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Carcass and internal organ characteristics of finisher broilers fed neem (*Azadirachtaindica*) leaf meal

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Studies were conducted for 28days to ascertain the carcass and internal organ characteristics of deep litter managed finisher broilers fed diets containing Neem (*Azadirachtaindica*) leaf meal. The neem leaf meal was included in the broiler finisher diets at 0, 2.5, 5.0, 7.5 and 10% levels respectively and fed to groups of 30 broiler birds of finisher phase using completely randomized design (CRD). Each group was further sub–divided into 3 replicates of 10 birds each and each replicate housed in a pen, measuring 1½ x2m. Feed and water were provided *ad libitum* for the 4 weeks. The air dried neem leaf meal contained 15.56% crude fibre and 18.10% crude protein.At the end of the feeding trial, 2 birds from each replicate were randomly selected, sacrificed, eviscerated and their carcarses and internal organs weighed. There were no significant differences ($P>0.05$) in the live-weights of the birds on $T_{0,}$ $T_{2.5,}$ and $T_{5.0,}$ but significant differences existed ($P<0.05$) between the live weights of the T_0, $T_{7.5}$, and T_{10}. Weight of blood for T_0, $T_{2.5}$, and $T_{5.0}$ were not affected by treatments ($P>0.05$). However, significant differences ($P<0.05$) existed between $T_{7.5}$, and the other treatments. Dressed weight were significantly affected by treatments ($P<0.05$) with T_{10} recording the least dressed weight and $T_{5.0}$ recording the highest. T_{10} and $T_{2.5}$ recorded the highest weight for head and neck, but there were no significant differences ($P>0.05$) among the other treatments. The weights of thighs were not affected by treatments ($P>0.05$). However, weights of wings were affected by treatments. The weights of drumsticks increased as the level of Neem leaf meal increased but there were no significant differences ($P>0.05$) among the drumsticks of T_0, $T_{2.5}$, and $T_{5.0}$. Heart and liver weights were not affected by treatments ($P>0.05$). T_{10} recorded the highest weight ($P<0.05$) for gall bladder. Abdominal fat reduced as from $T_{7.5}$. The carcass and internal organ characteristics obtained from the study tended to suggest that the Neem leaf meal did not present any discernible nutritional problems to the birds that could clearly manifest in the organ weights.

Keywords: Neem leaf meal, carcass and internal organs, deep litter managed finisher broilers

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Introduction

One of the problems facing most developing tropical countries is the scarcity of food for the teaming human population and feed for the dwindling livestock industry. The conventional feed ingredients (maize, soybean, groundnut, etc) have become very expensive, thereby creating need for alternatives. The need for alternative sources of feeds has led to the exploitation of leaf meals of some tropical legumes and browse plants as ingredients in poultry diets.

Neem is mainly used as a shade tree in many areas because it tolerates a wide variety of field conditions (Koul, 1990; Schmutterer, 1990). *Aindica* grows rapidly to 4-7meters in its first five years of growth and 5-11 meters for the following five years. It bears fruit within three years and reaches a maximum fruiting yield of 50kg seed /year, ten years after planting (Jacobson, 1989). Medically all parts of the plant have been used including the fruits, seed, oil (extracted from the seed) leaves, roots and bark, but its utilization in poultry diet has not been fully exploited. A methanol extract of the leaves exert antipyretic effect in male rabbits (Okpanyi and Ezeukwu, 1981). The plant also possesses analgesic activity mediated through oploid receptors in laboratory animals (Vohra and Dandiya, 1992). The aqueous leaf extract when orally fed also produces hypoglycaemia in normal rats and decreased blood glucose level in experimentally-induced diabetes in rats (EL-Haway and Khalief, 1990). Extract of neem leaf, neem oil and seed kernel are effective against certain human fungi, including *Trichophyton*, *Epidermophton*, *Microsporium*, *Tichosporon*, *geoticum* and *Candida* (Khan and Wassilew, 1987). However studies conducted by Uko and Kamalu (2006) shows that there is significant reduction in dry matter, protein, fat and fibre availability associated with non-extracted neemkenels (which are unaffected by deflated neem kernel), incriminating neem oil as the responsible factor. Presumably the oil retarded fermentative activity of caecal microbes. The work of Obikaonu *et al.* (2011b) on the haematological and serum biochemical indices of starter broilers fed diets containing Neem (*Azadirachtaindica*) leaf meal suggested that Neem leaf meal can be included in the diets of broiler chicks up to 10% without any deletions effect on their haematological and serum biochemical constituents.

