Pakistan Journal of Nutrition 7 (1): 13-16, 2008
ISSN 1680-5194

Performance, Nutrient Utilization and Organ Characteristics of Broilers Fed Cassava Leaf Meal (M*anihot esculenta* Crantz)

F.C. Iheukwumere[1], E.C. Ndubuisi[1], E.A. Mazi[2] and M.U. Onyekwere[3]
[1]Department of Agriculture, Abia State University, PMB 7010, Umudike, Nigeria
[2]Department of Food Science, Abia State University, PMB 7010, Umuahia, Nigeria
[3]Federal College of Agriculture, Ishiagu, Ebonyi State, Nigeria

Abstract: A 35-day feeding trial involving 120, 5-week old Anak broilers was carried out in a completely randomized design to evaluate the performance, nutrient utilization and organ characteristics 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 organ weight of birds on the control (0%) and (5%) leaf meals were significantly superior (p<0.05) to the group on 10% and 15% leaf meal. The utilization of Dry Matter (DM), crude protein, ether extract and ash was significantly poorer at the 10 and 15% dietary levels. The organ weights (heart, liver, gizzard) were superior at 0 and 5% (p<0.05) groups to the groups on 10 and 15% inclusion levels of the leaf meal. It is suggested that 5% inclusion of cassava leaf meal could be used in broiler finisher diets without any deleterious effects.

Key words: Cassava leaf meal, performance, broiler, organs weight and nutrient utilization

Introduction

Poultry meat and eggs offer considerable potential for bridging the protein gap in view of the fact that high yielding exotic poultry are easily adaptable to our environment and the technology of production is relatively simple with returns on investment appreciably high (Idufueko, 1984; Madubuike, 1992). That the poultry industry in Nigeria is undergoing very turbulent times and on the brink of collapse gives cause for concern. More than 50% of the country's poultry farms have closed down and another 30% forced to reduce their production capacity because of shortage of feed (Esonu *et al*., 2001).

Feed accounts for 70-85% of the production cost of poultry (Opara, 1996). The bulk of the feed cost arises from protein concentrates such as groundnut cake, fish meal and soybean meal. Prices of these conventional protein sources have soared so high in recent times that it is bec oming uneconomical to use them in poultry feeds (Opara, 1996; Esonu *et al*., 2001). There is need therefore to look for locally available and cheap sources of feed ingredients, particularly those that do not attract competition in consumption between humans and livestock.

One possible source of cheap protein is the leaf meal of some tropical legume and plants. Leaf meals do not only serve as protein source but also provide some necessary vitamins, minerals and also oxycarotenoids, which cause yellow colour of broiler skin, shank and egg yolk (D'Mello *et al*., 1987; Opara, 1996).

Cassava leaves are a by-product of root production and comprise the leaves and petioles of cassava plant. 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 that 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*., 1985; Nwokolo, 1987; Ravindran, 1991). The nutritional value of cassava leaves has been reviewed by Lancaster and Brooks (1983), who reported that the amino acid composition of cassava leaves shows that; except for methionine, the essential amino acid value in cassava leaves exceeds those of FAO reference protein. Furthermore, 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, soybean seed and spinach leaf (Yeoh and Chew, 1976). Ravindran *et al.* (1986) revealed that cassava leaf meal contained 84 mg/kg hydrocyanic acid as an anti-nutritional factor.

This study is therefore designed to examine the nutritional value of cassava leaf meal in broiler finisher diets.

Materials and Methods

Preparation of the leaf meal: The cassava leaves used for this study were harvested at the Abia State University, Umuahia Nigeria, farms. The leaves were chopped for faster and effective drying on a cement floor. The chopped leaves were sun-dried for three days until they

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 fire	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	12.52

*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

become crispy while still retaining the greenish colouration. The leaves were turned regularly to prevent uneven drying and possible decay of the leaves. The dried leaves were then milled using a hammer mill to produce leaf meal. A sample of the leaf meal was subjected to proximate analysis according to AOAC (1995). Mineral analysis was carried out by the methods of Grueling (1966) while gross energy was determined with a Gallenkamp adiabatic calorimeter.

