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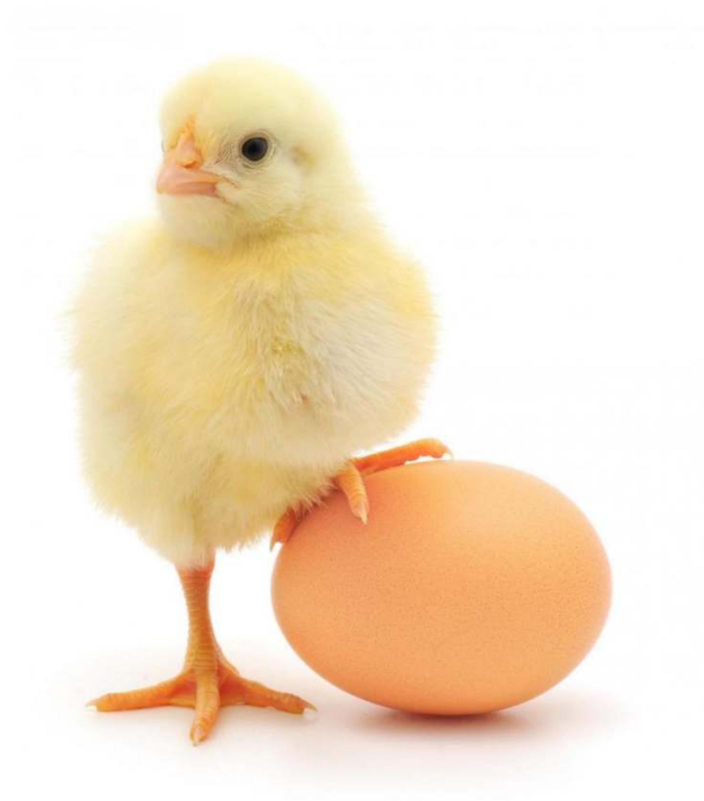

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Growth, Blood Chemistry and Carcass Yield of Broilers Fed Cassava Leaf Meal (*Manihot esculenta* Crantz)

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Abstract: A 25-day feeding trial involving 120, 5-week old Anak broilers was carried out in a completely randomized design to evaluate, growth, blood chemistry and carcass yield of broilers fed cassava leaf meal at dietary levels of 0, 5, 10 and 15% respectively. Feed intake, body weight gain, feed conversion ratio and the control (0%) leaf meal were superior (p<0.05) to the group on 10% and 15% leaf meal. The total serum protein albumin and haemoglobin at 0% and 5% leaf meal were superior to the values on 10% and 15% leaf meal; however, cholesterol, creatinine and urea showed no significant differences (p>0.05) between the treatment group. The cut parts of the carcass showed superior values (p<0.05) in the control treatment and they differed significantly (p<0.05) from broilers on 5, 10 and 15% leaf meal in carcass yield. It is suggested that 5% inclusion of cassava leaf meal could be used in broiler finisher without any deleterious effect on growth, blood chemistry and carcass yield of broilers.

Key words: Growth, blood chemistry, carcass yield, leaf meal, broilers

Introduction

The animal protein intake shortages in Nigeria observed in the early 1970s has progressively worsened till date. The resultant sub-optimal consumption of animal protein by a large percentage of Nigerian population has challenged not only livestock farmers, but also researchers and policy makers. The increasing competition between man and animals for available grains (Tegbe *et al*., 1984), the inadequate production of farm crops to meet the needs of man and his livestock (Esonu *et al*., 2001) and perhaps the threat of desert encroachment in many parts of West African sub-region which had destroyed the vegetation and depleted livestock population (Idufueko, 1984; Madubuike, 1992). If we are to save the livestock and poultry industries in Nigeria from total collapse is to provide food especially animal protein for the ever increasing population, there is urgent need to look critically for other sheep and indigenous sources of protein and energy, particularly those that attract no competition in consumption between man and livestock. One possible source of cheap protein is the leaf meal of some tropical legume and browse plants. Leaf meals not only serve as protein source but also provide some necessary vitamins such as vitamin A and C, minerals and also oxycarotenoids, which causes yellow colour of broiler skin, shank and egg yolk (Opara, 1996). Considerable attention has been focused and leaf meals from leuceana leucocephala (D'Mello *et al*., 1987); Sesbania Sesban (Ash and Detaia, 1992), Prosposis and Albizia (D'Mello, 1987) Cajanus cajan (Udedibie and Igwe, 1989).