The study also showed that Neem leaf diets reduce blood cholesterol and tend to maintain the integrity of both kidney and liver. Internal organs have very significant role in body metabolic activities (Ogunlayi, 1999) and their characteristics are affected by internal and external factors. According to Madhusudhan *et al.* (1986), presence of antinutritional factors has been associated with enlargement of organs like liver and pancreas. Al-Dabagh and Abdula (1963) also reported that factors like age, diet and body weight

influence organ weight. There is need therefore to determine the effects of Neem leaf meal diets on the carcass and internal organ characteristics of finisher broilers.

The Objectives of this study is therefore to evaluate the effect of Neem leaf on the carcass and internal organs of finisher broilers.

Materials and methods

Study Site: The study was carried out during the dry season in the Poultry Unit of the Teaching and Research Farm of the School of Agriculture and Agricultural Technology and Animal Science Laboratory of the Federal University of Technology, Owerri, Imo State, Nigeria. Imo State lies between latitude 4˚4' and 6˚3' N and longitude 6˚15' and 8˚15' E. Owerri is about 100m above sea level. The climatic data of Owerri as summarized in Ministry of Lands and Survey Atlas (1984) of Imo State are as follows: mean annual rainfall, 2500 mm; temperature range, 26.5 – 27.5˚C and humidity range, 70 – 80%. Dry season duration (i.e. months with less than 65mm rainfall) is 3months. The annual evapo-transpiration is 1450mm and the soil type is essentially sandy loam with average pH of 5.5.

Source and processing of Neemleaves:Fresh green neem leaves used for the experiment were harvested within the University community in batches. Each batch of collection was air-dried under room temperature. They were considered adequately dried when they became crispy to the touch. They were then milled, using a hammer mill with 2mm sieve, to produce neem leaf meal (NLM). Samples of the leaf meal were subjected to proximate analysis according to AOAC (1995).

Experimental Diets

Five white maize-based experimental broiler finisher diets (19% CP) were made, incorporating the leaf meal at 5 levels of 0.00, 2.50, 5.00, 7.50 and 10.00%, respectively. The ingredient composition of the experimental diets is shown in Table 1. The diets were balanced for crude protein and caloric content to meet the requirements of finisher broilers in the tropics (Sainsbury, 1980)

Experimental Birds and Design

One hundred and fifty 5-week old finisher broiler were used. The birds were divided into 5 groups of 30 birds each and each group randomly assigned to one of the 5 experimental diets in a completely randomized design (CRD). Each group was further sub-divided into 3 replicates of 10 birds each and each

replicate housed in a pen measuring 11/2 x 2m. Feed and water were given $1^{1}/_{2}$to them *ad-libitum*. The birds were weighed at the beginning of the trial and weekly thereafter. Daily feed intake per pen was determined by weighing the feed offered and left-over the following morning. The feeding trial lasted 4 weeks.

Procedure for slaughtering and weighing of internal organs

At the end of the trial, 2 birds from each replicate were randomly selected, weighed and tagged making a total of 30 birds. They were starved for a day of feed but not water and then scarified by cuting at the junction between the head and the neck and allowed to bleed. After bleeding, they were reweighed to get the weight of blood (i.e. the difference between the weight before slaughter and after slaughter). They were then defeathered and weighed again to get the weight of the feathers and thereafter opened up and all the internal organs removed examined and weighed. The following were weighed/observed and recorded:

Blood, feather, dressing percentage, head, neck,wings, drumstick, shanks, heart,Liver, gall bladder and bile, gizzard (full), gizzard (empty), abdominal fat

Data collected were subjected to analysis of variance. Where analysis of variance indicated significant treatment effects, means were separated using Duncan's New Multiple Range Test as described by Steel and Torrie (1980).

