole^{R}) to the nearest 0.01mm. Other performance characteristics computed are

a). Haugh Unit (Hu) = $100 \text{ Log } (H + 7.5 - 1.7W^{0.37})$

Where H is observed height of albumen in mm and W is the weight of the egg

b). Egg shape index = $\frac{\text{Width of egg}}{\text{Length of egg}} \times \frac{100}{1}$

c). Albumen Ratio = $\frac{\text{Albumen weight}}{\text{Egg weight}} \times \frac{100}{1}$

d). Yolk Ratio = $\frac{\text{Yolk weight}}{\text{Egg weight}} \times \frac{100}{1}$

e). Shell Ratio = $\frac{\text{Shell weight}}{\text{Egg weight}} \times \frac{100}{1}$

f). Egg surface = $K \times EW^{2/3}$ where EW is egg weight, K = 4.67 for egg weight less than 60g, 4.68 for egg weight between 60 -70g and 4.69 for egg weight greater than 70g

Data collected were analyzed using SPSS (2002) statistical package

Result and Discussion

Table 1 shows the composition of the experimental diets while Table 2 presents the proximate composition of the experimental diets. The result of the effects of various levels of Moringa leaf meal on the egg production and external egg quality characteristics are presented in Table 3, while that of internal qualities of the eggs are presented in Table 4. The result showed that birds on T_2 had significantly ($P < 0.05$) better egg production and external egg quality characteristic compared to birds on T_3 and T_4. Numerical values are 159 $\pm$ 1.52 egg/wk, 66.25 $\pm$ 7.69g, 5.58 $\pm$ 0.24cm, 8. 63 $\pm$ 1.01g and 76.62 respectively for mean weekly egg collection, egg weight, egg length, shell weight and egg surface for birds on T_2, while the respective values are 131 $\pm$ 1.34 egg/wk, 60.48 $\pm$ 8.05g , 5.39 $\pm$ 0.18cm, 8.67 $\pm$ 1.39g and 72.11 for those on T_3 and 133 $\pm$ 1.54 egg/wk, 58.33 $\pm$ 7.61g, 5.41 $\pm$ 0.26cm, 8.17 $\pm$ 0.92g and 70.23 for those on T_4. Egg width, shell thickness and

egg shape index did not show any significant difference ($P > 0.05$). The result of the internal characteristics of the birds followed a similar trend with birds on T_2 having significantly ($P < 0.05$) better indices of internal egg quality. The respective values are 23.13 $\pm$ 3.55g, 1.5cm, 32.71 $\pm$ 3.29g, 34.89 for yolk weight, yolk height, albumen weight and yolk ratio for birds on T_2, while those on T_3 and T_4 had 19.90 $\pm$ 2.77g, 1.4cm, 29.62 $\pm$ 3.94g 32.9 and 15.58 $\pm$ 1.89g, 1.4cm, 29.71 $\pm$ 3.4 and 27.22 for the parameters indicated. The range of egg weights obtained in this study agrees with Olugbemi et al. (2009), however the egg weight values are slightly higher than the standard egg weight value of 58g, the breed effect and higher nutritive value of Moringa leaf meal (Sarwatt et al., 2004) as well as the natural enzyme that aid feed digestibility in Moringa (Greg, 2008) may be responsible for this result. The result therefore indicated that inclusion of Moringa at lower levels improved egg production and egg quality but higher levels of inclusion resulted in lower productivity and poorer egg quality indices. Chickens being monogastrics cannot handle appreciable quantity of vegetative material. The results were however in contrasts with results from other leaf meals. Mellau (1999) observed an increase in egg weight values with increase in *Leucena leucocephala* leaf meal (LLM). Bhatnagar et al. (1996) however found non -significant effect on egg weights at 0%, 5% and 10% inclusion levels but egg weight was lowest at 20% inclusion level.

References

Adejinmi, O.O., Hamzat, R.A., Raji, A.M. and Owosibo, A.O. (2011). Performance, nutrient digestibility and carcass characteristics of Broilers fed cocoa pod husks-based diets. Nig. J. of Anim. Sci. 13: 61-68.

Bhatnagar R., Kataria M. and Verna S.V.S. (1996). Effects of dietary Leuceana leaf meal on the performance and egg characteristics in White leghorn Hens . *Indian Journal of Animal Science* 66 (12): 1291 -1294.

Fahey, J.W., Zakmann, A.T. and Talalay , P. (2001). The chemical diversity and distribution of glucosinolates and Isothiocyanates among plants. *Corrigendum Phytochemistry* 59: 200 -237.