Cassava leaves are a by-product of root production and comprise the leaves and petioles of cassava plants. The importance of the leaves becomes obvious when one considers that depending on the variety, as much as 10-30 t/ha of leaves would be obtained in a year and this amount is usually wasted or used as manure (Bokanga, 1994). Furthermore, cassava leaves can yield more than 6 tonnes of crude protein per hectare a year with the proper agronomic practices directed towards foliage harvesting (Huy *et al*., 1995). Cassava leaves are a significant source of dietary protein, minerals and vitamins (Bokanga, 1994). The protein content in cassava leaf is between 20-23% (Gomez *et al*., 1995; Nwokoro, 1987; Ranvindran, 1991). The nutritional value of cassava leaves has been reviewed by Lancaster and Books (1983), who reported that the amino acid composition of cassava leaves exceed those of FAO reference protein. Further, the total essential amino acid content of cassava leaf protein is similar to that found in hen's egg and is greater than that in oat and rice grain, soyabean seed and spinach leaf (Yeoh and Chew, 1976). Ranvindran *et al*. (1986) revealed that cassava leaf meal contained 84 mg/kg hydrocyanic acid as an anti-nutritional factor.

Blood chemistry constituents reflect the physiological responsiveness of the animal to its internal and external environments which include feed and feeding (Esonu *et al*., 2001; Iheukwumere and Okoli, 2002). Blood chemistry studies are usually undertaken to establish the diagnostic baselines of blood characteristics for routine management practices of farm animals

Table 1: Chemical Composition of Cassava Leaf Meal

Parameter	DM (%)
Dry matter	25.30
Crude protein	25.10
Crude fibre	11.40
Ether extract	12.70
NFE	46.10
Ash	9.10
Gross energy Kcal/kg	4.50
Calcium	1.40
Phosphorus	0.30

Table 2: Ingredient Composition of Experimental Diet

	Treatments			
Ingredients	0% (T_1)	5% (T_2)	10% (T_3)	15% (T_4)
Maize	45.00	45.00	45.00	45.00
Soyabean	20.00	15.00	10.00	5.00
Cassava leaf meal	0.00	5.00	10.00	15.00
Brewer dry grain	10.00	10.00`	10.00	10.00
Fish meal	5.00	5.00	5.00	5.00
Blood meal	3.00	3.00	3.00	3.00
Oyster shell	3.00	3.00	3.00	3.00
Wheat offal	10.00	10.00	10.00	10.00
Salt	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Vit/Premix*	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Calculated Composition (% DM)				
Crude protein	20.10	20.15	20.30	20.20
Crude fibre	8.20	9.10	9.85	8.80
Ether extract	2.10	2.35	2.05	2.20
Ash	14.35	12.80	10.90	13.75
Calcium	1.42	1.83	1.86	1.88
Phosphorus	0.58	0.57	0.56	0.55
ME (MJ/kg)	12.71	12.56	12.50	12.52balt

*To provide the following per kg of diet: Vit A, 10,000 iu, Vit. D_3 2000 iu; Vit E, 5 iu; Vit K, 2 mg; Riboflavin, 4.20 mg; Vit B_{12} 0.01 mg; Panthotenic acid, 5 mg; nicotinic acid, 20 mg; folic acid 0.5 mg; choline, 3 mg; Mg, 56 mg; Fe, 20 mg; Cu 10 mg; Zn, 50 mg, Co 125 mg; iodine 0.8 mg

(Tambuwal *et al.*, 2002; Onyeyilli *et al.*, 1992; Aba-Adulugba and Joshua, 1990).
The objective of this study therefore was to determine the effect of feeding cassava leaf meal on the growth, blood chemistry and, carcass yield of broiler birds.

Materials and Methods

Management of birds: One hundred and twenty broiler finisher birds were used for this study. The initial weights of the broilers were recorded. The birds were housed in a litter floor system. Routine management procedures in intensive broiler production were maintained to ensure disease control and comfort of the experimental birds. Feed and water were provided to appetite.

Experimental diets and design: Fresh cassava leaves were collected and dried by spreading them under the sun for about 8 h every day for 4 days until they become crispy to touch. The sun-dried leaves were milled in a hammer mill before incorporating them into the experimental diets. The diets were formulated to contain cassava leaf meal at 0% (control) 5, 10 and 15% inclusion levels. A sample of the processed leaf meal was subjected to chemical analysis to determine the proximate composition using standard methods (AOAC, 1995). Gross energy was determined using a Gallenkamp bomb calorimeter. The formulated diets were also analyzed by the same procedures to determine their chemical composition. The chemical composition of the leaf meal and the formulated diets are shown in Table 1 and 2 respectively. The experimental birds were divided into four treatment groups of 30 birds per group. Each treatment group was further replicated three times consisting of 10 birds per replicate. The groups were then randomly allotted to the 4 dietary treatments in a Completely Randomized Design (CRD). Feed and water were offered ad libitum and birds weighed weekly. The experiment lasted for 35 days.

