Influence of neem (*Azadirata indica*) leaf meal on growth performance and blood profile of the pearl Guinea fowl

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Abstract

This study was conducted to investigate the effect of neem (*Azadirata indica*) leaf meal on growth performance and blood profile of the pearl Guinea fowl. Four experimental diets formulated to contain 0%, 3%, 6% and 9% Neem Leaf Meal (NLM) were fed to a total of one hundred and twenty (120) pearl guinea fowls aged 20-weeks. The birds were randomly assigned to treatment groups of 30 birds with 3 replicates (10 birds per each replicates) in a complete randomize design. The experimental diets were formulated to contain approximately 17.3% Crude protein and 2752 kcal/kg Metabolizable Energy (ME). Data collected were subjected to analysis of variance with the aid of GenStat version 11.1 (2008). Results from the present study showed that birds fed with 6% NLM gained significant ($p<0.05$) higher body weight, body weight gain, daily weight gain, total feed intake, daily feed intake and superior feed conversion ratio. Red blood cells was significant ($p<0.05$) higher in 3% and 9% inclusion of NLM and lower in the control treatment. Birds fed with 3% NLM had significant ($p<0.05$) higher packed cell volume and lower in the control treatment. Neutrophils, lymphocytes, eosinophils, basophils levels were significant ($p<0.05$) higher with increase in dietary NLM at 6% inclusion levels. Birds fed with 6% and 9% NLM had significant ($p<0.05$) higher albumin and Total serum protein levels whiles globulin and cholesterol levels were similar ($p>0.05$) between treatments.

It was concluded that Neem (*Azadirata indica*) Leaf Meal (NLM) at 6% levels can be included in the diets of indigenous Guinea fowl without adverse effects on their growth performance and blood profile up to a level of 6 or 9%.

Keywords: *biochemical, body weight, feed intake, haematology*

Introduction

In Ghana, Guinea fowl meat production is increasing gradually (Kyere et al 2017). However, the productivity of indigenous Guinea fowls is very low due to an increase in the population of pathogenic microorganisms. The rise in pathogenic microorganisms in livestock production has affected poultry farmers to meet the demand of consumers' (Ifeanyi and Bratte 2015) This has attracted a lot of researchers to investigate into several non-conventional plants extract with high antimicrobial properties to reduce microbial infections from farm animals. The addition of neem (*Azadirachta indica*) leaf meal serves as a possible replacement for synthetic antibiotic growth promoters (Ifeanyi and Bratte 2015), help to reduce feed cost and reduce competition between man and the livestock industry for the available conventional feedstuffs (Muriu et al 2002). The aim of every farmer is to reduce the cost of production by using cheaper and unconventional feed resources, reduce

mortalities and to achieve high productivity (Alu 2010). Neem (*Azadirachta indica*) is popularly known as Indian lilac of the family *Maliaceae* (Ifeanyi and Bratte 2015). It is a tropical plant which is distributed worldwide including Ghana. The plant is available all year round and adapted to the climatic conditions in most parts of the world. The leaves of the plant is very bitter, it possess a garlic-like smell and non-toxic to humans and animals. Neem (*Azadirachta indica*) leafs extract contains antimicrobial properties which protect poultry birds against microorganisms such as*Staphylococcus spp*, *Streptococcus spp* and *Pseudomonas spp* (Valarmathy et al 2010). Despite the abundant potential of the plant to livestock, there is limited information on the health status and growth performance of indigenous Guinea fowls (Ifeanyi and Bratte 2015)

The ultimate goal of this experiment was to investigate the effect of neem (*Azadirata indica*) leaf meal on growth performance and blood profile of indigenous Guinea fowl (*Numida meleagris*) in Ghana.

Materials and methods

The study was carried out at the Poultry Unit of the Animal farm of the Department of Animal Science Education, University of Education, Winneba, Mampong-Ashanti campus, Ghana, in 2017. Mampong-Ashanti lies in the transitional zone between the Guinea savanna zone of the north and the tropical rain forest of the south of Ghana along the Kumasi-Ejura road.

Fresh leaves of Neem (*Azadirata indica*) were harvested around the Animal farm of the University of Education, Winneba, Mampong-Ashanti campus, Ghana and spread out evenly to dry under sunlight for five (5) days until the leaves were crispy to touch. The dry leaves were milled to a fine powdered state. Samples of the Neem Leaf Meal (NLM) were subjected to laboratory analysis to determine their proximate composition (Keller 1984). The four experimental diets were formulated such that they contained milled Neem Leaf Meal at 0%NLM, 3%NLM, 6%NLM and 9%NLM inclusion levels respectively (Table 1).

