EVALUATION OF THE NUTRITINAL VALUE OF NEEM (*Azadirachta indica*) LEAF MEAL ON THE PERFORMANCE OF FINISHER BROILERS

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ABSTRACT

Feeding trials were conducted for 28days to evaluate the nutritional value of Neem (Azadirachta indica) leaf meal on the performance and economics of deep litter managed finisher broiler production. The neem leaves were harvested, air dried and milled to become neem leaf meal. It was included in the broiler finisher diets at 0,2.5,5.0,7.5 and 10% levels respectively. One hundred and fifty (150) finisher broiler birds were used for the experiment. The birds were divided into 5 groups of 30 birds each and randomly assigned to the 5 experimental diets in a completely randomized design (CRD). Each group was sub–divided into 3 replicate of 10 birds each and each replicates housed in a pen, measuring 1½ x2m. Feed and water were provided ad libitum for 4weeks. Proximate analysis of the air dried neem leaf meal contained–high crude fibre (15.56%) and moderate crude protein (18.10%). Body weight gain of the treatment birds decreased significantly ($p<0.05$) as the level of neem leaf meal increased. The control group recorded significantly ($p<0.05$) heavier body weight than the birds on the leaf meal diet. Feed conversion ratio and protein efficiency ratio were also affected by the treatments ($p<0.05$).The average total feed intake increased with increase in the level of leaf meal inclusion with T_{10} having the highest value. No mortality was recorded in all the treatment during the trial. Feed cost decreased as the level of neem leaf meal increased, with T_{10} recording the least cost. Costs per kg body weight gain increased as the level of Neem leaf meal inclusion increased because of their higher feed intake and lower growth rate.

Key words: Neem leaf meal, performance, broiler finisher, cost of production.

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 feed has led to the exploitation of leaf meals of some tropical legumes and browse plants as ingredients in poultry diets.

There is need therefore for evaluation of the nutritional value of graded levels of Neem leaf meal diet on broiler finisher performance and economics of production. South Eastern Nigeria is highly endowed with browse plants which goats in the region feed upon. Leaf meal from some of these plants have been shown to serve as sources of protein, vitamins and minerals as well as carotenoids for non-ruminants (D' Mello *et al*, 1987). This has been demonstrated with leaf meals from *leucaena leucocephala* (Mateo *et al* 1970), *Cajanus cajan*, (Udedibie and Igwe, 1989), *Gliricidia sepium* (*Ose*i *et al*, 1990), and *Alconia cordifolia* (Udedibie and Opara, 1996). Although some good results have been recorded from these studies, one common problem encountered in the use of leaf meals in poultry diets is the high fibre content of the leaf meals which limit feed intake at high dietary levels. Proximate analysis of the neem leaf meal used in this study shows - high crude fibre (15-56%) and moderate crude protein (18.10%) as reported for Jacaranda (Okorie, 2006;), with relatively high crude fibre content. The metabolizable energy must be low even though its gross energy content was high (4.16 kcal /g). Neem is mainly used as shade tree in many areas because it tolerates a wide variety of field

conditions (Schmutterer, 1990). *A indica* grows rapidly 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 activitity mediated through opioid 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 neem kenels (which are unaffected by deflated neem kernel), incriminating neem oil as the responsible factor. Presumably the oil retarded fermentative activity of caecal microbes.

Obikaonu (2009) however reported that inclusion of neem leaf meal for young Starter broilers should not exceed 5% since inclusion levels beyond this suppressed their feed intake and growth rate. The objective of this study therefore is to evaluate the feeding value of graded levels of neem leaf meal diet on finisher broiler performance and the economics of production.

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 (1994) of Imo State is as follows: mean annual rainfall, 2500mm; temperature range, 26.5 – 27.5˚C and humidity range of 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 Neem leaves: 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 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 broiler finisher were used. The birds were divided into 5 groups of 30 birds each and each group was randomly assigned to one of the 5 experimental diets in a Completely Randomized Design (CRD). Each group was 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 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.

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

RESULTS AND DISCUSSION:

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 *Microdesmis puberula* (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 performance of the experimental birds in summarized in table 3. The average final body weights of the finisher broilers decreased as the

