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Performance and Economic Characteristics of Broilers Fed Varying Dietary Levels of Neem Leaf Meal (*Azadirachta indica*)

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Abstract: The performance and economic indices of broilers fed varying dietary levels of sun dried Neem Leaf Meal (NLM) were investigated using ninety 'Ross' unsexed two weeks old broilers. The birds were randomly assigned to five treatment groups of eighteen birds each in which NLM was incorporated at 0, 0.5, 1.0, 1.5 and 2% for treatments 1, 2, 3, 4 and 5 respectively. Each treatment was further replicated twice with nine birds per replicate in a Completely Randomized Design. Results showed that treatment effect on Average Final Body Weight (AFBW), Average Daily Gain (ADG), Average Daily Feed Intake [ADFI] and Feed Conversion Ratio (FCR) were significant ($P<0.05$). Birds on the 0.5% NLM had significantly ($P<0.05$) superior AFBW, ADG and FCR. ADFI of birds on the 0.5% NLM was statistically the same with the control birds but differed from the rest treatments on NLM. Gross margin analysis reveals that a profit of N707.30 is made per bird on the 0.5% NLM as against N630.97, N620.73, N621.81 and N507.06 for birds on the control, 1.0, 1.5 and 2.0% NLM respectively. It is concluded that inclusion of 0.5% NLM in the diets of broilers will support optimum performance and economic benefit.

Key words: Performance, broilers, neem leaf

INTRODUCTION

Poultry farming plays a major role in bridging the protein gap in developing countries where average daily consumption is far below recommended standards. A major constraint to poultry production in Nigeria is the very high cost of conventional feeding stuff especially; the primary energy and protein sources. Leaf meals have been incorporated in the diets of poultry as a means of reducing the high cost of conventional protein sources (Nworgu *et al*., 2003). There is evidence in the literature of the beneficial effects of using leaf meal from different sources in poultry production (D'Mello *et al*., 1987; Iheukwumere *et al*., 2008; Egbenwade and Olorede, 2003; Fasuyi *et al*., 2005). D'Mello *et al*., 1987 observed that leaf meals do not only serve as protein source but also provide some necessary vitamins, minerals and oxycaretenoids which cause yellow colour of broiler skin, shank and egg yolk.

Neem tree (*Azadirachta indica*) is an indigenous tropical plant. The tree has been made popular in recent times in Nigeria where it is widely used in reforestation programmes of both States and Federal Agencies. According to Elangovan *et al*. (2000), neem leaf yields mainly quercetin (Flavonoid) and nimbosterol (beta-sibosterol) as well as a number of liminoids (nimbin and its derivatives).Esonu *et al*. (2006) reported that neem leaf meal has a proximate composition of 92.40 per cent dry matter; 7.58% moisture; 20.68% crude protein; 16.60% crude fibre; 4.13% ether extract; 7.10% Ash and 43.91% Nitrogen free extract. The further observed that carcass weight, liver; heart and gizzard weights of laying hens fed varying levels of neem leaves were significantly increased at 5% level. Sokunbi *et al*. (2003) reported that feeding prepubertal pigs diets containing up to 10% neem leaf meal will not lead to depression in the utilization of nutrients for weight gain. There is however paucity of information in the literature on the utilization of neem leaves by broilers. The present study was thus designed to investigate the performance and economic characteristics of broilers fed varying dietary levels of Neem Leaf Meal (NLM).

MATERIALS AND METHODS

This study was carried out at the Poultry unit of the Animal Production Programme, Federal College of Agriculture, Ishiagu, Ebonyi State. The feeding trial lasted for 49 days.

One hundred and twenty broilers of the 'Ross' strain was purchased from a reputable distributor in Enugu. The birds were brooded together for two weeks in a deep litter pen measuring 2m x 3m^2. Kerosene stoves and lanterns were used to provide the necessary heat used to maintain the optimum temperature range for the birds at this stage. Feeding was carried out twice daily between the hours of 07.00-08.00 am and 5.30-6.30 pm. Water was provided *ad libitum*. All the necessary vaccines and medication needed by the birds were strictly administered. At the end of the two weeks of brooding, ninety birds were randomly selected from the pool on the basis of vigor. The birds were randomly assigned to five treatments with eighteen birds per treatment in a Completely Randomized Design. Each treatment was further replicated twice with nine birds each.

Fresh neem leaves were harvested from neem trees within the premises of the Federal College of Agriculture, Ishiagu. The leaves were dried on bare floor in a well-ventilated room for 7 days. They were latter exposed to the sun for 8 h after which they were ground to fine particle size using a plate mill.