Table 1. Percentage composition of the experimental diet

Feed ingredients	0%NLM	3%NLM	6%NLM	9%NLM
Neem Leaf Meal (NLM)	-	3.00	6.00	9.00
Maize	55.0	53.0	52.0	50.0
Wheat bran	19.5	18.0	16.5	18.5
Soya bean meal	4.00	4.00	3.50	3.00

Tuna fish meal	4.50	5.00	5.00	4.50
Anchovy fish meal	8.00	8.00	8.00	6.00
Oyster shell	7.50	7.50	7.50	7.50
Dicalcium phosphate	0.50	0.50	0.50	0.50
Vitamin premix	0.50	0.50	0.50	0.50
Salt	0.50	0.50	0.50	0.50
Total	100	100	100	100
Calculated nutrient composition of the experimental diet				
Ash Content, %	4.40	4.43	4.50	4.50
Crude protein, %	17.2	17.3	17.5	17.4
Crude fibre, %	14.5	14.6	14.5	14.8
Ether extract, %	8.30	8.50	8.50	8.40
Metabolizable Energy, Kcal/kg	2755	2749	2751	2753

The 0%NLM had no NLM, and served as the control. The experimental diets were isocaloric and isonitrogenous and contain approximately 17.3% Crude protein and 2752 kcal ME/kg Metabolizable Energy (ME).

A total of one hundred and twenty (120) pearl guinea fowls aged 20-weeks, were used and the experiment lasted for sixty (60) days. The birds were randomly assigned to the four treatments dietary groups (0% NLM, 3% NLM, 6% NLM and 9% NLM) of 30 birds each with 3 replicates (10 birds per each replicates) in a complete randomize design. The birds were reared under similar

managerial conditions and the experiment lasted for 60 days. The experimental diets and clean water were supply to the birds *ad libitum* throughout the experimental period. The birds were weighed at the beginning of the experiment and at the end of the experiment to obtain their initial and final body weight respectively. Feed intake was recorded daily. Feed conversion ratio was computed as the feed intake divided by weight gain. Vaccination and other routine poultry practices were also carried out.

At the end of the feeding trial, two birds were randomly selected from each replicate, making a total of 24 birds. Blood samples were collected between 7.30 and 8.30 am from the armpit (under the wing) of the bird for haematological and biochemical analysis using a sterilized disposable syringe and needles. A cotton swab soaked in methylated spirit was use to dilate the veins and to prevent infection. 5mL of blood was carefully drawn from each bird. 3mL of the blood was put into a labeled sterile universal bottle containing Ethylene-Diamine-Tetra-Acetic Acid (EDTA) as anticoagulant and shaken gently to prevent coagulation, while 2.0 ml of blood was put into a labeled sterile sample bottle without anticoagulant and used to determine the biochemical components according to the methods of Okeudo et al (2003). The heamaglobin (Hb) content was determined with a digital photo colorimeter (Model 312E by Digital Photo Instruments, Germany). Packed cell volume (PCV) was determined through the Winthrose microhaematocrit technique. Red blood cell (RBC) counts were obtained with a Coulter Electronic counter (Model ZF by Coulter Electronic Ltd. London). The white blood cells (WBC) were counted with an improved Neubauer haemocytometer. Neutrophil, lymphocyte, eosinophils and basophil counts were also considered. The blood sample for the serum biochemical assay was allowed to clot at room temperature. The clotted samples were spun in the centrifuge to separate the blood cells from the serum. The serum was then used for the analysis as follows; the total protein (TP) was determined using Biuret method as described by Keller (1984). Blood albumin was determined using the Bromocresol Green (BCG) method. Total cholesterol was estimated using the CHOP-PAP method and the globulin level was also calculated. The globulin content was determined by subtracting albumin from the total protein (Keller 1984).

The data collected was analyzed using the one-way analysis of variance (ANOVA) according to the procedure of Steel and Torrie (1980) and the treatment means were separated by the least significant difference (LSD) to determine which of the treatments has significance difference or not at 5% probability level (Obi 1990).

Results and discussion

Influence of neem leaf meal on growth performance

Results from the present study (Figures 1 and 2, Table 2) showed that birds fed with 6% neem leaf meal gained higher body weight, body weight gain and daily weight gain than birds fed with the control diet (0% NLM) and lower in birds fed with 9% NLM.

Figure 1. Influence of neem leaf meal on body weight gain

Figure 2. Influenc

Table 2. Growth performance of the pearl Guinea fowl fed NLM

Parameters	0% NLM	3% NLM	6% NLM	9% NLM	SEM

Av. initial body weight, g/bird	885	890	881	882	1.30
Av. final body weight, kg/bird	1.73[b]	1.69[c]	1.79[a]	1.66[d]	0.45
Av. body weight gain, g/bird	875[b]	800[c]	909[a]	778[d]	8.32
Av. daily weight gain, g/bird	14.6[ab]	13.3[bc]	15.2[a]	12.9[c]	1.42
Av. total feed intake, kg/bird	3.60[b]	3.49[c]	3.90[a]	3.42[d]	19.3
Av. daily feed intake, g/bird	60.0[b]	58.2[c]	65.0[a]	57.0[c]	1.13
Feed conversion ratio, g/bird	4.10[c]	4.38[a]	4.28[b]	4.42[a]	0.55

