"Effect of Varying Levels of Dietary Cassava (*Manihot esculenta*, Crantz) Leaf Meal on Broiler Gut Morphology"

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Target Audience: Research Scientists, Poultry Farmers, Feed Millers

Abstract

60 day-old Anarh 2000 broiler chicks were used for this study which lasted for 7 weeks. Four experimental diets A,B,C and D were formulated and were designed to be both isonitrogenous and isocaloric in formulation. While diet A contained no cassava (Manihot esculenta) leaf meal (CLM) and served as the control, diets B, C and D contained 15.0, 22.5 and 25.0% CLM, respectively.

There were significant decreases (P<0.05) in gut weights and sizes as the level of dietary CLM increased. However, these observed decreases had no adverse effects on the overall gut morphology.

Key Words: Broiler Chickens, Cassava leaf meal, gut morphology.

Description of Problem

The existing acute shortage of protein in Nigeria and the rapidly increasing demand for livestock products exemplify meat and eggs as quick means of meeting this demand. However, the production and ready availability of poultry products is limited by the high cost of the feed ingredients.

The importance of feed in the animal industry is generally recognized. In Nigeria, feed cost is estimated to represent over 70% of the total cost of producing livestock intensively (Oluyemi, 1984: Ogunfowora, 1984). Apparent cost of feed has followed an upward trend reaching an all-time peak in the nineties. The feed industry in Nigeria is currently faced with acute shortage and high price of feed ingredients and these are responsible for the present rise in poultry and livestock feeds with the attendant rise in the cost of livestock and poultry products, leading to deficiencies of animal proteins in the average Nigerian diet.

In almost all countries of the cassava-belt in Africa, cassava leaves constitute a major by-product of cassava root harvest (Aletor and Fasuyi, 1997) and a significant source of dietary protein, minerals and vitamins (Bokanga, 1994). The nutritional value of cassava leaves has been reviewed by Lancaster and Brooks (1983), who reported that their proximate composition compared favourably well with the composition of sorghum grain, maize grain, milk, fish and eggs.

Inspite of these qualities, the nutritional potentials of CLM remain currently under-researched in Nigeria. The major draw back to its wide-spread use in poultry nutrition "cyanide scare" and their content of cyanogenic glucosides could, depending on the variety, be six times higher than in the roots (Aletor & Fasuyi, 1997). Moreover, apart from cyanide, tannin, phytic and oxalic acids (Reddy *et al*, 1982; Bokanga, 1994) may limit the nutritional value of cassava leaves.

This study was therefore designed to evaluate the effect of CLM-based diets on the gut morphology of broiler chickens.

Materials and Methods

Cassava leaves and peels of mixed varieties were used in this study. The leaves and peels were the major by-products of the cassava roots harvested at between 9-10 months of age from the Institute's cassava plantation. They were sun-dried separately on clean cement floors immediately after collection for 7 days, after which the dried samples were ground separately in a hammer machine, packed in polythene bags and stored at room temperature.

The experimental cassava peels and leaves were analyzed for their proximate constituents according to AOAC (1980) procedure. Gross energy (GE) was determined with a ballistic bomb calorimeter in which benzoic acid was used as a standard. The hydro cyanic acid (HCN) and oxalate contents of the samples were determined by the methods of Cooke (1979) and Dye (1956), respectively.

Four experimental diets A,B,C, & D were formulated (Table 1). While diet A contained no CLM and served as the control, diets B, C, & D contained, respectively, 15.0, 22.5 & 25% CLM.

The rations were designed to be isonitrogenous (21.4% CP) and isocaloric (2.9Kcal/g ME) in formulation. The test ingredients (CPM and CLM) contained, respectively (%), DM 90.15 and 85.50, ash 9.80 and 10.12, crude fibre 1.70 and 4.50, ether extract 1.90 and 4.25, crude protein 5.40 and 35.75, nitrogen free-extractive 56.05 and 60.18, gross energy (Kcal/g) 3.01 and 4.45 and free HCN (mg/kg) 20.50 and 36.50.

60 day-old Anarch 2000 broiler chicks were used for this study which lasted for 7 weeks. They were fed the conventional commercial broiler starter mash for 7 days, after which they were weighed individually and randomly allotted to the 4 experimental diets. Each treatment consisted of 3 replicates with 5 chicks each. Feed and water were supplied *ad libitum* to the chicks. Feed intake and weight gain were recorded weekly.

Gut Morphology Study

At the end of the 7th week of study, a chick per replicate was taken randomly, starved of feed and water for 6 hours, weighed and then killed by the cervical bone dislocation method. After defeathering and evisceration, the organs and gastro-intestinal tracts were removed and weighed accordingly (Table 2).

All data obtained in these studies were subjected to analysis of variance procedure of Snedecor and Cochram (1969), using the completely randomised design. Where statistical significant differences were observed, the treatment means were compared, using the Least Significant Difference (Steel and Torrie, 1980) procedure.

