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Nutritional evaluation of cassava leaf meal based diets on broiler starter chicks performance

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Abstract
The effect of partial replacement of Groundnut Cake with Cassava Leaf Meal (CLM) with or without enzyme supplementation on the performance of broiler starter chicks was investigated. This study was undertaken at the University Teaching and Research Farm, Animal section, Faculty of Agriculture, University of Abuja. The site has latitude 8.55°N and 90°N; longitude 7° 00°N and 7° 05°E. It covers land mass total of 655qkm (6,500 hectare). One hundred and ninety-four (194) day old white marshal broiler starter chicks purchased from a reputable hatchery was used in the study which lasted for five (5) weeks. It was a 3x2 factorial arrangement in a Completely Randomized Design (CRD). There were eight (8) treatments with three replicates and eight (8) birds per replicate. Feed and water were supplied *adlibitum* while other poultry management procedures were strictly adhered to. There were significant effects ($p<0.05$) of the treatment on the daily weight gain, which are 39.02g, 34.81g, 34.38g and 24.76g at 0%, 20%, 40% and 60% CLM inclusion levels respectively. The daily weight gain decreased as the level of Cassava leaf meal increased from 0% to 60%. The dietary treatment also had significant effects ($p<0.05$) on the feed to gain ratio. Apart from the control diet, treatment 2 had a good feed to gain ratio compared to other treatments. Values recorded were 2.69, 2.79, 2.63, and 2.90 at 0%, 20%, 40% and 60% inclusion levels.respectively. Generally, the results of the experiment showed that the ingredients were not toxic, hence, could be introduced to broiler starter chicks between the ranges of 20% and 40% inclusion which gave promising result when compared to 60% inclusion. Cassava Leaf Meal is seen to be a promising feed ingredient obtained at lesser price when it is well processed. It is not harmful to broiler chicken when given at a low level and it gives satisfactory results but depress broiler performance at higher inclusion levels.

Keywords: groundnut cake, cassava leaf meal, enzyme, nutritive value, chicks, performance

1. Introduction

Animal production is a source of livelihood for many Nigerians and has over the years proven to be a profitable enterprise. However quite a number of factors including feed and feeding continue to hinder optimum animal production for the benefit of humans and national economy. It is very expensive to provide adequate nutrition for livestock especially poultry because conventional feed ingredients such as groundnut cake, maize, soybean and fish meal among others continue to rise in price.

The conventional protein feedstuffs for poultry such as soybean, groundnut cake, and fish meal are scarce and expensive because they are being competed for by humans as food and other industrial uses. The rising cost of finished feed, which is 70 - 80% of the cost of production among others, is a major setback. According to Esonu *et al* (2003) [3] prices of conventional protein feed ingredients have soared so high in recent times that it is becoming uneconomical to use them in poultry feeds. There is need; therefore to look for locally available and cheap sources of feed ingredients, particularly those that do not attract competition in industrial uses as well as consumption between humans and livestock. Cassava Leaf meal do not only serve as protein source but also provide some necessary vitamins, minerals and some other benefits for poultry feed formulation.

Cassava leaves is a byproduct of cassava root harvest. Depending on the varieties, is rich in protein (14-40%), dry matters, mineral, vitamins B1, B2, vitamin C and carotenes. Although lower in methionine, lysineand perhaps isoleucine content, the amino acid profile of cassava leaf protein compares favourably with those of milk, cheese, soybean, fish, and egg. It is also notorious for its high content of cyanogenic glucosides, depending on the variety and six times higher than in the root among which Tannins and possibly phytin are present which may limit the nutritional value of cassava leaves (Fasuyi, 2005) [8]. Thus, the aim of the study is to investigate the effect of partial replacement of groundnut cake (GNC) with cassava leaf meal (CLM) on the performance of broilers.

In Nigeria, the rapid expansion of the poultry industry is characterized by the emergence of smallholder farms. The major factors that have contributed to this expansion are genetics, nutrition and disease control. During the past two decades, a wide range of new feed resources have been successfully evaluated in research stations (Ravindran *et al*., 1993) [11], but there had been little or no adoption of these technologies at the farm level. Recommendations from the research stations need to be tested on-farm because such testing represents conventional wisdom as to appropriate technologies (Devenda, 1988) [3]. They allow a more realistic evaluation of the innovation, while stimulating new avenues for applied research are appropriate to small farmers. In view of the priority given to the development of ruminants in the country, on-farm animal researches in the past have focused more on these species (Devenda, 1977) [4].

