SHORT COMMUNICATION

UTILIZATION OF LEUCAENA LEAF MEAL AS A PROTEIN SUPPLEMENT IN BROILER FINISHER RATIONS

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ABSTRACT

Ninety finisher broiler birds averaging 586.06g and 28-days old were randomly assigned into three dietary treatments in which a multipurpose tree (MPTs) - Leucaena leucocephala leaf meal (LLM) replaced soybean meal (SBM) at levels of 0.00, 5.25 and 10.50% for a period of 42 days using performance characteristics and economy of production as assessment criteria. Birds fed the 0% LLM (diet A)and 10.50% LLM (diet C) consumed more ($P<0.05$) feed than the birds fed 5.25% LLM (diet B). Average daily weight gain (ADG) of birds fed diet A was significantly ($P<0.05$) higher than ADG of birds fed diet C and birds fed diet B recorded the least ($P<0.05$) ADG. However, the efficiency of feed utilization were similar ($P> 0.05$) among birds fed the three diets. The cost of feed intake per live weight gained of birds fed 5.25% LLM inclusion was higher than the value obtained for birds fed the control diet by 1.65% but birds fed 10.5% LLM inclusion recorded a 4.56% reduction value over birds fed (control) diet A.

Key words: Broiler, Leucaena leafmeal, performance and production economy.

INTRODUCTION

Both animal and vegetable protein supplements are used as protein sources in poultry rations. Present high cost of feed ingredients in Nigeria has made it necessary to look inwards for alternative feed ingredients which are relatively cheaper than soybean meal, groundnut cake or fishmeal as protein sources and not important as an item of human food. The leaf of Leucaena leucocephala is apparently a good example of such material.

Leucaena leucocephala is a perenial, leguminous, evergreen plant and is among the multipurpose trees (MPTs) found throughout the tropics. Its leaves contain 35.7% CP, 3.0% EE and 6.1% mineral matter (Hill, 1971; Hegarty, 1977; Blood, 1979) Leucaena is rich in vitamins (NAS, 1977; Jones et al, 1979; Onwuka et al, 1992). However, the use of leucaena as an all-purpose livestock feed has been limited by the presence of the free uncommon amino acid, mimosine,B(1-3-hydroxy-4Pyridine)-X-amino propionic acid that causes low weight gains, general poor condition and hair loss in ruminants and non ruminants; (Liener, 1980; Onwuka et al; 1989). Furthermore, poultry has been shown by Springhall and Taplins (1978) to tolerate high levels of mimosine while studies on the use of Leucaena leucocephala and G. sepium leaves as feed for chickens and rabbits (Cheeke and Raharjo, 1987; Onwudike, 1995) have given some disappointing results in terms of animal production. The present study was conducted to investigate the effect of graded levels of sundried leucaena leaf meal (LLM) on finisher broilers.

MATERIALS AND METHODS

Green Leucaena leaves were harvested from the established legume pasture field of the school of Agriculture at Ikorodu and sundried for about 3 days at a temperature (24° - 33°C) and relative humidity (49.6 - 96.0%), milled in Nulus mill using 0.5 mm screen and bagged up in polythene bags weighing 20kg. It took 5 mandays at sixty Naira (N60) per manday to harvest, sundry and mill the 20kg LLM used in this study. The cost of milling and transportation totalled N50.00 at the time of the study (Jan. - May 1997). Therefore, a kilogram of LLM was procured at N17.50k. Three isonitrogenous diets were formulated as shown in Table 1. Diet A was the control and contained defatted soybean meal (SBM) as the vegetable protein source. In diets B and C, 36.2 and 72.4% of the SBM in diet A were replaced with the Leucaena leaf (LLM). In absolute values, LLM constituted 0.00, 5.25 and 10.50(%) of the experimental diets A, B and C respectively. All of the diets were balanced to contain 18% crude protein on as fed basis (NRC, 1979).

A total of 150 Anak-broiler day old chicks were raised for a period of 28 days on a commercial ration in which SBM was used as the reference vegetable protein source. All necessary vaccinations and other medications were administered at the appropriate periods. At day 29, 90 birds were selected and randomly distributed into 3 treatment groups each with three replicates in a completely randomized design experiment. Each replicate consisted of 10 birds (i.e. 30 birds per treatment) housed in a pen measuring 2.70 x 2.20 providing 0.59 m^2 floor space per bird.