Results and discussions

The Proximate composition of the neem leaf meal is presented in Table 2. The leaf meal contained 18.10% crude protein, 15.56% crude fibre, 2.50% ether extract, 5.26% ash and 58.22% nitrogen free extract. The leaf meal displayed same characteristics as leaf meals from other tropical browse plants – high crude fibre and moderate crude protein content as reported for *Jacaranda mimosifolia*(Okorie, 2006) and for *Microdesmispuberula* (Esonu *et al.* 2002). With relatively high crude fibre content, (15.56%), the metabolizable energy must be low even though its gross energy content was high (4.16 Kcal/g). The carcass weight of the finisher broilers are presented in Table 3. There were no significant differences ($P>0.05$) in the weight of blood among T_0, $T_{2.5}$, $T_{5.0}$ and T_{10}. There was, however significant difference ($P<0.05$) between $T_{7.5}$ and the other treatments. Weight of feathers were not affected by treatments ($P<0.05$). The birds on $T_{5.0}$ recorded the highest dressing out percentage of 70.24% which was significantly better ($P<0.05$) than those of the other groups T_0, $T_{2.5}$, $T_{7.5}$ and T_{10}. This result also reflected the overall outstanding performance being recorded by $T_{5.0}$ in most of the parameters measured a pointer that T_5.0 is

regarded as the optimal level of inclusion of the leaf meal for starter broilers (Obikaonu *et al*. 2011a). Based on actual dissectible meat, T_{10} should be preferred as it had the highest drumstick percentage. The control birds recorded the lowest weight for shanks ($P<0.05$) compared to the other treatment groups. There were no statistical differences ($P>0.05$) in the weight of the heart among the treatment groups. There were also no significant differences ($P>0.05$) in liver weight between the control and the other groups. Abdulrashid *et al*. (2007) similarly reported negligible heart and kidney weight changes in broilers fed 1.7mg/100g tannins. Atuehene *et al.* (1986) and Bamgbose and Niba (1995) associated significantly heavier liver weight of birds fed diets containing higher toxic factors in the diets. The weight of gall bladder ranged from 0.12 to 0.97%. The birds on T10 recorded the highest ($P<0.05$) weight for gall bladder than the other groups. The enlargement of bladder could be attributed to the constant digestion as a result of the high feed intake on higher dietary neem leaf meal. There was significant difference ($P<0.05$) in the weight of the full gizzard of the control birds when compared with T_5.0, while T_0, $T_{2.5,}$ $T_{7.5,}$ and T_{10} had no statistical differences ($p>0.05$) among them. There was however, an increase in the weight of the empty gizzard with increase in neem leaf meal inclusion. This increase could be attributed to the high muscular movement associated with high fibre diets (Maduibuike and Obidima, 2009).

Abdominal fat reduced in $T_{7.5}$ compared to the other treatment groups. On the other hand gastrointestinal tract of $T_{5.0}$ and $T_{7.5}$ compared favourably ($P>0.05$) with the control but significant differences ($p<0.05$) existed between the control and $T_{2.5}$ and T_{10}.

Conclusion

The results of this trial have shown that Neem leaf meal could be incorporated in broiler finisher diets without any harmful effects on the birds. The results showed that the Neem leaf meal did not present any discernible nutritional problems that could clearly manifest in the organ and carcass weights.

Table 1. Ingredient composition of broiler finisher experimental diets

	Dietary levels of NLM (%)				
Ingredients (%)	**$T_{0.00}$**	**$T_{2.50}$**	**$T_{5.00}$**	**$T_{7.50}$**	**$T_{10.00}$**
White maize	60.00	59.00	57.00	56.00	55.00
Neem leaf meal	-	2.50	5.00	7.50	10.00
Soybean meal	20.00	20.00	20.00	20.00	20.00
Wheat offal	9.00	7.50	7.00	5.50	4.00
Palm kernel cake	3.00	3.00	3.00	3.00	3.00
Fish meal	2.00	2.00	2.00	2.00	2.00
Blood meal	2.00	2.00	2.00	2.00	2.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Common salt	0.25	0.25	0.25	0.25	0.25
Vitamin/Trace min. premix *	0.25	0.25	0.25	0.25	0.25
L - Lysine	0.25	0.25	0.25	0.25	0.25
L - Methionine	0.25	0.25	0.25	0.25	0.25
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Calculated Analysis (% of dm)					
Crude protein	18.99	18.98	18.96	18.95	18.93
Crude fibre	4.32	5.06	4.82	5.07	5.32
Ether extract	3.94	3.94	3.94	3.94	3.93
Calcium	1.99	2.04	2.58	2.07	2.18
Phosphorus	1.07	1.04	1.01	0.98	0.95
Methionine	0.57	0.59	0.59	0.57	0.57
Lysine	1.24	1.22	1.20	1.20	1.20
Methabolisable Energy (kcal/kg)	3019.20	2978.10	2964.36	2915.00	2906.60

