NIGERIAN AGRICULTURAL JOURNAL
ISSN: 0300-368X
Volume 52 Number 3, December 2021 Pg. 263-267
Available online at: http://www.ajol.info/index.php/naj
https://www.naj.asn.org.ng

GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF BROILER CHICKENS FED DIET CONTAINING GRADED LEVELS OF PRO-VITAMIN-A CASSAVA (*Manihot esculenta*) LEAF MEAL AS REPLACEMENT FOR GROUNDNUT CAKE

Urom, S.M.O.C., Nsing, F.E., Onunkwo, D. N., Zachary, B.N, Onabanjo, R.S. and Oko E. C.
Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria
Corresponding Authors' email: donunkwo1@gmail.com

Abstract
The study was conducted to investigate the performance of broiler chickens fed diet containing Pro-vitamin-A Cassava Leaf Meal (PVACLM) as a replacement for groundnut cake (GNC) protein. A total of 120-day-old Ross-308 broiler chicks were randomly allotted into 4 treatment groups of 30 birds per treatment, each group further divided into 3 replicates of 10 chicks per replicate in a Completely Randomized Design (CRD). The group were tagged as treatment 1 (T_1) treatment 2 (T_2), treatment 3 (T_3) and treatment 4 (T_4) at the ratio of 0%, 5%, 10% and 15% PVACLM for T_1, T_2, T_3 and T_4respectively. Treatment 1 had no PVACLM, designated control. The feeding trial lasted for 56 days. Results for growth parameters showed that there were no significant differences ($p>0.05$) among the treatment groups, except in feed conversion ratio (FCR). The best feed conversion ratio (2.63) was found in 10% inclusion level of PVACLM (T_3), followed by 15%, 0%, while 5% was the lowest. Least levels (36.6967 and 26.6667) of mortality were recorded in T_2 and T4 respectively. Carcass characteristics shows that T_4 (15%) inclusion level had better performance ($p<0.05$) in thigh weight (17.75 g). therefore, for efficient productivity and reduction in cost of production 10% inclusion of graded PVACLM is recommended.

Keywords: Performance, FCR, PVCLM, mortality, thigh weight, productivity, cost reduction

Introduction

Poultry, through the provision of meat and egg continue to serve as an excellent and cheap source of animal protein for Nigerians. The full potential of poultry products as panacea to insufficient animal protein intake of Nigerian has not been achieved principally because of inadequate feeds. However, feed cost is presently very high and makes up to 60-70% (Onunkwo*, et al*., 2021a) or 70-80% (Oruwari *et al.*, 1995) of the total cost of production in Nigeria compared to 50-70% in developed countries (Thackie and Flenscher, 1995). This has remained the major factor limiting the development and expansion of poultry farming. The bulk of the feed cost arises from protein concentrates such as fish meal, soybean meal and groundnut cake. Prices of these conventional protein sources have soared so high in recent times that it is no longer economical to use them in poultry feeds (Esonu *et al*., 2001). Cassava is traditionally grown for root production. It yields about 10 – 30t ha-1 of leaves that is usually wasted or used as manure (Bokanga, 1994). However, the leaves have become increasingly important as a source of protein for monogastric and ruminant animals (Wanapat 2002). Cassava leaves are rich in protein, but they are low in sulfur amino acids (Wanapat 2002). Dried cassava leaves processed for food or feed (Cassava Leaf Meal or CLM; also called cassava leaf powder) has been analyzed in detail as a potential source of dietary protein and other nutrients. Average leaves contain about 70% water, whereas, the dried meal is approximately 9–10% moisture (Wobeto *et al.,* 2007). Energy content in leaves is high for both ruminants and swine, with digestibility ranging from 62–73%, and Digestible Energy (DE) (MJ/kg DM) values of 12.3–13.2, slightly higher (15.2), measured in wilted forage fed to growing pigs. Energy values are considerably lower for poultry [apparent Metabolizable Energy (ME) 7.8 MJ/kg DM for broilers], due to high fibre levels in leaves. Fibre content increases with maturity; both Nitrogen Detergent Fiber (20–30% of DM, up to 60% in some reports) and Crude fibre (8–20%) fractions are not insignificant. Crude protein, with highest levels in leaves approximately 12 months of age, is reported to vary from ~17 to 40% of Dry matter (Wobeto *et al*., 2007), averaging ~21%; current summary data average slightly higher (25–28%). Almost 85% of the crude protein fraction is true protein according to Onunkwo *et al*. (2021). Onunkwo*, et al*. (2021) and Montagnac *et al*. (2009) reported that cassava leaf protein is deficient in methionine but high in lysine. Cassava leaves are a good