Experimental birds and design of the experiment: 120 Anak broiler birds five weeks old were used for this study. The birds were divided into four treatment groups identified as T_1. T_2, T_3 and T_4 consisting of 30 birds per group. Each treatment group was further replicated 3 times with 10 birds per replicate. Based on the result of the chemical analysis four finisher broiler diets were formulated to contain cassava leaf meal at 0% (T_1), 5% (T_2), 10% (T_3) and 15% (T_4) and fed to the birds in a Completely Randomized Design (CRD). The treatment diets were isoenergetic and isonitrogenous (Table 2). The birds were reared on a deep-litter system. Feed and water were provided *ad libitum.* The necessary routine vaccination and veterinary attention were provided. The experiment lasted for 25 days.

Feed intake was recorded daily and the birds were weighed weekly. Other routine poultry management practices were maintained. The feeding trial lasted for 35 days. At the end of the 35th day, three birds were randomly selected from each replicate and transferred to metabolism cages (one bird per cage) for faecal collection, determination of nutrient utilization and proximate composition. Excreta were collected from beneath the metabolism cages twice daily on polythene sheets, feathers and feed particles were carefully removed and excreta weighed. The collections for each day were sun dried and weight recorded.

The 7-day samples were pooled, ground and then analyzed for dry matter, crude protein, crude fibre, ether extract and total ash (AOAC, 1995). Another three birds were randomly selected from each of the treatment groups, deprived of feed but not water for a day, slaughtered and eviscerated for organ weight determination.

The data collected were subjected to analysis of variance (Steel and Torrie, 1980). Where significant treatment effects were detected from the analysis of variance, means were compared using 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 performance, nutrient utilization expressed as 100 (Intake-Excreta)/Intake) and organ characteristic of the birds on the various dietary levels of the leaf meal are presented in Table 3.

Feed intake, growth rate and feed conversion ratio were similar for the groups on the control (0%) and 5% dietary level of the leaf meal and were significantly ($p<0.05$) better than for the groups on 10% and 15% leaf meal inclusion. The relative organ weights of the groups on the control (0%) and 5% leaf meal diets were significantly ($p<0.05$) higher for the groups on 10% and 15% leaf meal. The utilization of DM, crude protein, ether extract and NFE decreased with increasing levels of leaf meal (Table 3) with significantly lower values at the 10% and 15% leaf meal levels compared with the control. No mortality was recorded during the feeding trial.

The depression in performance with 15% level of cassava leaf meal agrees with the general observation that at high leaf meal inclusion levels in poultry diets the growth is depressed (D' Mellow and Acomovic, 1989;

Table 3: Effect of Different Dietary Levels of Cassava Leaf Meal on the Performance 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]	4.64
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
Organ weight, % body weight					
Heart	0.48[a]	0.52[a]	0.44[b]	0.42[b]	0.1
Liver	2.03[a]	1.95[a]	1.43[b]	1.42[B]	0.03
Gizzard	3.82[a]	2.60[a]	2.01[b]	2.00[b]	0.04
Abdominal fat	2.34[a]	1.84[a]	1.63[b]	1.61[b]	0.11
Nutrient utilization, %					
Dry matter	80.1	70.1	57.0	55.0	5.98
Crude protein	73.30	64.03	54.30	53.10	3.69
Crude fibre	65.45	62.42	56.53	55.20	2.51
Neutral ether extract	92.80	81.21	50.80	49.20	5.02
Ash	56.21	57.20	62.76	64.50	1.03

a'bMeans within rows with different superscripts are significantly different ($p<0.05$)

Ash and Petaia, 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 the broilers at 15% leaf meal might be due to the fact that feed intake was low due to 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 observations of Esonu *et al.* (2001) that leaf meals from *Microdesmic puberula* depressed feed utilization efficiency in chickens. Cheeke *et al.* (1983) 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 an unpalatable taste to the feed, which consequently inhibited the birds from consuming adequate quantities (Omekam, 1994).