[abc] *Means bearing different superscripts in the same row are different at p<0.05. SEM= standard error of Av.=Average p = probability of mean effects*

This corresponds with the results reported by Kudke et al (1999). The improved body weight, body weight gain and daily weight gain of birds fed with 6% NLM could be attributed to the higher crude protein content of the diet which were metabolized and used efficiently for growth. The reduction in body weight, body weight gain and daily weight gain of birds fed with 9% NLM could be attributed to the lower feed intake and the higher crude fibre content of the diet which may have affected nutrient digestion and absorption (Onu and Otuma 2008). Feed consumption increased with an increase in neem leaf meal up to 6% inclusion level. However, there was a marked reduction in the feed consumption of birds fed with 9% neem leaf meal diet. The reduction in feed consumption among birds fed with 9% neem leaf meal could be attributed to the reduced palatability of the diet (Kakengi et al 2003). There was a significant increase in the feed conversion ratio of the birds fed with 9% neem leaf meal. This suggests that birds fed with 9% neem leaf meal diet adequately utilized the nutrients they consumed. This observation agrees with the finding of (Onu and Aniebo 2011).

Influence of neem leaf meal on haematological parameters

The inclusion of neem leaf meal in the diets of Guinea fowl had influence on red blood cells, packed cell volume, neutrophils, lymphocytes, eosinophils and basophils (Figure 3 Table 3).

Figure 3. Influence of neem leaf meal on neutrophils and lymphocytes

Figure 4. Influence o lymphocytes on to

Table 3. Haematological and serum biochemical indices of the pearl Guinea fowl fed NLM

Haematological parameters	0% NLM	3% NLM	6% NLM	9% NLM	SEM
Hemoglobin, g/dl	12.6	11.6	11.3	11.6	1.11
Red blood cells, k/ÂµI	6.03^{c}	8.44^{a}	8.77^{a}	7.81^{b}	0.45
White blood cells, M/ÂµI	32.7	34.6	33.6	33.2	1.55
Packed cell volume, k/ÂµI	32.1^{d}	38.3^{a}	36.7^{b}	34.8^{c}	2.17
Neutrophils, %N	28.33^{d}	48.8^{b}	55.4^{a}	42.6^{c}	3.68
Lymphocytes, %L	37.33^{c}	36.67^{c}	58.2^{a}	48.3^{b}	4.63
Eosinophils, %E	8.33^{c}	9.67^{b}	12.6^{a}	10.6^{b}	1.24
Basophils, %B	1.65^{c}	1.98^{b}	4.33^{a}	2.61^{b}	1.09
Serum biochemistry					
Total serum protein, g/dl	48.7^{c}	50.6 ^{b}	55.7^{a}	54.6^{a}	1.10
Albumin, g/dl	21.8^{b}	21.6^{b}	24.1^{a}	23.8^{a}	1.36
Globulin, g/dl	4.17	4.53	4.73	4.38	0.59
Cholesterol, g/dl	3.90	4.11	4.03	3.79	0.69

^{abc} Means bearing different superscripts in the same row are different at p<0.05. SEM= standard error of m
p = probability of mean effects

The values for red blood cells, neutrophils, lymphocytes, eosinophils and basophils were significantly

(p<0.05) higher with the birds fed neem leaf meal based diets than birds fed (up to 6% NLM, but not so much at 9% level) with the control diet (0% NLM). This could be attributed to the protein levels and the inclusion levels of neem leaf meal in the diets. The higher red blood cells recorded for birds fed neem leaf meal diets indicates a higher protein quality of these diets and that inclusion of neem leaf meal in the diets of Guinea fowl increased the blood quality. The significantly (p<0.05) differences observed in neutrophils, lymphocytes, eosinophils and basophils is an indication that the birds are health **y** and will be able to fight against invading pathogens, protecting the lungs against asthma and defending the host against helminthic parasites (Jacobsen et al 2012). This corresponds with the results reported by Olugbemi et al (2010).

Influence of neem leaf meal on biochemical parameters

There was increase in total serum protein and albumin with increasing the inclusion levels of neem leaf meal in the diets (Figure 4). The significant difference observed in total serum protein and albumin at 9% neem leaf meal diet could be attributed to the protein levels and the inclusion levels of neem leaf meal in the diets. Onu and Aniebo (2011) reported that total serum protein is a reflection of the protein quality fed. This observation agrees with the finding of Eggum (1970).

Conclusion and recommendation

- From these result, it is concluded that Neem (*Azadirata indica*) Leaf Meal at 6% levels can be included in the diets of indigenous Guinea fowl without adverse effects on their growth performance and blood profile.

- It is recommended to farmers that Neem (*Azadirata indica*) Leaf Meal should be added (up to 6%) to the diets of indigenous Guinea f owl to reduce the risks of infection from pathogenic microorganisms.

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