To address the challenges of high cost of protein feedstuff like groundnut cake meal in poultry production, a cheaper alternative of protein is sought after. Cassava Leaf Meal is identified as one of those cheaper alternative sources of protein that is capable of improving livestock performance. Cassava leaves are a by-product of cassava after harvest, and are highly nutritious. Like other dark green leaves, they are an extremely valuable source of protein (140 – 400g/kg DM), minerals, vitamins B^1, B^2, C and carotenes (Eggum, 1970; Adewusi and Bradbury, 1993) [6, 2].

Leaves can be harvested within 4 to 5 months of planting without adversely affecting root production, yielding up to 10 tonnes of dry foliage per hectare (Khajaren and Khajaren, 1991) [9].

Materials and Methods

One hundred and ninety-four day old white marshal broiler starter chicks were purchased from a reputable hatchery. The chicks on arrival at the experiment site were housed in metal hutch with twine mesh at the base for easy collection of faeces. The hutch was disinfected and cleared a week before the birds were housed in it. On arrival, the birds were given anti-stress with antibiotics for the first week and were allowed to adapt to the environment. Feeders and drinkers were provided, and the hutch, were also cleaned at intervals. The performance of the chicks was monitored and the initial weights of the chick were recorded at the commencement of the experiment. Weekly body weight gained and daily feed intake were recorded while feed to gain and cost implication was calculated.

All data were subjected to complete randomized design (CRD) model by (Steel and Torrie, 1980) [13]. Proximate composition was determined using the method of A. O. A. C. (1995) [1]. The significant difference between mean were compared using Duncan Multiple Range test (Duncan, 1955) [5]. The birds were allotted into eight dietary treatments designated as T_1, T_2, T_3, T_4, T_5, T_6, T_7 and T_8 with three replicates per treatment with or without enzyme supplementation. Each replicate has 8 birds making a total of 24 birds per treatment. The birds were managed in a battery cage system. Standard management procedures were strictly followed throughout the brooding and rearing period.

Table 1: Composition of experimental diets

Ingredients	0%		20%		40%		60%-	
	T_1 +	T_2 -	T_3 +	T_4 -	T_5 +	T_6 -	T_7 +	T_8 -
Maize	48	48	48	48	48	48	48	48
S.B.M	15	15	15	15	15	15	15	15
CLM (Test ingredient)	0	0	4	4	8	8	12	12
Groundnut cake	20	20	16	16	12	12	8	8
Wheat offal	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3
Fish meal	5	5	5	5	5	5	5	5
Bone meal	4	4	4	4	4	4	4	4
Common salt	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Vitamin/Mineral premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
DL-Methionine	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Total	100	100	100	100	100	100	100	100

Key -- + = with enzyme; - = without enzyme

Results and Discussion

There were significant effects ($p<0.05$) of the treatment on the daily weight gain, which are 39.02g, 34.81g, 34.38g and 24.76g at 0%, 20%, 40% and 60% CLM inclusion levels respectively. This indicates that the daily weight gain decreased as the level of Cassava leaf meal increased from 0% to 60%. The dietary treatment also had significant effects ($p<0.05$) on the feed to gain ratio. Apart from the control diet, treatment 3 had a good feed to gain ratio compared to other treatments. Values recorded were 2.69, 2.79, 2.63, and 2.90 at 0%, 20%, 40% and 60% inclusion levels of the Cassava leaf meal respectively.

There were also significant effects ($p<0.05$) of the treatment on the total weight gain. The values recorded were 1365.67g, 1218.23g, 1203.3g and 866.67g at 0%, 20%, 40% and 60% inclusion of Cassava leaf meal respectively. There were significant effects ($p<0.05$) of the treatment on the daily feed intake of the broiler (starter) chicks as well. The values recorded were 105.2g, 97.14g, 90.5g and 71.9g at 0%, 20%, 40% and 60% inclusion of the Cassava leaf meal respectively. In terms of supplement, there was significant increase ($p<0.05$) in feed consumption. Broiler (starter) chicks fed enzyme supplemented diets consume more of the feed compared to broiler starter chicks fed the diets with no supplement (95.58g). The interaction between the levels of Cassava leaf meal and supplementation was significant ($p<0.05$) on the feed intake.