Results and Discussion

The results of the energy and proximate chemical composition of the CLM used in this study differ from the values reported by Smith (1992), Bokanga (1994) and Aletor and Fasuyi (1997). Seerley (1972) attributed the values obtained to the strain, age, varietal differences, environmental conditions and methods of analyses of the CLM. The results of the present study show that the live weights decreased ($P<0.5$) with increasing levels of dietary CLM.

Similarly, gizzard weight, liver weight and caecum length decreased ($P<0.05$) with increasing levels of dietary CLM. Deaton *et al*; (1977) reported that gizzard weight as a percentage of body weight was significantly influenced ($P<0.05$) by dietary energy and fibre contents of the diets. In the present study, there were significant decreases ($P<0.05$) in gut-gizzard length as levels of dietary CLM increased.

In conclusion, it was observed in the present study that the inclusion of varying levels of processed CLM in diets of broiler chickens had no adverse effects ($P>0.05$) on the gut morphology of the chickens. However, the gut-gizzard lengths generally decreased ($P<0.05$) with increasing levels of dietary CLM.

TABLE 1 : Ration and Calculated Chemical Composition and energy value of Experimental Diets (DM BASIS)

	EXPERIMENTAL DIETS			
INGREDIENTS COMPOSITION (%)	A	B	C	D
Cassava Peel Meal (CPM)	45.00	30.0	22.5	20.0
Cassava Leaf Meal (CLM)	-	15.0	22.5	25.0
Groundnut Cake	25.0	22.5	21.5	22.0
Wheat Offal	1.0	6.0	8.5	8.5
Palm Kernel Cake	8.0	9.0	9.0	10.0
Soyabean Meal	6.0	6.0	6.0	5.0
Fish Meal	5.0	5.0	5.0	5.0
Bone Meal	2.0	2.0	2.0	2.0
Palm Oil	2.0	0.5	-	-
Rice Bran	4.0	2.0	1.0	0.5
Oyster shell	1.0	1.0	1.0	1.0
Methionine	0.2	0.2	0.2	0.2
Lysine	0.1	0.1	0.1	0.1
Vitamin-Min-Premix*	0.5	0.5	0.5	0.5
Salt	0.2	0.2	0.2	0.2
TOTAL	100.0	100.0	100.0	100.0
Calculated analysis:				
Crude Protein (%)	21.49	21.41	21.43	21.40
ME (Kcal/g)	2.86	2.87	2.88	2.89

*The Vit-Min Premix used in this study is a product of Pfizer Nigeria Limited, Ikeja, Lagos. Each I kg contains: Vit A (I.U) 10.000; Vit E (I.U) 2.5; Vit K (mg) 20; Choline (mg) 300; Riboflavin (mg) 4.2, Folic acid (mg) 0.5; Methionine (mg) 0.225; Mn (mg) 56.0 ; I (mg) 1.0; Fe (mg) 20.0; Cu (mg) 10.0; Zn (mg) 1.25; Co (mg) 1.25.

Table 2: Gut Morphology of the Broiler Chicks.

PARAMETERS	EXPERIMENTAL DIETS A (0)	B (15.0)	C (22.5)	D (22.0)	SEM*
Live Weight (g)	1.25[a]	1.16[b]	1.13[b]	1.03[c]	+0.039
Dressed Weight (g)	0.94[a]	0.72[b]	0.62[c]	0.72[b]	+0.058
Dressed Weight as % of live Weight	75.20[bc]	62.61[b]	60.19[c]	63.72[b]	+2.89
Gizzard (g)	58.33[a]	55.0[b]	52.67[bc]	51.0[bc]	+1.38
Liver (g)	53.33[a]	46.17[b]	41.67[c]	40.67[c]	+ 2.50
Crop-Oesophagus (cm)	15.67[a]	14.27[b]	140.7[b]	14.13[b]	+0.33
Proventriculus (g)	5.40[a]	4.23[b]	4.07[b]	4.07[b]	+0.28
Duodenum fold length (cm)	26.67[a]	22.67[b]	21.67[b]	22.0[b]	+1.00
Duodenum width (cm)	2.81	3.13	2.77	3.13	+0.09
Jejunum width (cm)	2.47[a]	2.28[ab]	2.10[b]	2.07[b]	+0.08
Ileum length (cm)	2.07[a]	1.95[ab]	1.85[b]	1.87[b]	+0.04
Caecum length (cm)	15.17[a]	12.45[b]	11.15[c]	9.03[d]	+1.11
Caecum width (cm)	4.93	4.90	4.52	4.88	+0.80
Small intestine (g)	69.83[a]	65.5[b]	62.87[c]	60.03[d]	+1.80
Colo-Rectum length (cm)	11.0	10.10	10.30	9.90	+0.21
Colo-Rectum width (cm)	4.13	4.07	3.92	3.92	+0.50
Colo-Gizzard length (cm)	22.25[a]	21.35[ab]	20.95[b]	20.80[b]	+0.28

a, b, c, d, Means with different superscripts on the same row differ significantly ($P<0.05$)

*SEM - Standard Error of Means.

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