Blood collection: At the end of the experiment, the birds were bled between 9 and 10.30 am from a punctured wing vein. Twelve milliliter of blood was aspirated from each bird. Two milliliter of each blood sample was discarded into Ethylene Diamine Tetra Acetic Acid (EDTA) treated Bijou bottles for haematological assay. The remaining 10 mL of each blood sample were allowed to coagulate to produce sera for blood chemistry to coagulate to produce sera for blood chemistry measurements. Triplicate blood samples were collected from each experimental group.

Blood chemistry analysis: The bottles of coagulated blood were subjected to standard methods of serum separation and the harvested sera used for evaluation of Total Serum Protein (TSP) and Serum Albumin (SA). Total serum protein was determined by the Golgberg refractometer method to obtain concentrations (g/dl) for each blood sample (Kohn and Allen, 1995); while albumin was determined using bromocresol green (BCG) method as described by Peters *et al.* (1983), cholesterol (determined from fresh blood) creatinine and urea concentrations were done following methods described by Baker and Silvertons (1985) were determined by the method described by Tuffery (1995).

Carcass yield evaluation: At the end of the experiment 2 birds from each of the replicate were randomly selected, starved for 24 h but not without water weighed and slaughtered by severing the jugular vein. Birds were bled dipped in hot water, defeathered and separated into head, neck and feet and visceral organs.
The wings were removed by cutting anteriorly severing at

Table 3: Effect of Feeding Cassava Leaf Meal on the growth of broiler finisher

	Dietary level of leaf meal %				
Parameters	0	5	10	15	SEM
Initial body wt of birds (g)	670	668	655	648	5.30
Final body wt of birds (g)	2073^a	2070^a	1638^b	1636^b	6.54
Body weight changes (g)	1405^a	1402^a	983^b	986^b	4.63
Daily body wt gain (g)	40.5^a	40.1^a	27.1^b	27.8^b	2.68
Daily feed intake (g)	143^a	148^a	130^b	128$^{b`}$	0.24
Feed conversion ratio (g feed/g gain)	3.53^a	3.70^a	4.78^b	4.60^b	0.15

a'b: Mean within rows having different superscripts are significantly different (p<0.05)

Table 4: Effect of feeding cassava leaf meal on the blood chemistry of broilers

	Treatments				
Parameters	T_1 0%	T_2 5%	T_3%10	T_4 15%	SEM
Total serum protein g/l	54.60^a	52,00^a	48.00^b	46,00^b	1.01
Albumin (g/l)	3.01^a	3.00^a	2.40^b	2.30^b	0.08
Cholesterol (mg/dl)	2.40	2.10	1.94	1.76	0.16
Urea (mg/dl)	5.30	5.10	5.00	5.00	0.26
Creatinine (mg/dl)	37.50	37.00	36.40	36.50	1.46
Haemoglobin (%)	54.60^a	53,10^a	48.00^b	46.00^b	2.40

a'b: Means within rows with different superscripts are significantly (p<0.05)

Table 5: Effect of feeding cassava leaf meal on the carcass yield of Broilers

	Treatments				
Parameters	T_1 0%	T_2 5%	T_3%10	$T_4$15%	SEM
Live weight k/g	1.43	1.05	0.93	0.06	#
Dressed weight expressed as % LW	79.00	69.50	69.00	67.70	2.54
Curt parts					
Thigh (g)	76.10^a	58.30^b	50.80^b	50.00^b	4.30
Neck (g)	31.60^a	14.20^b	13.30^b	12.50^b	4.60
Shank (g)	41.60^a	29.20^b	25.00^b	25.00^b	3.90
Drum stick (g)	75.00^a	58.80^b	50.30^b	50.00^b	4.80
Wings (g)	75.00^a	50.00^b	50.00^b	47.50^b	4.80
Back (g)	108.30^a	100.80^b	95.80^b	87.80^b	13.70
Breast muscle (g)	154.10^a	100.80^b	95.80^b	87.80^b	13.70

a'b: Means within rows having different superscripts are significantly different (p<0.05), # = Not analyzed, LW = Live weight, SEM = Standard Error of Means

the humeo-scapular joint, the cuts were made through the rib head to the shoulder girdle, the back was removed intact by pulling anteriorly. Thighs and drum stick were dissected from each carcass and weighed separately.