From the results of this study, it would appear that a 5% inclusion of cassava leaf meal could be used in broiler finisher diets without any deleterious effects on performance.

References

AOAC, 1995. Official Methods of Analysis, 15th edition, Washington, DC.

Ash, A.J. and L. Akoh Petaia, 1992. Nutritional value of *Sesbania grandiflora* leaves for ruminant and monogastrics. Trop. Agri. (Trinidad), 69: 223-228.

Bokanga, A., 1994. Processing of cassava leaves for human consumption. Acta Horticulture, 375: 203-207.

Cheeke, P.R., M.P. Georger and G.H. Ascotti, 1983. Utilization of black locust (Robinia pseudoac acia) leaf meal by chicks. Nitrogen Fixing Tree Research Report, 1: 41.

D'Mello, J.P.E., T. Acamovic and A.G. Walker, 1987. Evaluation of Leucaena leaf meal for broiler growth and pigmentation. Trop. Agri. (Trinidad), 64: 33-35.

D'Mello, J.P.F. and T. Acomovic, 1989. Leuceana Leucocephela in Poultry Nutrition. A review. Anim. Feed Sci. Tech., 25: 1-28.

Esonu, B.O., O.O. Emenalom, A.B.I. Udedibie, U. Herbert, C.F. Ekpor, I.C. Okoli and F.C. Iheukwumere, 2001. Performance and blood chemistry of weaner pigs fed raw Mucuna (Velvet bean) meal. Trop. Anim. Prod. Invest., 4: 49-54.

Gomez, C.G., M. Vadic Viso, J. Santos and C. Hoyos, 1985. Evaluation of cassava root meal prepared from low and high cyanide containing cultivars in pig and broiler diets. Nutr. Report Int., 28: 693-7004.

Grueling, H.T., 1966. The chemical analysis of tissues. Mimeo No. 6622 Agronomy Department. Cornell University. Ithaca, New York, USA.

Huy, B.H.P., U.I. Nguyen, T.R. Preston, B. Ogele and J.E. Lindberg, 1995. Replacing of soya bean meal with cassava root diet for growing pigs. Reserch for Rural Development November-December.

Idufueko, A., 1984. Sefl-sufficiency in animal protein supply under changing economic fortunes. Nigerian J. Anim. Prod., 11: 14-21.

Lancaster, P.A. and J.E. Brooks, 1983. Cassava leaves as human food. Econ Bot., 37: 331-348.

Madubuike, F.N., 1992. Bridging the animal protein gap for rural development in Nigeria. The potential of pigs. J. Agri. Rural Develop., 5: 5-12.

Nwokolo, E., 1987. Leaf meal of cassava (*Manihot esculanta* crantz) and Siam weed *(Eupatorum odoratum* l) as a Nutritional source in Poultry. Nutr. Reports Int., 36: 819-826.

Obi, I.U., 1990. Statistical methods of detecting differences between treatment means. 2nd Ed. Snaap Press, Enugu, Nigeria.

Omekam, V.N., 1994. Studies on nutrition and health implications of dietary inclusion of dried poultry waste for broilers. MSc. Thesis, Federal University of Technology, Owerri, Nigeria.

Opara, C.C., 1996. Studies on the use of *Aklchornia cordifolla* leaf meal as feed ingredient in poultry diets. MSc. Thesis, Federal University of Technology, Owerri, Nigeria.

Ravindran, V., E.T. Vornegay, A.S.B. Rajoguro, L.M. Pottes and T.A. Chery, 1986. Cassava leaf meal as a replacement for coconut oil meal in broiler diets. Poult. Sci., 65: 1720-1727.

Ravindran, V., 1991. Preparation of cassava leaf product and their use as animal feeds. Proceedings of the FAO expert consultation CIAT, Cali, Columbia, 21-25, pp: 81-95.

Steel, R.G.D. and J.H. Torrie, 1980. Principles and Procedures of Statistics, McGraw Hill Book Co., New York, USA.

Yeoh, H.H. and M.Y. Chew, 1976. Protein content and amino acid composition of cassava leaf. Phytochemistry, 15: 1597-1599.