*To provide the following per kg of feed: vit. A, 1500 iu; vit. D_2 1600 iu; riboflavin, 90 mg; biotin, 0.25 mg; pantothenicacid, 11.0 mg; vit. K, 3.0 mg; vit. B 22.5 mg; vit. B_1, 60.3mg; vit. B_{12}, 8.0mg; nicotinicacid, 8.0 mg; Fe, 5.0 mg; Zn, 4.5 mg; Mn, 10.0 mg; Co, 02 mg; Se, 0.01 mg.

Table 2. Proximate Composition of the Neem Leaf Meal (100% DM basis)

Components	% of dm
Crude protein	18.10
Crude fibre	15.56
Ether extract	2.50
Ash	5.62
Nitrogen free extract	58.22
Gross energy (Kcal/gm)	4.16

Table 3. Carcass Weights of Finisher Broilers Fed Neem Leaf Meal

Parameters	Dietary levels of the leaf meal					
	T_0	$T_{2.5}$	$T_{5.0}$	$T_{7.5}$	T_{10}	SEM
Live weight (g)	2575.03[a]	2575.02[ac]	2445.83[a]	2666.67[c]	2268.33[b]	70.59
Weight of blood (% of LW)	2.26[a]	2.18[a]	2.60[a]	3.28[b]	2.28[a]	0.22
Weight of feathers (% of LW)	3.54[a]	2.80[a]	3.53[a]	3.47[a]	3.41[a]	0.45
Dressed weight (g)	1854.33[a]	1908.33[a]	1854.33[a]	1945.02[a]	1350.01[b]	75.21
Dressing percentage (% of LW)	72.02[a]	73.68[a]	76.24[b]	72.65[a]	73.79[a]	0.87
Head (% of LW)	2.36[a]	2.81[b]	2.62[a]	2.68[a]	2.76[a]	0.14
Neck (% of LW)	5.10[a]	6.07[b]	5.13[a]	5.59[a]	5.67[b]	0.19
Wings (% of LW)	10.35[ac]	10.96[a]	9.51[ab]	9.62[b]	9.08[b]	0.31
Thigh (% of LW)	12.86[a]	13.24[a]	12.20[a]	12.97[a]	13.09[a]	0.36
Drumstick (% of LW)	11.17[ab]	10.92[a]	11.07[ab]	12.71[b]	12.21[b]	0.31
Shanks (% of LW)	3.97[a]	4.50[b]	4.24[a]	4.09[ab]	4.12[a]	0.16

[a b] Means within the same row with different superscripts are significantly different ($P < 0.05$)
LW = Live-weight

Table 4. Internal Organ Weights of Finisher Broilers Fed Neem Leaf Meal

Dietary levels of the leaf meal						
Parameters (% of Lw)	T_0	$T_{2.5}$	$T_{5.0}$	$T_{7.5}$	T_{10}	SEM
Heart	0.33[a]	0.41[a]	0.36[a]	0.30[a]	0.44[a]	0.03
Liver	1.37[a]	1.19[a]	1.58[a]	1.48[a]	1.62[a]	0.33
Gall bladder	0.28[b]	0.23[b]	0.15[c]	0.12[c]	0.97[c]	0.03
Gizzard (full)	3.75[a]	3.15[b]	3.00[b]	3.59[a]	3.16[b]	0.20
Gizzard (empty)	1.97[a]	2.41[b]	2.11[a]	2.43[b]	2.20[a]	0.12
Abdominal fat	1.65[a]	2.03[b]	1.60[a]	1.18[c]	2.14[b]	0.15
GIT	3.98[a]	4.57[b]	3.95[a]	3.89[a]	4.67[b]	0.20

[a b c] Means within the same row with different superscripts are significantly different ($P < 0.05$)

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