Farina , L., Demey, F. and Hardouin J.(1991). Production of Termites in agricultural villages in Togo. *Tropical Culture* 9 (4):181-187.

Greg, M.E. (2008). Effect of enzymes on cellulose. *European Journal of Applied Microbial Biotechnology* 40: 167-171.

Jed, W. and Fahey, S. (2008). Moringa oleifera : A review of Medicinal evidence for nutritional, therapeutic and prophylactic properties. Tree for life Journal 1: 8-16.

Mellau N.N. (1999). The Effect of *Leuceana leucocephala* leaf meal on egg production and quality. Unpublished Dissertation For Award of M.Sc. (Agriculture) Degree At Sokoine University of Agriculture (SUA) Tanzania.104p.

Olugbemi, T.S. Mutayoba, S.K. and Lekule, F.P. (2009). Moringa oleifera leaf meal as a hypocholestrimic agent in laying hen diet. Livestock Research For Rural Development 22 (4): 201-205.

Sarwatt, S.V., Milangha, M.S., Lekule, F.P. and Madalla, N. (2004). Moringa oleifera and cotton seed cake as supplements for small holder dairy cow fed napier grass. Livestock Research for Rural Development Vol 16 Issue 38 Accessed on 21st June 2012,http//www.cipac.org.co//Lrrd1616?sarw16038.html

SAS (2002). Statistical Analysis System Institute User's Guide. 9th Edition, North, Carolina, USA

Table 1: Gross composition of the experimental diets (%)

	Diet 1	Diet 2	Diet 3	Diet 4
Maize	50	50	50	50
Soyabean	12	12	12	12
Fish meal	2	2	2	2
Blood meal	2	2	2	1
Wheat offal	18	15.5	13	11.5
MOLM	0	2. 5	5.0	7.5
Bone meal	10	10	10	10
Oyster shell	5	5	5	5
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Vit/ Min	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25

MOLM = Moringa oleifera leaf meal

Table 2: Proximate Composition of experimental diets

	Diet 1 (0%)	Diet 2 (2. 5%)	Diet 3 (5%)	Diet 4 (7.5%)
Crude protein	16.92	16.53	16.77	16.97
Ether extract	3.52	3.44	3.44	3.55
Crude fibre	4.02	4.32	4.57	4.82
Moisture	12.09	12.60	13.70	13.50
Ash	13.80	16.15	13.30	11.50
Fat	0.8	1.1	1.05	1.20
Calcium	3.90	3.90	3.90	3.90
Phosphorus	1.70	1.70	1.70	1.70
ME (Kcal/Kg)	2609.55	2596.23	2599.21	2602.18

Table 3: Effect of *Moringa oleifera* inclusion on the external qualities of egg from Isa Brown Layers

Parameters	T_1	T_2	T_3	T_4
Egg number/wk	137 ± 2.25	159 ± 1.52	131 ± 1.34	133 ± 1.54
Egg weight (g)	61.25 ± 6.79	66.25 ± 7.69	60.48 ± 8.05	58.33 ± 7.61
Egg length (cm)	5.39 ± 0.19	5.58 ± 0.24	5.39 ± 0.18	5.41 ± 0.26
Egg width (cm)	4.29 ± 0.14	4.43 ± 0.10	4.23 ± 0.11	4.34 ± 0.13
Shell weight (g)	8.29 ± 1.08	8. 63 ± 1.01	8.67 ± 1.39	8.17 ± 0.92
Shell thickness (mm)	0.29 ± 0.09	0.29 ± 0.05	0.28 ± 0.07	0.27 ± 0.14
Egg shape index	0.79	0.77	0.78	0.79
Egg shell index	11.40	11.26	12.02	11.63
Egg surface	72.72	76.62	72.11	70.23

Table 4: Effect of *Moringa oleifera* inclusion on the internal qualities of egg from Isa Brown Layers

Parameters	T_1	T_2	T_3	T_4
Yolk weight (g)	18.96 ± 3.29	23.13 ± 3.55	19.90 ± 2.77	15.58 ± 1.89
Yolk height (cm)	1.2	1.5	1.4	1.4
Yolk width (cm)	3.29 ± 0.1	3.29 ± 0.12	3.28 ± 0.15	3.26 ± 0.10
Albumen weight (g)	30.08 ± 2.98	32.71 ± 3.29	29.63 ± 3.94	29.71 ± 6.38
Albumen length (cm)	6.16 ± 0.63	5.79 ± 0.65	5.70 ± 0.53	6.38 ±1.06
Yolk ratio	30.95	34.89	32.90	27.22
Albumen ratio	49.11	49.67	48 . 97	50.93