Generally, the results of the experiment showed that the ingredients were not toxic, hence, could be introduced to broiler starter chicks between the ranges of 20% and 40% inclusion which gave promising result when compared to 60% inclusion. Cassava Leaf Meal is seen to be a promising feed ingredient obtained at lesser price when it is well processed. It is not harmful to broiler chicken when given at a low level and it gives satisfactory results but depress broiler performance at higher inclusion levels.

Table 2: Growth performance characteristics of broiler chicks (starter) fed cassava leaf meal partially replacing groundnut cake with or without enzyme supplementation

Levels of CLM (%)	Initial Weight (g)	Final Weight (g)	Weight Gain (g)	Daily Feed Intake (g)	Daily Weight Gain (g)	Feed to Gain Ratio
0	62^a	1427.67^a	1365.67^a	105.2^a	39.02^a	2.69^c
20	62^a	1280.23^b	1218.23^b	97.14^b	34.81^b	2.79^b
40	62^a	1265.33^c	1203.3^c	90.5^c	34.38^c	2.63^d
60	61^b	927.67^d	866.67^d	71.9^d	24.76^d	2.90^a
SEM	0.13	55.21	55.1	3.7	1.45	0.03
Significance Supplementation	*	*	*	*	*	*

NSA	61.75[a]	1225.23[b]	1163.48[b]	91.19[b]	33.24[b]	1.86[b]
Enzyme (Maxigrain)	61.75[a]	1246.72[a]	1184.97[b]	95.58[a]	33.86[a]	2.82[a]
SEM Significance	0.004 *	4.81 *	4.81 *	0.98 *	0.14 *	0.24 *
Enzyme &CLM Interaction	*	*	*	*	*	*

Treatment means with different superscripts along the same column are significantly different($p<0.05$)
NSA–no supplement added
SEM – standard error of mean
*-- significance

Table 3: Nutrient retention of broiler starter chicks fed cassava leaf meal in partial replacement for groundnut cake with or without enzyme supplementation

Level of CLM (%)	Nutrient Intake (g)	Fecal Output (g)	Nutrient Retained (g)	Nutrient Retention (%)
0	3.79[b]	1.36[b]	2.43[d]	64.11[d]
20	3.79[b]	0.94[d]	2.85[a]	75.19[a]
40	3.82[a]	1.02[c]	2.8[b]	73.29[b]
60	3.72[c]	1.52[a]	2.47[c]	66.39[c]
SEM Significance	0.01 *	0.07 *	0.63 *	1.4 *
Supplementation NSA	3.78	1.20	2.63	69.74
Enzyme (Maxigrain)	3.74	1.44	2.3	58.16
SEM Significance	0.01 *	0.05 *	0.07 *	2.6 *
Enzyme &CLM Interaction	*	*	*	*

Treatment means with different superscripts along the same column are significantly different ($p<0.05$)
NSA – no supplement added
SEM – standard error of mean
*-- significance

Table 3 shows the result of nutrient characteristics of broiler starter chicks fed varying levels of cassava leaf meal with or without enzyme supplementation as partial replacement for groundnut cake. There were significant effects ($p<0.05$) with respect to nutrient retention by the experimental animal. The nutrient intake (feed) corresponds to nutrient retention, highest at 40% inclusion (3.82) and lower at 60% inclusion of the cassava leaf meal (3.72), while values remain the same at 0% and 20% inclusion (3.79). However, nutrient retention was high at 20 and 40% level of cassava leaf meal inclusion respectively. In terms of supplement, there were significant effects ($p<0.05$) in the nutrient intake. Broiler (starter) chicks with no supplement added fed better (3.78) compared to those fed with enzyme supplement (3.74). However, the interaction between the cassava leaf meal and the supplement showed significant effect ($p>0.05$) on the nutrient intake.

Conclusion and Recommendations

Cassava Leaf Meal (CLM) which is the by-product of cassava root harvest, are highly nutritious. Like other dark green leaves, they are an extremely valuable source of protein (140 – 400g/kg DM), minerals, vitamins B^1, B^2, C and carotenes (Eggum, 1970; Adewusi and Bradbury, 1993) [6, 2]. However, the leaf contains cyanogenic glucosides, six times higher than in the roots. Moreover, tannin and phytin may also limit the nutritional value of cassava leaves (Reeds *et al.*, 1982) [12].