source of minerals, particularly Ca, Mg, Fe, Mn and Zn (Ravindran and Ravindran, 1988). Limited data on the use of cassava leaf meal and cassava foliage meal in poultry diets indicate that these products might be used, at low inclusion levels, as pigment agents, or, at higher levels, as partial substitutes for the conventional feedstuffs. Cassava leaf meal could be included up to 20% in broiler diets, whereas, the inclusion levels of cassava foliage meal were slightly lower (Khieu, 2005). To close the gap between high cost of feed ingredients and non-availability of non-conventional feedstuff, there is need to use more of un-conventional feedstuff. Consequently, the optimum levels of inclusion PVCLM in poultry diets have not been fully studied. This has become essential in animal feeding to minimize the competition of livestock with human for conventional fed and for economic reasons. Most poultry farmers and Scientists in this country have inadequate information on the importance of pro-vitamin-A cassava leaf meal (yellow cassava) and its use in broilers production. The effect of this alternative feedstuff on the growth performance and nutrient utilization of broilers is very important for the growth of poultry industry in Nigeria. Therefore, PVCLM has its advantages that make it a possible feedstuff in poultry production**.** PVCLM is readily available in most southern and western part of Nigeria. If properly harnessed, the leaf meal of yellow cassava which is dried and graded can potentially provide energy and protein required in diets of broilers. PVCLM if added at acceptable replacement levels can help to reduce the cost of animal feed and by so doing, will eventually led to high profit and reduce cost of production.

Materials and Methods

Experimental Site

The study was carried out at the Poultry Unit of the Teaching and Research Farm of Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria (MOUAU). The area falls within the Tropical rain forest zone, it is located at latitude 05° 21°N and longitude 07° 33°E, its elevation is about 112m above sea level. It has an average Rainfall of about 2177mm/annum, Relative Humidity of about 50-90% and a monthly temperature range of 17°-36°C. (Meteorological Station, NRCRI, Umudike, 2020).

Experimental Animals and Management

A total of 120-day-old chicks (broilers) used for the research were purchased from a reputable hatchery in Ibadan, Oyo State Nigeria. The chicks were brooded in a deep litter for 4 weeks They were provided with heat using kerosene lampshade, hot coal pot and a 400watt electric bulb. The broilers were well vaccinated and medicated for the period. The birds were randomly divided into 4 treatment groups of 30 birds per treatment and replicated 3 times with 10 birds per replicate. Feed and water were provided *ad libitum*. The broiler chickens were reared on the deep litter house using wood shaving. This study lasted for 8 weeks.

Experimental Diet and Preparation

Pro vitamin A cassava leaf (*Manihot esculenta)* gotten from National Root Crop Research Institute (NRCRI), Umudike was air dried (drying under shade) for about 2-3 days, then it was chopped into pieces and milled (using hammer miller). The pro-vitamin A cassava leaf meal (PVACLM) was used to substitute groundnut cake (GNC) protein at levels of 0%, 5%, 10% and 15% for T_1 (control), T_2, T_3, and T_4 inclusion levels for both starter mash and finisher mash as shown in Table 1 and 2 respectively.

Experimental Design

The experimental design used in this experiment was CRD (Completely Randomized Design) because the study dealt with only one factor of interest and there was no effect of block in the experiment, the experimental design used for the research project is completely randomized design CRD with the model;

$$Y_{ij} = u + T_{ij} + e_{ij} \quad \ldots\ldots (1)$$

Where:
Y_{ij} = Single Observation
u= Overall Mean
T_i = Effect of Treatments
e_{ij} = Random Error; ~ iind(0, δ^2).(Independently, Identically, Normally, Distributed with Zero mean and Constant Variance).