TABLE 1: GROSS COMPOSITION OF EXPERIMENTAL DIETS

	DIETS		
Ingredients	**A**	**B**	**C**
Maize	40.00	40.00	40.00
Wheat offal	40.00	40.00	40.00
Soya bean meal	14.50	9.25	4.00
Leucaena leaf meal	0.00	5.25	10.50
Blood meal	3.00	3.00	3.00
Bone meal	2.00	2.00	2.00
Vitamin Premix[b]	0.25	0.25	0.25
Salt	0.25	0.25	0.25
TOTAL	100.00	100.00	100.00
Calculated analysis:			
Crude Protein, %	18.15	18.10	18.00
M.E. (kcal/kg),	2820	2799	2789
Calcium,%	0.60	0.62	0.65
Phosphorous,%	0.36	0.40	0.44
Lysine,%	0.87	0.88	0.90
Methionine,%	0.30	0.30	0.33
Crude Fibre,%	5.14	5.48	5.89

[a] As Fed basis

[b] Contained the following per kg of diet: Vitamin A.3,086,440IU, Vitamin D3, 440,920IU. Vitamin E,6,614IU, Vitamin B12, 10.6mg;Riboflavin, 2,205mg, menadione,1,96mg;Folic Acid, 256; Pyridoxine, 882mg;Thiamine,442mg; d-Biotin,44mg: Antioxidant and Anti-cacing Agent.

All birds were provided with feed and water *ad libitum* under identical environmental and management conditions on concrete-floored pens littered with wood shavings as bedding material. The birds were weighed at the commencement of the experiment and subsequently at weekly intervals for rate of gain (ADG) and a record of feed consumption was also kept for the calculation of feed to gain ratio.

Proximate components of the diets and test ingredients (SBM and LLM) were determined according to AOAC (1990) procedures while the gross energy was determined using the Gallenkamp Ballistic oxygen Bomb Calorimeter. Metabolizable Energy (ME) of LLM was predicted from the analysed GE value (2010 kcal/kg) in Table 2 using the ME of broilers diet prediction formula: ME = 0.860 + 0.629 (GE) - 0.78 (CF) reported by Campbell (1986). Total extractable polyphenolics in the diets were also analysed (King and Health, 1967; Allen, 1974). All data were subjected to analysis of variance according to Steel and Torrie (1960). Differences between means were determined by Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

Soybean meal (SBM) and Leucaena leaf meal (LLM) had similar DM, EE and GE contents; Leucaena leaf meal (LLM) had lower crude protein (CP) but higher nitrogen-free extract (NFE) and mineral matter (ash) contents than soybean meal (Table 2). Ellis et al (1981) also observed that LLM had relatively low crude protein (CP) and gross energy (GE) but higher in total ash (Tuah, 1992) than SBM. The observed increase in ash content (Table 2) from diet A to diet C was slightly reflected on the Ca and P levels (Table 1) and this may be due to the suggestion of Lloyed et al (1978) that ash content may not be a true measure of total inorganic matter constituents present in a feed component. The phenolic (tannin) contents of the diets increased from (%) 0.01 of diet A to 0.65 of diet B and 0.70 of diet in Table 2. The maximum level of phenolic content in the three diets of this study is below the 5% level of inclusion reported with detrimental effects in livestock by Price and Butter (1980).

Average initial weights of the birds in the three experimental diets were similar (P>0.05) and the mean value was 586.05± 0.78g. At the end of the study the average final weight 1952.20± 21g

TABLE 2: CHEMICAL COMPOSITION OF DIETS AND LEUCAENA LEAF MEAL (LLM) (DM BASIS)

	DIETS				
Nutrients	A	B	C	SBM	LLM
Dry matter, %	90.75	90.60	90.62	90.00	90.50
Crude protein, %	18.19	18.01	18.00	44.00	22.54
Crude fibre, %	5.60	5.41	5.21	6.50	13.27
Ether Extract, %	4.20	3.96	3.96	3.50	4.40
Ash, %	8.90	9.30	10.40	5.70	13.10
N.F.E., %	50.86	51.62	49.85	29.30	37.19
G.E. (kcal/kg)	3568	3523	3523	2420	2010
Phenolic (Tannin), %	0.01	0.65	0.70	-	4.09

TABLE 3: PERFORMANCE CHARACTERISTICS OF BROILER BIRDS FED THE EXPERIMENTAL DIETS

	DIETS			
Parameters	A	B	C	SE
Experimental period (days)	42	42	42	
Average initial weight/bird, g	586.50[a]	585.90[a]	585.75[a]	0.78
Average final weight/bird, g	1952.20[a]	1883.70[c]	1930.35[b]	20.85
Average daily weight gain/bird, g	32.52[a]	30.90[c]	32.01[b]	0.43
Average daily feed intake/bird, g	92.40[a]	91.90[b]	92.90[a]	0.46
Feed to gain ratio	2.84[a]	2.97[a]	2.90[a]	0.15
Mortality	1.0	0.0	1.0	

a,b,c: Means along the same row with identical superscript are not significantly ($P > 0.05$) different.