The milled leaves were incorporated into the diets at levels of 0.5, 1.0, 1.5 and 2% in treatments 2, 3, 4 and 5 respectively. Treatment 1 had no NLM and served as the control. A 23% CP diet was fed to the birds during the starter phase [14-28 day) and a 20% CP diet during the finisher phase (29-49 day) Table 1 and 2.

Table 1: Percentage composition of the starter Diets (14-28 days)

	Dietary treatments				
Ingredients (%)	Control 1	2	3	4	5
Neem leaf meal	-	0.5	1.0	1.5	2.0
Maize	44.50	44.40	44.20	44.10	44.10
Wheat Offal	13.80	13.70	13.60	13.40	13.10
Soybean meal	9.40	9.30	9.20	9.20	9.10
Groundnut Cake	14.20	14.10	14.10	14.00	14.00
Palm Kernel Cake	7.50	7.40	7.30	7.20	7.10
Common Ingredt[@]	10.60	10.60	10.60	10.60	10.60
Total	100	100	100	100	100
Calculated					
Crude Protein	23.31	23.30	23.32	23.33	23.34
Crude Fibre	4.25	4.29	4.31	4.34	4.36
Energy (kcal/kg)	2786	2789	2763	2753	2744

[@]Common ingredients (%): Fishmeal 5.7, Blood meal 1.90, Bone meal 2.0, Common salt 0.25, Vitamin mineral premix 0.25, lysine 0.25, methionine 0.25.

Table 2: Percentage composition of the finisher Diets (29-49 days)

	Dietary treatments				
Ingredients	Control (1)	2	3	4	5
Neem leaf meal	0	0.5	1.0	1.5	2.0
Maize	48.50	48.30	48.20	48.10	48.00
Wheat Offal	14.10	14.00	13.90	13.80	13.70
Soybean meal	5.40	5.30	5.20	5.10	5.00
Groundnut Cake	12.30	12.20	12.10	12.10	12.00
Palm Kernel Cake	10.50	10.50	10.40	10.20	10.10
Common Ingredients[@]	9.20	9.20	9.20	9.20	9.20
Total	100	100	100	100	100
Calculated					
Crude Protein	20.17	20.16	20.15	20.16	20.15
Crude Fibre	4.5	5.3	5.5	6.4	6.5
Energy (kcol/kg)	2895	2883	2873	2862	2818

[@]Common ingredients (%): Fishmeal 3.20, Bloodmeal 2.00, Bonemeal 3.00, Common Salt 0.25, Vitamin mineral premix 0.25, lysine 0.25, methionine 0.25.

Initial weights of the birds were taken at the start of the study and subsequently live weight measurements were carried out on weekly basis. Feed intake was determined on daily basis as the difference between the quantity of feed fed the previous day and the quantity left the next morning. Feed conversion ratio was calculated as the ratio of feed intake over body weight gain.

All data collected were subjected to analysis of variance (ANOVA) according to the procedure of Steel and Torrie (1980). Significantly different means were separated according to the method of Duncan (1955). Proximate composition of the NLM and the diets were performed using the procedure of AOAC (1990).

RESULTS AND DISCUSSION

The result of the proximate composition of the NLM is presented in Table 3. Result obtained is similar to that reported by Esonu *et al*. 2006. The crude protein value obtained in the present study is higher than the crude protein value of 18.90% reported by Sokunbi *et al*. (2003). The same authors have also reported a crude fibre level of 33.77% for sun dried neem leaf. This crude fibre is higher than the 12.00% observed in the present study. These differences in the crude protein and crude fibre level reported by Sokunbi *et al*., 2003 from the present findings may be related to the ages of the leaf. It is established facts that as leafs ages the crude protein reduces whereas the crude fibre content increases.

Table 3: Proximate Composition of the Neem leaf meal

Components	Percentage
Moisture	3.5
Crude Protein	24.06
Crude Fibre	12.00
Ether Extract	6.00
Ash	6.00
NFE	51.94

Results of the effect of treatments on the performance of the birds revealed that treatment effect on Average Final Body Weight (AFBW) g, Average Daily Gain (ADG) g, Average Daily Feed Intake (ADFI) g and Feed Conversion Ratio (FCR) were significant ($P<0.05$). Results showed that AFBW of the birds on 0.5% NLM were significantly different from the others. Birds on this treatment had an AFBW of 2520 g which differed significantly ($P<0.05$) from values of 2320, 2280, 2270 and 1890 g obtained for birds on the control, 1.0, 1.5 and 2.0% NLM respectively. Results on ADG followed the same trend as observed in AFBW. The same birds on 0.5% NLM had highest significant ($P<0.05$) ADG value of 44.80 g. ADFI value of 131.71 g recorded for birds on the o.5% NLM were also significantly ($P<0.05$) different from the 129.39 g. 138.24, 126.56 and 110.60 g recorded for birds on the control, 1.0,1.5 and 2.0% NLM respectively.

