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RESEARCH ARTICLE

Performance Characteristics and Economic Evaluation of Laying Birds Fed Graded Levels of Neem Leaf Meal

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ABSTRACT

A study was carried out with 300 bovan brown laying birds to evaluate the performance characteristics and the cost effect of laying birds. The birds were randomly distributed into five treatment groups with three replicates and each replicates containing twenty (20) birds. The experiment was laid out in a Completely Randomized Design (CRD). A diet containing neem leaf meal (NLM) was administered to birds on treatment 2, 3, 4 and 5 in levels of 2, 4, 6 and 8kg/100kg of diet, while treatment 1 (0% NLM) serves as the control. Data was obtained in experimental parameters such as average daily feed intake, average weight gain, feed conversion ratio, egg number, hen day egg production and cost effect of producing a dozen egg per bird. Results obtained shows that there was significant ($P<0.05$) difference in average daily feed intake, final body weight, average daily weight gain, egg number, hen day egg production and the cost effect of producing a dozen egg per bird fed the control and those birds fed the diets containing neem leaf meal. But there was no significant ($P>0.05$) different in the values obtained for feed conversion ratio. Result revealed that birds on treatment 1 was significantly ($P<0.05$) higher than the other birds fed NLM diets. While birds on treatment 5 had a superior ($P<0.05$) feed conversion ratio than the other birds on diets supplemented with NLM and the control which correspond to the highest number of eggs laid and also the hen day egg production. Better cost benefit was observed in birds in treatment 5 which was superior ($P<0.05$) to other treatments and the control. Thus from the results obtained a conclusion was drawn that the inclusion of NLM up to 8% is beneficial.

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INTRODUCTION

Eggs are good source of low cost high quality protein, providing 6.3grams of protein (13% of the daily value of protein) in one egg for a caloric cost of only 68calories (Oluyemi and Robert, 2000). The structure of humans and animal is built on protein. We rely on animal and vegetable protein for our supply of amino acids and then our bodies rearrange the nitrogen to create the pattern of amino acids we require. According to Olabode (2008) lutein a carotenoid thought to help prevent age related muscular degeneration and cataracts may be found in even higher amounts in eggs than green vegetables such as spinach, which have been considered its major dietary sources as well as supplements.

Thus, the use of non-conventional feed ingredients and leaf meal is fast gaining ground in the feeding of monogastric animals, especially poultry birds. It has been reported that the nutrient content of leaf meals mostly those of the leguminous plants have relatively higher crude protein than the non-leguminous plants and cereals. Leaf meals also provide some essential vitamins such as vitamin A and C, minerals and oxycarotenoids which cause yellow colour of broiler chickens skin, beaks, shanks and egg yolk (Opara, 1996).

Neem is an attractive broad leaved evergreen tree which can grow up to 7-15m tall (25-50 feets) and 2.5m in girth. Its trunk usually straight is 30-80cm in diameter (Ogbuewu, 2008; Olabode, 2008). Fresh matured leaves yield an odorous viscous essential oil which exhibits antifungal activities against *Trichophyton mentagrophtes*. Also the leaves are compounds, impair-pinnate, consisting of up to 15 leaflets arranged in alternate pairs with terminal leaflets (Olabode, 2008). Leaves mainly yield

quercetin (flavonoid) and nimbosterol (β-sitosterol) as well as a number of liminoids (nimbin and its derivatives). Neem is known to increase the production of Glutathione-s-transferase, thus improving the ability of the liver to detoxify itself of chemical contaminations (Esonu *et al*., 2006). Thus few works have been carried out using neem leaves in poultry production; prominent among which include the work of Esonu *et al*. (2006) who reported that up to 15% treatment diet of neem leaf meal may increase both hen day egg production and egg yolk colour and also Olabode (2008) who reported up to 8% inclusion level of neem leaf meal in the diet of laying birds, where superior feed conversion ratio, egg number and hen day egg production was obtained. This study is therefore geared towards determining the performance of laying birds and to maximize the benefit of leaf meal (precisely neem leaf meal) in reducing the cost of producing egg in the poultry industry, capitalizing on the abundantly free availability of the test ingredient.

MATERIALS AND METHODS

The study was conducted at the poultry unit of the experimental site of the Animal production department in Ishiagu, Ebonyi state. A total number of three hundred bovan brown laying birds which had been raised from day old were randomly distributed into five treatment groups each comprising of three replicates with sixty (60) birds per treatment and twenty (20) birds per replicate in a Completely Randomized Design (CRD). Five diets were compounded for the experiment; diet one served as the control with 0% neem leaf meal (NLM), while diets 2, 3, 4 and 5 had NLM included in the diet at a level of 2, 4, 6 and 8kg/100kg of diet.