TABLE 4: COST OF FEED AND EFFICIENCY OF THE EXPERIMENTAL DIETS

	DIETS		
Parameters	A	B	C
Feed cost (N/kg)	17.57	17.08	16.32
Total feed intake/bird (kg)	3.88	3.85	3.90
Cost of feed intake/bird (N)	68.17	65.76	63.65
Total weight gained/bird (kg)	1.37	1.30	1.34
Cost of feed/kg gain (N)	49.76	50.58	47.5

1₦ = Naira, the Nigerian currency N1.00 = US$0.82 (1997)
LLM = Leucaena leaf meal
Naira value of LLM after processing = N17.50k/kg
Defatted soybean meal (SBM) market price = N28.00k/kg (1997) after processing.

recorded by the birds on control diet (Diet A) was higher ($P<0.05$) than 1930.35±21g of birds fed 10.50% LLM inclusion (Diet C) while the birds fed 5.25% LLM inclusion (Diet B) recorded the least ($P<0.05$) weight gain of 1883.70±21g. Similarly average daily gain of birds fed diet A (32.52± 0.43g) was higher ($P<0.05$) than 32.01± 0.43g of birds fed diet C while 30.90±0.43g of birds fed diet B had the least ($P<0.05$) gain. The reason for the observed decline in feed intake of birds on diet B resulting in the lowest ($P<0.05$) weight gained is not known but Okonkwo *et al* (1995) reported a similar observation in finisher broiler birds with mean liveweight gain (g/bird/week) 627.7, 547.5, 701.2 abd 627.6 when fed 0, 5, 10 and 20% respectively leucaena seed meal (LSM) inclusion in their diets.. Also, the daily gains

TABLE 5: AWARENESS, SOURCE OF FIRST INFORMATION AND PRACTICE OF ALLEY FARMING

	Frequency	Percent
Aware of Alley Farming		
Yes	23	32
No	50	68
Source of First Information on Alley Farming		
Government Agents (EAs etc)	14	19
Formal education	7	10
Other sources(friends, neighbours, relatives e tc.)	2	3
No response	50	68
Practice Alley Farming		
Yes	6	8
No	67	92

observed in this study were similar to the daily gains (34.66 - 31.30g) reported by Adeleye and Odunsi (1990) on broiler birds fed 0%, to 20% rubber seed meal based diets. The feed intake of birds fed diets A and C were similar ($P>0.05$) and the mean value 92.65±0.46g was higher ($P<0.05$) than 91.70±0.46g of birds on diet B. The decline in feed consumption of birds fed diet B may not be ascribed to mimosine-toxicity effect as birds on diet C with higher LLM inclusion recorded similar (P 0.05) feed consumption as birds fed diet A (control diet). Okonkwo et al (1995) also reported a similar decline in feed intake in finisher birds on 5 and 10% LLM inclusion in their rations but higher ($P<0.05$) feed intake at 20% LLM inclusion in the same finisher birds study.

The feed to gain ratio of the birds on the three dietary treatments were not significantly ($P<0.05$) different. Odeyinka *et al* (1995) reported similar on rabbit fed graded levels of leucaena forage but Okonkwo et al (1995) reported significant ($P<0.05$) reduction in feed conversion ratio as LLM increased by up to 10% in broiler finisher diet. However, loss of weight, loss of appetite, stunted growth, goitre, aleopecia (NAS, 1977) or any of the other symptoms of mimosine-toxicity were not observed among the broiler birds fed up to 10.5% sundried LLM supplemented diet for a period of 42 days in this study.

Processed LLM was estimated to be seventeen naira and fifty kobo (N17.50) per kilogram when a kilogram of defatted SBM cost twenty eight naira (N28.00) at the time of this study. Therefore, feed cost per kilogram of feed progressively declined by 2.79 and 7.11 (%) as the level of LLM increased by 5.25 and 10.5 (%) in diets B and C respectively as shown in Table 4. Feed intake cost (₦) also declined as the levels of sundried LLM increased in the diets and about 6.65% reduction was noticed with 10.5% LLM replacement level. Feed cost (₦) per kilogram liveweight gained of birds fed diet B was unexpectedly higher than the value obtained in birds fed (control) diet A. This observation is traceable to the significantly ($P<0.05$) reduced averaged daily feed intake and daily weight gain (g) of birds fed diet B. However, 10.5% LLM inclusion by birds fed diet C reduced the feed cost (₦) per kilogram weight gained by 4.56%. Data from this trial suggest that up to 10.5% LLM supplementation in broiler finisher diet is economically beneficial.. More studies are however recommended for the causes of reduction in feed intake and rate of gain at 5.25% LLM inclusion in broiler finisher diets.

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