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Effect of Neem Leaf Meal (*Azadirachta indica* A juss) on the Internal Egg Quality and Serum Biochemical Indices of Laying Birds. (A case study at Federal College of Agriculture, Ishiagu, Ebonyi state)

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ABSTRACT

A total of 300 Bachelor brown laying birds were used to evaluate the effect of neem leaf meal (*Azadirachta indica*) on the internal egg qualities and serum biochemical indices of laying birds. The birds were randomly distributed into five treatment groups which were replicated thrice with each replicate comprising of 20 birds in a completely randomized design (CRD). A diet containing neem leaf meal (NLM) was formulated for the birds with inclusion levels of 2, 4, 6 and 8kg/100kg corresponding to treatment 2, 3, 4 and 5, while treatment 1 served as the control with 0% NLM. Results obtained in the study showed that there was no significant ($p>0.05$) difference for the values obtained for albumen index and haugh unit, but there was significance ($p<0.05$) difference for values obtained for yolk index and yolk colour respectively. Results obtained for serum biochemical indices analyzed for showed significance ($p<0.05$) namely high density lipoprotein, low density lipoprotein and triglyceride. Thus, it can be concluded based on the study that NLM can be included in the diet of laying birds up to a level of 8kg/100kg without any detrimental effects on the birds and the end consumers at a long run.

Keywords: - Internal egg qualities, serum biochemistry, layers, neem leaf meal.

INTRODUCTION

Poultry production remains the fastest means to provide animal protein to a protein hungry nation like Nigeria. Poultry meat and egg are still widely consumed with none or little religious or social constrains. Egg is a good source of low cost high quality protein providing 6.3grams of protein in one egg for a calorie cost of only 68 calories (Oluyemi and Robert, 2000). The importance of egg cannot be overemphasized as chicken egg is the most commonly eaten egg that is capable of supplying all the essential amino acids for humans while also providing several vitamins such as vitamin A, riboflavin (vitamin B2), folic acid (vitamin B9), vitamin B12, choline and minerals such as iron, calcium, phosphorus and potassium (Chris, 2005). All of the fat soluble vitamins (A, D, E and K) are found in the egg yolk. Egg yolk also contains the long chain omega-3-fatty acid DHA (deoxyhydroxynucleic acid) which is necessary for the brain and proper retina function in the eye, and the long chain omega-6-fatty acid arachidonic, which is required for the healthy skin, hair, libido, reproduction, growth and response to injury (Chris, 2005).

Neem, a tropical ever green tree is native to the Indian sub-continent. Most of the plant parts such as fruits, seeds, leaves, barks and roots contains antiviral and hypocholesterolemic properties (Onyimonyi *et al*., 2009; Olabode, 2008). Biologically active ingredients isolated from different parts of the plants include; azadirachtin, meliacin, gedunin, salanin, nimbin, valassin etc (Chari, 1996).

MATERIALS AND METHOD

The research work was conducted at the poultry unit of the Animal Production Department, Federal College of Agriculture, Ishiagu, Ebonyi state. The experiment lasted for 12 weeks. A total number of 300 Bachelor brown pullet purchased from a reputable farm in Enugu was used for the research work. The birds were randomly distributed into five treatments with sixty birds per treatment in a completely randomized design. Each treatment was further replicated three times with twenty birds each per replicate. Fresh neem leaves were harvested from neem trees within the compound of the Federal College of Agriculture and were air dried in a ventilated room for seven days. They were later exposed to the sun for 2 hours after which they were grounded to fine particle size using a hammer mill. The milled leaves were incorporated into the diets of the birds at a level of 2, 4, 6 and 8kg/100kg in treatment 2, 3, 4 and 5 respectively.