The trend of result obtained in this study suggests that incorporation of 0.5% NLM in the diet of broilers show promising beneficial effect. As earlier observes, neem leaf yields mainly quercetin (flavonoid) and nimbosterol (beta-sibesterol) as well as a number of liminoids (nimbin and its derivatives). Quercetin is reported to have antibacterial and antifungal properties (Elangovan *et al*., 2000). It is probable that at the 0.5% NLM

Table 4: Performance of Broilers fed varying Dietary levels of Neem leaf meal

	Dietary treatments					
Parameter	Control (1)	2	3	4	5	SEM
Average Initial Body Weight (g)	320	320	310	320	310	-
Average final Body weight (g)	2320[b]	2520[a]	2280[c]	2270[c]	1890[d]	0.40
Average Daily Feed Intake (g)	129.39[a]	131.71[a]	128.24[a]	126.56[b]	110.60[c]	0.85
Average Daily Gain (g)	40.82[b]	44.80[a]	40.20[b]	39.80[b]	32.36[c]	0.77
Feed conversion Ratio	3.17[b]	2.94[c]	3.19[b]	3.18[b]	3.43[a]	0.05

[abcd] Row means with different superscripts are significantly different (P<0.05). SEM: Standard Error of Mean.

Table 5: Gross Margin of Broilers fed varying Dietary levels of NLM

	Dietary treatments				
Parameter	1	2	3	4	5
Cost/kg of feed (N)@	46.85	46.62	46.38	46.16	45.93
Feed intake/bird (kg)	6.34	6.45	6.28	6.20	5.42
Cost of feed consumed (N)[(b)]	297.03	300.70	291.27	286.19	248.94
Selling price/bird (N)[(c)]	928.00	1008	912	908	756
Profit[(d)]	630.97	707.30	620.73	621.81	507.06

[a]Computed from the price of the various feedstuffs used for compounding each ration, [b]Product of feed intake/bird and cost/kg of feed. [c]Product of the final body weight of bird and N400 (selling price per kg of life chicken in Nsukka market). [d]Selling price minus cost of feed consumed (All other costs were assumed constant).

inclusion, these active components of neem leaf were able to create a harmonious gut environment suitable for the release and assimilation of digestive nutrients necessary to enhance growth. At higher levels of NLM, this harmonious gut environment may have been distorted by nutrient imbalance and improper metabolism.

This view agrees with the earlier views of D'Mello and Acamovic (1989) that at higher levels of *Leucaena leucocephala* leaf meal inclusion in diets of chicken, growth retardation occurred. The inclusion of NLM in the diet gave the most beneficial ADFI at the 0.5% level. Beyond this level, there was a reduction in ADFI. This reduction in ADFI beyond the 0.5% NLM could be attributed to the fact that NLM imparted a bitter and unpalatable taste to the feed thus inhibiting the birds from consuming much. There is evidence in the literature that most soluble polyphenolics have a bitter and astringent taste (Kumar and D'Mello, 1995). Depressed body weight gain at levels above 0.5% NLM inclusion may also be attributed to the low feed intake at this level arising from the bitter and astringent taste of NLM.Also the high bulk or fibre content of NLM resulting in insufficient consumption of digestible nutrients particularly protein and energy required to sustain growth could account for the depressed body weights observed above the 0.5% level of NLM inclusion. Similar views were earlier expressed by Iheukwumere *et al*., 2008. Previous workers on other leaf meals have also reported decline in feed intake. This they attributed to the antinutritional factors inherent in the plants (Nwokolo, 1987; Onwudike and Oke, 1986). However, this trend of decrease in feed intake at levels above 0.5% NLM does not agree with earlier findings of Esonu *et al*., 2003, that increased fibre content of the leaf meal had an energy dilution effect on the feed and a consequential increase in feed intake. The observed difference may be due to the bitter taste of neem leaf which may be absent in *microdemis puberula* leaf meal used by Esonu *et al*. (2003).

Table 5 presents the gross margin analysis of the birds on the various dietary treatments. A profit of 707.30 is made per bird on the 0.5% NLM as against N630.97, N620.73, N621.81 and N507.06 for birds on the control, 1.0, 1.5 and 2.0 NLM respectively. The trend of result further corroborates the fact that birds on the 0.5% NLM had significantly better performance than the other birds on the rest NLM. This further suggests that a broiler farmer stands to have more returns to his investment by incorporating 0.5% NLM in rations for his broiler birds.

Conclusion: Incorporation of 0.5% NLM in the diets of broilers yields better performance and economic benefit to a farmer.

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