Data Collection

Data was collected on the following: **Growth Performance Parameters**

a. **Initial body weight:** This was taken on arrival.
b. **Final body weight:** The birds were weighed randomly, and the average weight was taken.
c. **Daily feed intake =**

$$\frac{\text{feed given} - \text{left over}}{\text{Number of birds}}$$

d. **Weekly weight gain:** The birds were picked at random and weighed and the average weight was taken.
e. **Feed Conversion Ratio (FCR) =**

$$\frac{\text{quantity of feed consumed}}{\text{weight gained}}$$

f. **Percentage (%) Mortality =**

$$\text{Number of birds bought} \times 100$$

Carcass Evaluation and parameters measured

At the end of the 8 weeks study, 2 birds were taken from each replicate for carcass evaluation**.** The birds slaughtered were fasted for 24 hours before slaughtering to reduce the contents of the gastro-intestinal tract, but water was supplied to them *ad libitum.* Slaughtering was done by making a clean cut across the jugular vein and the birds were allowed to bleed for at least two minutes. The weights of the birds before slaughtering and after slaughtering were taken. Each bird was dipped in hot

water of about 60°C for about a minute and then defeathered. The defeathered weights of the birds were also taken. The carcass was cut into various parts according to the procedures described by Ojewola and Longe (1999). All the cut parts (breast, muscle, back, thigh, wing, etc.) were weighed and expressed as percentage dress weight.

Statistical Analysis

Data collected were subjected to analysis of variance (ANOVA). The mean separation was carried out using Duncan's Multiple Range Test as described by Duncan (1955).

Results and Discussion

The result of the growth performance of broiler chicken fed graded levels of pro-Vit-A Cassava leaf meal is presented in Table 3. There were no significant differences (P> 0.05) among the treatment groups in all the parameters measured except in feed conversion ratio and mortality. The best value in feed conversion ratio was recorded in T_1 (2.49), followed by T_3(2.63), while the least values were recorded in T_4(2.79) and T_2 (3.69). The mortality values of 53.33% were recorded highest in T_1 and T_3 each, while lower values of 36.67 and 26.67 were recorded in T_2 and T_4 each. Result recorded in this work did not tally with the result reported by Adedokun *et al*., (2017) and Ironkwe and Ukanwoko (2012*)* who reported significant differences in all parameters measured except in initial weight. Adedokun *et al.* (2017) also recorded increase in feed conversion ratio with increase in inclusion level of UMUCASS, while in this trial; there was decrease in feed conversion ratio with increase in the level of Pro-vit-A cassava leaf meal. Average feed intake of 41.33g to 51.67g recorded in this trial is higher than the range of 28.75 and 35.67 recorded by Adedokun *et al.* (2017) but tallies with Ngiki *et al.* (2014), who reported high feed intake in feeding composite fed to broiler chickens, who insinuated that the higher feed intake recorded could be that the birds ate to meet their nutritional requirement. The result of the carcass characteristics of broiler chickens fed pro-vitamin A cassava leaf meal is shown in Table 4. The dressed weight of the broiler chickens expressed as percentage live weights were similar between treatment groups. The cut parts of the carcass followed the same pattern. The birds on the T_1 (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 T_2, T_3 and T_4 groups. The depressed weights of the carcass cut parts may be as a result of low feed intake, thus the inability of the birds to convert the feed into meat (Esonu *et al*., 2001). Evaluation of carcass were similar in all the dietary treatment in line with the findings of Onunkwo *et al*. (2020). The results of the primal cut up parts on thigh, though significantly different ($p>0.05$) from one another fell within the level reported by Onunkwo *et al*. (2018). The highest ($p>0.05$) percentage (17.75) of the thigh cut was recorded by the broiler chickens placed on 15% of pro vitamin A cassava leaf meal which is a good indication that tissue synthesis was at the best at that particular dietary level.

Conclusion

Pro vitamin A Cassava leaf meal is a good source of protein, high in lysine but deficient in methionine and tryptophane, and is rich in vitamins and minerals. Pro-Vit-A Cassava leaf meal can replace levels of GNC protein at inclusions of 10% inclusion level. The findings of the study suggest that broilers can be placed at 10% levels for better performance. Recommendation of pro vitamin A cassava leaf meal vary within wide ranges according to several research carried out by several authors. Protein quality can be improved by further processing cassava leaves into leaf protein concentrate. The price for cassava leaves is generally low when compared to the price of protein sources used in feed formulation. Therefore, could be easily affordable and accessible as protein source for broiler birds which will aid to improve the birds' physiological performance.