Five (5) ml of blood was collected from each bird into experimental bottles without anti-coagulant for serum biochemical indices analysis. The HDL, LDL and Triglyceride were analyzed using commercially available kits (sigma diagnostic). Twenty-four eggs per treatment were sampled at random for the evaluation of the internal egg quality. The eggs were broken out into a piece of flat glass (petri-dish) positioned on a flat surface for the determination of the internal egg qualities. All data collected were subjected to analysis of variance (ANOVA). Significant different means were separated according to the method of Duncan as outlined by Obi (2002).

RESULTS

The result of the internal egg quality is shown in table 2. The result revealed that there was no significant ($p>0.05$) difference in the value obtained for albumen index. Treatment1 (control) had a value of 0.88 which was similar to those on treatment 2, 3 and 5 with values of 0.87 each and treatment 4 (0.86). Yolk index values showed significance ($p<0.05$) with the highest value obtained in treatment 3 (0.38) which was similar to the values obtained for birds on treatment 2 (0.37). Birds on treatment 1 had the lowest value of 0.35, while those on treatment 4 and 5 had same value of 0.36 respectively. Results for yolk colour were significantly ($p<0.0\text{-}5$) different. Birds on treatment 5 had a superior value of

9.6, which was significantly ($p<0.05$) higher than birds on control (2.1), while birds on treatment 2, 3 and 4 had values of 3.9, 4.4 and 7.8 respectively. The result obtained for haugh unit showed that there was no significant ($p>0.05$) difference among the treatment group. Birds on control had a value of 84.78 which was similar to those of birds on treatment 3, 4 and 5 with 84.44, 84.33 and 84.34, while birds on treatment 2 had a value of 83.92 respectively. The results obtained for serum biochemical indices were presented in table 2. The result showed that the effect of treatment on birds for high density lipoprotein (HDL) was significant ($p<0.05$). Birds on treatment 5 had the highest value of190.3mg/dl, while the least value was obtained in treatment 1 (control) with a value of 164.67mg/dl. Birds on treatment 2, 3 and 4 had values of 171, 177.33 and 181.67mg/dl respectively. Low density lipoprotein (LDL) values were also significantly ($p<0.05$) different. Birds on treatment 1 had superior value of 37.67mg/dl which was significantly ($p<0.05$) different from those of birds on treatment 2, 3, 4 and 5 with values of 34.67, 29.33, 24.67 and 21.00mg/dl respectively. Values obtained for triglyceride showed significant ($p<0.05$) difference with birds on treatment 1 (147mg/dl) having a superior value, while the lowest value was obtained for birds on treatment 5 with a value of 129mg/dl.

DISCUSSION

The result obtained for albumen index showed that there was similarity among the treatment group studied. Values obtained ranged between 0.86-0.88. This was similar to the work carried out by Garba *et al*. (2010) using pearl millet for corn in layers diet and Esonu *et al*. (2005) who worked with neem leaf meal in layers. Oluyemi and Robert (2000) reported that albumen index is a good parameter for determining the quality of the albumen of egg and that good albumen index of 0.85-0.90 is required, which implies that the value obtained for albumen index in this study is of a good standard. The values obtained for yolk index ranged from 0.35-0.38. This was similar to the value reported by Odunsi *et al*. (2002), but lower than the range of 0.44-0.47 as reported by Garba *et al*. (2010). They reported that the range value of yolk index in bird from 0.30-0.55 was an indication of the good internal quality of egg produced from leaf meal based diets, while Oluyemi and Robert (2000) reported that the yolk index which is a mathematical measure for determining the quality of an egg yolk should be between 0.30-0.50. The color score of egg from neem leaf meal (NLM) diets indicates that there was improved yolk coloration due to its rich xanthophylls content. This is in agreement with the report of Kaijage (2003) and Olugbemi *et al*. (2009). The range of values obtained for haugh unit in this study was higher than those reported by Odunsi *et al*. (2002), but was similar to the values of 83.63-87.02 reported by Adedeji *et al*. (2008). The average value of haugh unit obtained in this study conforms to the values reported for standard commercial egg production guides. Oluyemi and Robert (2000) also reported that an haugh unit score of 72 and above has been graded as the best quality. This implies that the haugh unit obtained in this study is of good standard. The result obtained for high density lipoprotein (HDL) showed that as the level of NLM increased in the diet, there was a correspondeing increase in the value of HDL obtained across the treatment group. The values obtained were in line with the standard reported by Aiello and May (1998). This suggested that the inclusion of NLM in the diet of the birds will consequently help to lower or reduce the risk of heart attack when neem leaf meal is used in the diet of the birds at optimum level when the eggs are consumed by humans. It has been observed from literature that quercetin (which is a bioflavonoid) protects the LDL from damage (Olabode, 2008). Therefore it could be suggested that as the level of NLM increased in the diet of the birds the level of LDL been protected increased, hence the risk of blockage or hardening of the arteries is reduced drastically. The reduction in triglyceride values with neem has been reported (Horton *et al*., 1991). This suggested that the lower level of triglyceride may be due to the inhibition of fatty acids synthesis. It should be noted that fats are stored as triglycerides in the body of the animals, hence the declining values obtained in this study across the diet groups suggested that the active ingredients in neem leaf meal could be responsible for breaking down the fat level and thereby leading to the reduction which was reflected in the values of triglycerides as shown in this study.