In this study, significant ($p<0.05$) differences were obtained in final weight of birds fed cassava leaf meal with or without enzyme supplementation varying with each level of inclusion from 0% to 60%with values ranging from 1427.67 to 927.67g. This means that the performance of birds fed cassava leaf meal with or without enzyme supplementation decreases as the inclusion level increases. This agrees with Ravindran *et al*. (1990) [10] who evaluated CLM as a substitute for coconut meal and reported that broiler performance was depressed at higher levels and that up to 15% level can be used with satisfactory results. In terms of supplement, the final weight of birds fed diet with enzyme was higher than birds fed without enzyme supplement.

The differences in values of feed intake recorded at all levels of CLM inclusion depressed remarkably probably due to high cyanide level and tannins present in the leaves. The presence of condensed tannins in cassava leaves presents ground for some concern (Reed *et al*. 1982) [12]. They are capable of forming indigestible complexes with protein, thus increasing the amino acid requirements of animals fed diets containing cassava leaf meal. The reduction in the rate of daily weight gain was observed at the different levels of inclusion of the Cassava leaf meal. The inclusion at 20% is a bit close to the inclusion at 40% compared to that inclusion of 60%.

Cassava Leaf Meal was seen to be a promising feed ingredient obtained at lesser price when it is well processed. It is not harmful to broiler chicken when given at a low level and it gives satisfactory results as Ravindran *et al,* (1990) [10] opined since it could be seen that broiler performance seemed to depress at higher level inclusions. Enzyme is a necessity to the performance of the broiler (starter) chicks to help break down and digest the feed diet because of the presence of tannins and phytins in cassava leaves which could be a major challenge in the digestibility of cassava leaf meal by the broiler (starter) chicks. From the results of this study, Cassava Leaf Meal was not toxic, hence, could be introduced to broiler (starter) chicks at about 20% replacement level.

References

1. OAC. Association of official analytical chemists, official methods of analysis. 15th edition, Washington, D.C., 1995.
2. Adewusi RA, Bradbury JH. Carotenoids in cassava: Comparison of open-column and HPLC methods of analysis Journal of the science of food and agriculture. 1993; 62(4):375-383.
3. Devendra C. Non-conventional feed resources and fibrous agricultural residues. Strategies for expanded utilization. Proceedings of a Consultation held in Hisar, India, 1988; 21-29, IDRC, ICAR
4. Devendra C. Cassava as a feed source for ruminants. In Cassava as animal feed. Proc. of Cassava as Animal Feed Workshop, Eds B. Nestel, 1977.
5. Duncan DB. Multiple rage and multiple F-test. Biometrics. 1995; 11:1-43.
6. Eggum OL. The protein quality of cassava leaves. British Journal of Nutrition. 1970; 24:761-769.
7. Esonu BO, Ihenkwumere FC, Iwuji TC, Akamu N, Nwugo OH. Evaluation of Microdermis puberula leaf meal as an ingredient in broiler starter diets. Nig. J. Anim Prod. 2003; (30):3-8.
8. Fasuyi AO. Nutrient composition and processing effects on cassava leaf (Manihotesculenta, Crantz) antinutrients. Pakistan Journal of Nutrition. 2005; 4(1):37-42.
9. Khajaren S, Khajaren JM. Use of Cassava Production Poultry Feeding In: Roots, Tubers, Plantains and Bananas in Animal Feeding Proceedings, the FAO Expert Consultation held in CIAT, Cal Columbia, Eds D Machin and S Nyold, 1991; pp. 141-156.
10. Ravindran V. Preparation of cassava leaf products and their use as animal feeds: FAO Corporate Document Repository produced by: Agriculture and Consumer Protection, 1990; pp. 1-7.
11. Ravindran V, Cyril HW. Utilization of Non-Conventional Feed Resources in Poultry Production: Results of On-farm Trials: Department of Animal Science, University of Peradeniya, Peradeniya, Sri Lanka, 1993.
12. Reed JD, McDowell RE, Van Soest PJ, Horvath PJ. Condensed tannins: a factor limiting the use of cassava foliage. Journal of the Science of Food and Agriculture. 1982; 33:213-220.
13. Steel RG, Torrie JH. Principles and Procedures of Statistics. Mc Graw Hill Book Company, New York, USA, 1980.