The neem leaves used for the study were obtained within the premise of the Federal college of Agric, Ishiagu, Ebonyi state. The leaves were air-dried for one week and thereafter were exposed to the rays of sunlight for 3 hours to allow the leaves attain a crispy touch to ease grinding and not to allow the leaves to lose its active ingredients (this happens when left in the sun for too long). The cripsy leaves were then grinded in the hammer mill at the feed mill house of the College. All necessary management, vaccination and drug administration were carried out as specified. The neem leaf meal and the experimental diets were analyzed using the methods outlined by the Association of the Official Chemist (AOAC, 2000). Data obtained were subjected to analysis of variance as outlined by Obi (2002).

The cost per kg of feed was obtained based on the prices of the feed ingredients at the time of the research; this was related to the feed efficiency on each treatment to determine the cost per dozen egg production.

RESULTS

The results of the proximate composition of the neem leaf meal (NLM) in the study are presented in Table 2. The results shows that the processed neem leaf meal has a crude protein content of 19.65%, crude fiber content of 16.08%, ether extract content of 3.32%, ash content of 6.36% and nitrogen free extract content of 54.59% respectively.

The results of the performance and cost effect of feed on egg production are presented in Table 3. The effect of diet treatment on the average daily weight change (ADWC) was significant ($P<0.05$). Result revealed that there was a progressive decrease in the ADWC of the birds as the level of NLM increases in the diets. Birds on control diet had the highest value of 291g which differ significantly ($P<0.05$) from the values obtained for birds on diet 2, 3, 4 and 5 with values of 190g, 71g, 50g and 34g respectively. Average daily feed intakes (ADFI) also follow the same trend as the ADWC. Birds on control had the highest value of 149.74g which was significantly ($P<0.05$) different from the rest of the treatments. Birds on treatment 5 had the lowest value of 133.10g which was significantly ($P<0.05$) different from birds on treatment 2, 3 and 4 with values of 147.95, 143.50 and 138.41g respectively. The result obtained for feed conversion ratio (FCR) revealed that there was significant ($P<0.05$) effect of treatment on birds. The result shows that birds on treatment 5 had the lowest value of 2.24 which is a reflection of the best among the treatment group. Birds on treatment 1 had values of 2.53 which is not significantly ($P>0.05$) different from the values obtained for birds on treatment 2, 3 and 4 with values of 2.45, 2.39 and 2.33 respectively. Result shows that average egg production per day was not significantly ($P>0.05$) different among the treatment groups. Birds on treatment 5 had the highest value of 52, while the lowest value was observed in birds on treatment 2 with 47. Birds on diet 1 and 3 had the same value of 49 eggs each, while birds on diet 4 had a close value of 50 eggs on average per day. The same pattern was observed for hen day egg production. The value obtained for birds on treatment 5 (86.67%) differ significantly ($P<0.05$) from birds on treatment 2 with a value of 78.33%, while birds on treatment 1 and 3 had the same value of 81.67%, but differ from the value of 83.33 obtained for birds on treatment 4.

Table 1: Percentage composition of layers diet

Ingredients	% Composition				
	T1	T2	T3	T4	T5
Neem leaf meal	0	2	4	6	8
Maize	53.15	52.65	51.65	51.00	50.00
Wheat offal	10.25	10.25	10.25	10.00	10.00
Palm kernel cake	7.00	6.00	5.00	4.90	4.50
Soybean meal	1.5	1.5	1.5	1.5	1.5
Groundnut cake	13.50	13.00	13.00	12.00	11.40
Fishmeal	1.5	1.5	1.5	1.5	1.5
Blood meal	1.5	1.5	1.5	1.5	1.5
Bone meal	4.0	4.0	4.0	4.0	4.0
Limestone	6.5	6.5	6.5	6.5	6.5
Salt	0.30	0.30	0.30	0.30	0.30
Layers premix	0.45	0.45	0.45	0.45	0.45
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

Table 2: Proximate composition of neem leaf meal (NLM)

Components	% Dry matter
Crude protein	19.65
Crude fiber	16.08
Ether extract	3.32
Ash	6.36
Nitrogen free extract	54.59