CONCLUSION

From the results obtained, it can be concluded that neem leaf meal (NLM) can be included in the diets of the laying birds up to an optimum level of 8kg/100kg of the diet without any negative impact on the internal egg quality and serum biochemical indices.

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Annexure

Table 1. Percentage composition of experimental diet.

Ingredients	**Treatments**				
	T1	**T2**	**T3**	**T4**	**T5**
NLM	-	2	4	6	8
Maize	49	48	47.50	46.50	45.50
Palm kernel cake	12	11.65	11.00	10.50	10.20
Wheat offal	7.50	7.25	7.00	6.80	6.60
Soybean meal	16.50	16.30	16.00	15.80	15.50
Groundnut cake	2.50	2.30	2.10	2.00	1.90
Fish meal	1	1	1	1	1
Bone meal	3	3	3	3	3
Limestone	7.5	7.5	7.5	7.5	7.5
Salt	0.3	0.3	0.3	0.3	0.3
Layers premix	0.35	0.35	0.35	0.35	0.35
Methionine	0.25	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10
Total	100	100	100	100	100
Calculated values					
Crude protein (%)	**16.88**	**16.92**	**16.93**	**16.95**	**16.97**
Energy (Kcal/kg)	**2632**	**2645**	**2647**	**2649**	**2652**
Crude fibre (%)	**4.58**	**4.44**	**4.32**	**4.23**	**4.14**

Table 2. Internal egg quality characteristics and serum biochemical indices

Parameters	**Dietary Treatments**					
	T1	**T2**	**T3**	**T4**	**T5**	**SEM**
Albumen Index (%)	0.88^{a}	0.87^{a}	0.87^{a}	0.86^{b}	0.87^{a}	0.0033
Yolk Index (%)	0.35^{bc}	0.37^{a}	0.38^{a}	0.36^{b}	0.36^{b}	0.0037
Yolk Color	2.1^{e}	3.9^{d}	4.4^{c}	7.8^{b}	9.6^{a}	0.083
Haugh unit	84.78^{a}	83.92^{b}	84.44^{a}	84.33^{a}	84.34^{a}	0.14
High Density Lipo-Protein (HDL) (mg/dl)	164.67^{d}	171.00^{bc}	177.33^{c}	181.67^{a}	190.33^{a}	0.54
Low Density Lipo-Protein (LDL) (mg/dl)	37.67^{a}	34.67^{b}	29.33^{c}	24.67^{d}	21.00^{e}	0.47
Triglyceride	147^{a}	142^{b}	137^{c}	131^{d}	129^{d}	1.55

^{abcde} means on the same row with different superscripts are significantly ($P<0.05$) different.
SEM = Standard error mean