References

Adedokun, O.O., Eburuaja, S. A., Onunkwo, D. N. (2017). Evaluation of cassava (*Manihot esculentum crantz* var. umucass 36) as an alternative feed resource for broiler chickens. *Nigerian Journal of. Animal Science*, 2017 (2):123 - 131.

Bokanga, M. (1994). Distribution of Cyanogenic potentials in the cassava germ plasm. *Acta horticulture*, 375: 117-123

Duncan, D. B. (1955) Multiple Range and MultipleF-Test. *Biometric*, 11:1-5

Esonu, B.O., Emenalom, O.O., Udedibie, A.B.I., Herbert, U., Ekpor, C.F., Okoli, I.C.and Iheukwumere, F. C. (2001). Performance and blood chemistry of weaner pigs fed raw mucuna beans (velvet bean) meal. *Tropical for Animal Production Investigation,* 4: 49-54.

Ironkwe, M. O. and Ukanwoko, A.I. (2012). Growth performance of broiler finisher birds fed composite cassava meal (CCM). *Bulletin of Environment, Pharmacology, and life Sciences*, 1 (6): 30-34.

Khieu B. (2005). Use of Cassava leaves for livestock feeding in Cambodia. Proceedings of the regional workshop on the use of cassava Roots and Leaves for On-going Farm Animal Feeding. *Hue Vietnam,* 2005. Pp. 17-19.

Montagnac, J.A., Davis, C.R. and Tanumihardjo, S.A. (2009). Nutritional value of cassava for use as a staple food and recent advance for improvement. *Comprehensive review in Food Science and Food Safety,* 8: 181-188.

Ngiki, Y. U., Igwebuike, J. U. and Moruppa, S. M. (2014). Utilization of cassava products for poultry feeding: a review. *International Journal of Science Technology;* 2 (6):48-59.

NRCRI (2020). *Agro-Meterology Unit*. National Root Crop Research Institute, Umudike, Abia State. Nigeria.

Ojewola, G. S. and Longe, G. O. (1999). Protein and energy in broiler starter diets. Effect on growth performance and energy utilization. *Nigerian Journal for Animal Production,* 26:23-28.

Onunkwo, D. N., Udeme, M. A., Ezea, J. and

Table 3: Growth performance of broiler chickens fed pro-vitamin A cassava leaf meal (PVACLM)

Parameter	T1 0%PVACLM	T2 5%PVCLM	T3 10%PVCLM	T4 15%PVCLM	SEM
Initial weight (g)	376.87	388.57	385.10	396.47	7.45
Final weight (g)	2165.33	1841.00	1968.67	1879.00	57.37
Weight gain (g)	1788.33	1452.67	1583.67	1482.67	57.52
Average daily weight gain (g)	42.58	34.58	37.70	35.29	1.37
Feed intake (g)	4469.33	5178.67	4177.67	4144.33	202.43
Average daily feed intake(g)	106.41	123.30	99.47	98.67	4.82
Feed conversion ratio(g)	2.49b	3.69a	2.63ab	2.79ab	0.20
Mortality	53.33a	36.67b	53.33a	36.67b	3.71

[ab] Means within the rows with different superscripts differ significantly (p>0.005); SEM-Standard error of mean

Table 4: Carcass characteristics of broilers fed pro-vitamin A cassava leaf meal (PVACLM)

	T_1 0%PVACLM	T_2 5%PVACLM	T_3 10%PVACLM	T4 15%PVACLM	SEM
Live weight (g)	2165.33	1841.00	1968.67	1879.00	57.36
Dressed weight (g)	1409.33	1221.67	1269.00	1165.67	50.44
Dressed weight (%)	65.02	65.81	64.36	62.05	0.94
Back cut (%)	20.57	18.93	19.48	18.97	0.29
Breast cut (%)	32.28	34.04	34.42	31.04	0.72
Thighs (%)	16.82^{ab}	15.57^{c}	16.05^{bc}	17.75^{a}	0.28
Drumstick (%)	16.68	15.41	15.26	16.85	0.36
Wings (%)	12.42	13.67	12.41	13.38	0.27

[abc] Means within the rows with different superscripts differ significantly(p>0.005); SEM-Standard error of mean

Ezenyilimba, B. N. (2021b). Blood profile of finisher broiler chickens fed diet containing leaf meal composite as alternative to commercial broiler premix. *The Nigerian Agricultural Journal,* 52(2): 306-311.