Table 3: Performance of laying birds fed graded levels of neem leaf meal

Parameters	Treatments					
	T1	T2	T3	T4	T5	SEM
*Initial wt. of birds (g/birds)	1812	1811	1819	1820	1820	6.5
*Final body wt. of birds (g/bird)	2103	2000	1890	1870	1853	13.42
*Average Daily feed Intake (g/bird)	149.74	147.95	143.50	138.41	133.10	0.66
*Average Daily wt. Change (g/bird)	291	190	71	50	34	14.21
*Feed Conversion Ratio	2.53	2.45	2.39	2.33	2.24	0.02
*Egg number (per treatment)	49	47	49	50	52	0.33
*Hen day egg production (%)	81.67	78.33	81.67	83.33	86.67	1.67
*Egg weight (g)	59.25	60.45	59.99	59.44	59.56	1.35
*Cost/kg feed (□)	79.02	77.86	76.88	74.57	73.12	1.51
*Cost/dozen egg produced (□)	199.92	190.76	183.74	173.75	163.79	2.67

The value obtained for cost per kg feed and cost per dozen of egg produced shows declining effect. The value of cost per kg feed obtained for birds in treatment 5 with □73.12 is significantly ($P<0.05$) different from those obtained in treatment 1 with □79.02, which is also different from the values of □77.86, □76.88 and □74.57 obtained for birds in treatment 2, 3 and 4. The results obtained for cost per dozen eggs produced also follow the same pattern. Birds on treatment 5 had value of □163.79 which is significantly ($P<0.05$) different from the values of □199.92 obtained for birds in treatment 1 and □190.76, □183.74 and □173.75 obtained for birds on treatment 2, 3 and 4 respectively. (Note: - □165=£1)

DISCUSSION

The result of the nutrient composition of neem leaf meal presented in table 2 revealed that neem leaf meal shows similar characteristics with leaf meals from other tropical browse plants namely; high crude fibre and moderate crude protein content as reported for *Jacaranda mimosifolia* (Okorie, 2006) and *Microdesmis puberula* (Esonu *et al*., 2002).

The result of the average daily feed intake as presented in Table 3 revealed that as the level of neem leaf meal increased in the diet there was a corresponding reduction in the value of average daily feed intake obtained. This is in line with the results obtained by various authors using different leaf meal as feed supplements in poultry feed (Esonu *et al*., 2001; Omekam, 1994). These authors noted a significant decrease in feed intake as the level of leaf meal increases. They suggest a high level of fiber content, anti-nutritional and toxin factors in the leaf meal as a major contributing factor to the low level of feed intake in poultry birds. Olabode (2008) and Onyimonyi *et al*. (2009) working with neem leaf meal on broiler birds also observed low level of feed intake as the level of neem leaf meal increased in the diets of the birds. They suggest low palatability, imbalance nutrient and bitterness of the diet as imparted by the test ingredient. The result of average daily weight change (ADWC) shows that at higher levels of inclusion of neem leaf meal in the diet, its utilization by the birds to add weight reduced drastically. This result agrees with the findings of Egbewande *et al*. (2004), where a graded level of mistletoes (*Tapinanthus bangwensis*) leaves induced dose-related depression in growth of chicks. Amaefule and Obioha (2001) and Iheukwumere *et al*. (2002) have also reported the effect of nutrient imbalance on monogastric animals fed high levels of unconventional feed ingredients. Siddhuraju *et al*. (1996) also reported incidence of incomplete elimination of toxic factor. The resultant effect observed in the study suggests that there is possibility of imbalance nutrient value and improper metabolism associated with the neem leaf meal as reported by Esonu *et al*. (2005). The result obtained for feed conversion shows that there was significant ($P<0.05$) increase in the value of feed conversion ratio (FCR) as the level of NLM in the diet increases; this was in agreement with the report of Onwudike and Oke (1986). They were also in consonance with the value obtained in experiments where cassava (*Manihot esculenta*) leaf protein concentrate and siam weed (*Chromolaena odorata*) leaf meal were used as protein supplements in layers diets (Fasuyi *et al*., 2005). The result for percentage hen day egg production (HDEP) revealed that there was slight significant ($P<0.05$) difference among the treatment group. The increase in the level of HDEP as the level of NLM increased in the diet of the birds suggest that at a certain dietary inclusion levels, there was the possibility of an increase blood flow to the ovaries thereby leading to more ovarian follicle formation which ultimately increased egg production. This result also is in line with the work carried out by Ogbamgba *et al*. (2007) who worked with *Mansonia altissima* on laying birds. The result obtained for feed cost per kg and feed cost per dozen egg produced shows declining effect as the level of NLM increases in the diet of the birds across the treatment group. This could be as a result of the zero cost attached to the test ingredient used in the study, since it is readily available within the premise where the experiment was conducted.

Conclusion

It can be concluded from the study carried out that up to 8kg/100kg of neem leaf meal can be included in the diet of laying birds without any negative effect, better egg production and less cost of production.

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