level of inclusion of the leafmeal increased ($p<0.05$). The control group recorded significantly ($p<0.05$) heavier body weight than the birds on the leaf meal diets where the body growth was affected by the treatment diets. The result is in agreement with the observation of Madubuike and Obidimma (2009) that high fibre diets in monogastric nutrition result to unavailability of the active ingredients of the diet to the animal for body growth, production (egg and meat) and maintenance. Feed intake of the finisher broilers increased with increase in the level of leaf meal inclusion, with T_{10} having the highest value. Significant difference ($p< 0.05$) existed in feed intake as from $T_{7.5.}$ This agrees with the work of D' mello *et al* (1987) and Udedibie and Opara (1996) who observed that diets containing 100g of leaf meal per kilogram of diet (ie 10%), significantly ($p<0.05$) reduced growth rates without affecting dry matter intake. This could be as a result of lower energy content of the diets since birds eat to satisfy their energy requirement (Oluyemi and Roberts, 2000). The treatment birds recorded significantly ($p<0.05$) poor feed conversion ratios except for$T_{5.0}$ with T_{10} having the worst feed conversion ratio relative to control. The reason could be as a result of poor capability of monogastic animals such as poultry and pigs to handle high fibre diets (Madubuike and Obidimma, 2009). Similar results were recorded by Obikaonu (2009). The growth rate decreased as the level of neem leaf meal inclusion increased with $T_{7.5}$ recording the least weight despite the fact that their feed intake increased. This is in agreement with observations of D' Mello *et al* (1987). The control birds had the best protein efficiency ratio when compared to the other treatments ($p<0.05$), showing that the neem diets were not adequately utilized by the birds (Esonu *et al* 2002). There was no mortality in all the treatments during the trial.

The cost analysis of the feeding trial is shown in table 4. The costs of the diets per kg were N49.59, ₦46.75, ₦45.92, ₦45.09 and ₦44.26 for T_0, $T_{2.5}$, $T_{5.0}$ $T_{7.5}$ and T_{10} respectively. Feed cost per kg decreased as the level of neem leaf meal increased, while feed cost per kg body weight gain increased as the level of neem leaf meal inclusion increased with T_{10} recording the highest value. This tended to show poor utilization of high dietary inclusion levels of neem leaf meal. However, the cost of production of 1kg broiler (feed conversion ration x feed cost /kg) were ₦164.14, ₦207.10, ₦180.46, ₦248.90 and N253.17 for T_0, $T_{2.5}$, $T_{5.0}$, $T_{7.5}$ and T_{10} respectively. The cost of production of the birds on $T_{5.0}$ was much lower than those of $T_{2.5}$ $T_{7.5}$ and T_{10} they had better feed conversion ratio.

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: vit. A, 1500iu; vit. D_2 1600iu; Riboflavin, 90mg; Biotin, 0.25mg; pantothenic acid, 11.0mg; vit. k, 3.0 mg; vit. B, 22.5 mg; vit. B_1, 60.3mg; vit B_{12}, 8.0mg; Nicotinic acid, 8.0mg; Fe, 5.0mg; Zn, 4.5mg; Mn, 10.0mg; Co, 02mg; Se, 0.01mg.

Table 2: Proximate Composition of 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: Growth performance of finisher broilers fed graded levels of neem leaf meal

	Dietary levels of neem leaf meal inclusion (%)					
Parameters	**T_0**	**$T_{2.5}$**	**$T_{5.0}$**	**$T_{7.5}$**	**T_{10}**	**SEM**
Av. initial body weight (g)	917.20^{a}	913.18^{a}	918.33^{a}	915.67^{a}	915.33^{a}	7.40
Av. final body weight (g)	2088.67^{a}	1866.52^{b}	1897.67^{b}	1732.33^{c}	1795.67^{bc}	36.61
Av. daily body weight gain (g)	41.84^{a}	34.04^{b}	34.98^{b}	29.61^{c}	31.44^{bc}	1.30
Av. total feed intake (g)	3875.33^{a}	4212.33^{a}	4287.33^{a}	4500.67^{b}	5245.12^{b}	166.06
Av. daily feed intake (g)	138.41^{a}	150.43^{a}	153.34^{ab}	160.73^{b}	180.13^{c}	5.23
Feed conversion ratio (FCR) (g feed/g gain)	3.31^{a}	4.43^{b}	3.93^{b}	5.52^{c}	5.72^{c}	0.28
Protein efficiency ratio (PER) (%)	1.51^{a}	1.20^{b}	1.21^{bc}	1.04^{bc}	0.93^{c}	0.057
Mortality (%)	0.00	0.00	0.00	0.00	0.00	0.00

$^{a\,b\,c}$ Means within the same row with different superscripts are significantly different ($P < 0.05$)

Table 4.: Economics of production of finisher broilers fed graded levels of neem leaf meal

	Dietary level of leaf meal inclusion (%)					
Parameters	**T_0**	**$T_{2.5}$**	**$T_{5.0}$**	**$T_{7.5}$**	**T_{10}**	**SEM**
Feed conversion ratio (FCR)	3.31^{a}	4.43^{b}	3.93^{b}	5.52^{c}	5.72^{c}	0.28
Feed cost (₦/kg feed)	49.59	46.75	45.92	45.09	44.26	-
Feed cost per kg body weight gain (₦)	164.14	207.10	180.46	248.90	253.17	-

$^{a\,b\,c}$ Means within the same rows with different superscripts are significantly different ($P < 0.05$)

CONCLUSION

This study revealed that inclusion of neem leaf meal for finisher broilers should not exceed 5% since among the treatments T5.0 had the best result in most of the parameters measured viz: final body weight gain, growth rate, feed convertion ratio, and feed cost per kg body weight gain.

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