Data analysis: All the data collected from this study were analyzed using the analysis of variance Steel and Torrie (1980). Means where significant differences occurred were separated using the Duncan's New Multiple Range Test as described by Obi (1990).

Results and Discussion

The chemical composition of cassava leaf meal is shown in Table 1, while the nutrient composition of the experimental diets is shown in Table 2. Data on the performance is shown on Table 3, while the blood chemistry is shown in Table 4 and the results on the carcass yield is shown in Table 5.

Feed intake, daily body weight gain and feed conversion ratio were similar for the groups on the control (0%) and 5% dietary level or the leaf meal and were significantly (p<0.05) different than for the groups on 10% and 15% leaf meal. The depression in growth with 10% and 15% level of cassava leaf meal agrees with the general observations that at high leaf meal inclusion levels in poultry diets the growth is depressed (D'Mello *et al.*, 1989; Ash and Akoh Detaia, 1992; Opara, 1996), even when maize oil was used to compensate for the low metabolizable energy value of the leaf meal (Opara, 1996). D'Mello *et al.* (1987) reported that a diet containing 10% leaf meal of Leucocephala significantly depressed the body weight gain of birds without affecting dry matter intake. The depressed body weight gain of broilers at 10% and 15% leaf meal might be due to the fact that feed intake was low due to the high bulk or fibre content of the leaf meal resulting in insufficient consumption of digestible nutrients particularly protein and energy required to sustain rapid growth. This result is in line with the observations of Esonu *et al.* (2002) that leaf meals from *Microdesmis pubarula* depressed feed utilization efficiency in chickens. Cheeke *et al.* (1988) reported a 71% depressed growth rate in chicks fed a diet containing 20% Robinia pseudo acacia leaf meal when compared with the control (0%) group. Another possible drop in feed intake could be that the leaf meal imparted unpalatable taste to the feed, which consequently inhibited the birds from consuming adequate quantities (Omekan, 1994).

The results of feeding dietary levels of cassava leaf meal on the blood chemistry of broilers are shown in Table 4. The broilers on 0% (control) and 5% of the trial leaf meal recorded higher total serum protein and albumin (p<005). Cholesterol and creatine did not show any significant difference (p>0.05) between the treatment groups, however, their values depressed as the dietary inclusion of the leaf meal increases. This is in agreement with the reports of Esonu *et al.* (2001). Total serum protein has been reported as an indication of the protein retained in the animal body (Akinola and Abiola, 1991; Esonu *et al.*, 2001), while total blood protein and creatinine contents have been shown to depend on the quantity and quality of dietary protein (Eggum, 1970; Iyayi, 1998). (Awosanya *et al.*, 1999; Esonu *et al.*, 2001). Muscle wating has been shown to be the source of excess creatinine in the blood of animals and is normally due to creatinine phosphate catabolism during this process (Bell *et al.*, 1992).

The reduction in haemoglobin values of broilers on 10% and 15% inclusion levels of the leaf meal could possibly be due to reduced feed intake. This is in agreement with the reports of Hemening (1992) and Esonu *et al*. (2001). The increase in albumin and total blood protein of broilers on 5% inclusion of the leaf meal when compared with the 0% control groups is indication of the protein quality of the leaf meal. There is the need to elucidate the amino acid profile of this leaf meal.

The results of feeding cassava leaf meal on the carcass yield of broilers are shown in Table 5.

The dressed weight of the broilers expressed as percentage live weights were similar between treatment groups. This is in line with the findings of Nwoche *et al*. (2006); in broiler finisher birds. The cut parts of the carcass followed the same pattern. The birds on the 0% control treatment showed superior values ($p<0.05$) in the weight of the cut parts of the carcass. The values differed significantly ($p<0.05$) from 5%, 10% and 15% treatment groups. The depressed weights of the carcass cut parts may be as a result of low feed intake, Esonu *et al*. (2002); the inability of the birds to convert the feed into meat Nwoche *et al*. (2006).

Conclusion: From the results of this study, it would appear that a 5% inclusion level of cassava leaf meal could be used in broiler finisher diets without any deleterious effects on the growth, blood chemistry and carcass yield of broiler finisher birds. Further research is necessary to determine how to increase the nutritive value of cassava leaf meal for monogastric animals in view of its cheapness and abundance.

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