Onunkwo, D. N.., Udeme, M. A., Ezea, J and Daniel-Igwe, G. (2021b). Growth performance of starter broiler chickens fed diet containing leaf meal composite as alternative to commercial broiler premix. *International Journal of Agriculture, Management, and Technology.* 5 (1): 208 – 211.

Onunkwo, D. N., Daniel-Igwe, G., Afam-Ibezim, E., Ezenyilimba, B. N. and Udokwu, I. U. (2020). Carcass characteristics and organ proportions of broiler chickens fed different plant protein sources in an Acha grain-based diet. *Nigerian Journal of Animal Production,* 47(6): 108 – 112.

Onunkwo, D. N, Amaduruonye, W. and Daniel-Igwe, G (2018). Assessment of abattoir wastes (bovine blood and rumen content) on carcass characteristics, internal organs and organoleptic properties of broiler birds. *Nigerian Agricultural Journal*, 49(1): 201-209.

Oruwari, B. M., Sese B. T., Mgbere O. O. (1995). The effect of whole palm kernel on Broiler performance and production cost: Energy protein ratio. *Intenationa Journal of Animal science,* 10:115-120

Ravindran,V and Ravindran, A.S.B. (1988).Effect of stem pruning in cassava root yield and leaf growth. Sri Lankan. *Journal of Agricultural Science,* 25(2):32-37.

Thackie, A.M. and Flenscher, J. E. (1995) Nutritional value of wild Sorghum fortified with Leucaena (*leucana leuccocepherla Wh.Lam*).bull., *Animal Health Africa*, 43:223-275.

Wanapat, M. (2002). In Research and Development in Asia: Exprig New Opportunities for an Ancient Crop, R.H..Howeler (ed), Proc.7th Regional Cassava Workshop. Pp. 22.

Wobeto, C. (2007). Anti nutrients in the Cassava (*Manhot esculenta Crantz*) leaf powder at the three ages of the plant. *Food Science and Technology*

Table 1: Composition of broiler starter diet containing Pro-vitamin-A Cassava Leaf Meal (PVACLM)

Ingredients	**T_1 0%PVACLM**	**T_2 5%PVACLM**	**T_3 10%PVACLM**	**T_4 15%PVACLM**
White maize	51.30	51.30	51.30	51.30
Groundnut cake	18.00	16.80	15.60	14.40
Soya bean meal	17.00	17.00	17.00	17.00
Pro-vitamin. A cassava leaf meal	0.00	1.20	2.40	3.60
Wheat offal	5.00	5.00	5.00	5.00
Bone meal	3.00	3.00	3.00	3.00
L – lysine	0.10	0.10	0.10	0.10
Fish meal	5.00	5.00	5.00	5.00
DL – Methionine	0.10	0.10	0.10	0.10
Common salt	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Calculated analysis				
Crude protein	23.23	22.98	22.74	22.50
ME (Kcal/Kg)	2770.3	2744.11	2717.92	2691.73

Table 2: Composition of broiler finisher diet containing Pro-vitamin-A Cassava Leaf Meal (PVACLM)

Ingredients	**T_1 0%PVACLM**	**T_2 5%PVACLM**	**T_3 10%PVACLM**	**T_4 15%PVACLM**
White maize	59.30	59.30	59.30	59.30
Groundnut cake	13.00	12.35	11.70	11.05
Pro-vitamin. A cassava leaf meal	0.00	0.65	1.30	1.95
Soya bean meal	16.00	16.00	16.00	16.00
Fish meal	4.00	4.00	4.00	4.00
Wheat offal	4.00	4.00	4.00	4.00
Bone meal	3.00	3.00	3.00	3.00
L – lysine	0.10	0.10	0.10	0.10
DL – Methionine	0.10	0.10	0.10	0.10
Common salt	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Calculated analysis				
Crude protein	20.06	19.95	19.83	19.71
ME (Kcal/Kg)	2831.61	2817.43	2803.23	2789.04