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## **HAEMATOLOGICAL AND SERUM INDICES OF BROILER CHICKENS FED DIETS CONTAINING GRADED LEVELS OF PRO-VITAMIN-A-CASSAVA LEAF MEAL AS REPLACEMENT FOR GROUNDNUT CAKE PROTEIN**

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### **ABSTRACT**

*The full potential of poultry products as a panacea to insufficient animal protein intake of Nigerians has not been achieved principally because of inadequate feeds as a result of high cost of feed stuff. A study was conducted to determine the physiological response of broiler chickens fed pro-vitamin-A-Cassava leaf meal at different inclusion levels in replacement to groundnut cake protein. A total of 120 broilers were used to evaluate the physiological response of broilers fed diet containing Pro-vitamin- A-cassava leaf meal as a replacement for Groundnut cake protein. The study was conducted at the Poultry unit of the Teaching and Research Farm of Michael Okpara University of Agriculture, Umudike, Abia State. The birds were weighed on arrival to get the initial weight; the chicks were randomly selected and divided into four (4) treatment of 30 birds\group. Each group were furtherly divided into 3 replicates of 10 birds\replicate. The birds were fed ad libitum with chick starter diet from day old to four (4) weeks of age before introducing the finisher diets from five (5) to eight (8) weeks. Clean drinking water were provided for the birds at libitum. Proper sanitation, routine medication, and vaccination such as lasota against new castle disease, gumboro vaccine were maintained to forestall any outbreak of disease. The leaves of Pro Vit-A- cassava leaf was collected at the point of harvest from cassava farm of National Root Crops Research Institute (NRCRI). Cassava leaves without the petioles were harvested, wilted overnight, and air-dried under shade for five days, milled using hammer mill and bagged as Cassava leaf meal. These were used to formulate four diets, at 0%, 5%, 10% and 15% levels designated T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> respectively to replace completely groundnut cake or partial replacement. At the end of the experiment, hematological, serum indices and feed cost benefit of broiler chickens fed graded levels of Pro-Vitamin-A Cassava leaf meal were measured. The experimental design was a Completely Randomized Design (CRD) at all the experimental phases. The birds were divided into 4 treatment groups of 30 birds per group. Each treatment group was further divided into replicates of 10 birds per replicate At the end of the experiment, there were significant differences in the haematological parameters measured. The results showed that there were significant differences ( $P < 0.05$ ) in most of the parameters measured. The red blood cell (RBC) increased with increase in the Pro-Vit-A Cassava leaf meal. Packed cell volume (PCV) and haemoglobin (HB) followed the same trend with RBC, while WBC reduced with increase in PVACLM inclusion level. There were no significant differences ( $P > 0.05$ ) in the treatment groups in Platelet, MCVC (MEAN CORPSULAR VOLUME CONCENTRATION) MCH (MEAN CORPSULAR HAEMOGLOBIN), and MCHC, (MEAN CORPSULAR HAEMOGLOBIN CONCENTRATION). The highest value recorded in RBC (RED BLOOD CELL), PCV (PARKED CELL VOLUME), and HB(HAEMOGLOBIN) were 3.5, 29.67, and 11.47 respectively all in T<sub>1</sub>. The lowest value obtained were recorded in T<sub>1</sub> as follows: 2.79, 24.66, and 9.23 for RBC, PCV, and HB respectively. The highest values in WBC 19.03 were recorded in T<sub>1</sub> while the lowest value was recorded of 15.95 was recorded in T<sub>4</sub>. The result of serum indices shows significant differences ( $P < 0.05$ ) in total protein, Globulin and Cholesterol. Total Protein and Globulin increased with increased levels of PVACLM, while Cholesterol decreased with increased levels of PVACLM. The highest values 3.49, and 1.32 recorded in total protein and Globulin respectively were found in T<sub>3</sub>, while the least values were recorded in T<sub>1</sub> for both. However, reverse was the case in cholesterol that recorded the highest value of 85.70 in T<sub>1</sub> and the least value of 74.55 in T<sub>4</sub> respectively. There was significant difference in Glucose that increased with increased levels of PVACLM with highest value of 172.33 recorded in T<sub>4</sub> while the least value of 95.67 was recorded in T<sub>1</sub>. The combination of Groundnut cake meal (GNC) and Pro-Vit-A cassava leaf meal (CLM) gave a good protein concentrate with a good balance of amino acid and enriches the diet with lysine. The result of this study showed that feeding diets containing Pro Vitamin-A-Cassava Leaf Meal can lead to reduction in the cost of feed and poultry production since the high cost of feed is mostly hinged in the high cost of major fed ingredient like the Soybean, Ground Nut Cake etc. and also availability of feed at all season since cassava leave is readily available at all seasons and its use has no deleterious effect on broilers rather it enhanced the health status of the birds*

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## 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 a panacea to insufficient animal protein intake of Nigerians has not been achieved principally because of inadequate feeds. Feed cost remains the major factor limiting the development and expansion of poultry farming. The bulk of the feed cost arises from protein concentrates such as fishmeal, 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). This perennial problem has necessitated the search for alternatives to the expensive grains and protein concentrates (Adeyemi, 2005). Animal Nutritionists have therefore concluded that replacement of expensive conventional feed ingredients with cheap and available substitutes represents a suitable strategy at reducing feed cost and encouraging production. Many research efforts were invested in the search for alternatives to soybean in poultry diets. These efforts involve the use of oilseed meals such as Castor oil seed (Ani and Okorie, 2009), Mucuna (Abdulazeez *et al.*, 2016); *Alchonia cordifolia* seed meal (Phuc *et al.*, 2000), rubber seed meal (Phuc *et al.*, 2000). The results of some of these efforts are conflicting and variable. Most of the studies conducted on lesser-known oilseed meals indicated the need for further processing as most of them are bedeviled by the presence of antinutritional factors.

Another major problem observed in the search for alternatives to soybean meal is the fact that the alternatives are most often seasonal in production and the quantity available is often too small for large scale utilization. As a result, it stands to reason that a viable alternative to soybean should not only be rich in nutrients, relatively free from anti-feed stuff but must be readily available in large quantities at all times. One possible source of cheap protein is leaf meal from some tropical legume and plants. Leaf meal have been reported to provide protein and some vitamins, minerals and oxycarotenoids, which cause yellow color of broiler skin, shank, and egg yolk (D'Mello *et al.*, 1987).

Cassava is traditionally grown for the production of roots. It yields about 10 – 30 tons/ ha 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 (Tuleun and Patrick, 2007). Cassava leaves are rich in protein, but they are low in sulfur amino acids (Soetan *et al.*, 2013). The leaf protein is reported to be limiting in methionine and tryptophan but rich in lysine, with overall biological value of 49-57% (Wanapat 2002). By the addition of cassava leaf meal to groundnut cake, the biological value of the protein (especially the amino acid) lysine level could be increased. Cassava leave meal is a plant protein source that is readily available everywhere at no cost. It contains high levels of protein and lysine. However, it is not popular in chicken diets because of its amino acid imbalance, low availability of its sulfur amino acid, (Emenalom *et al.*, 2011). Groundnut cake is readily available and has a comparable crude protein content with SBM, though deficient in lysine and methionine (Ijaiya *et al.*, 2011) which can be balance with CLM mix. The combination of Groundnut cake meal (GNC) and cassava leaf meal (CLM) is expected to give a good protein concentrate with a good balance of amino acid and enriches the diet with lysine. This study is therefore designed to determine the physiological response, reproductive performance and cost implication of pullets fed diets containing grade levels of CLM to substitute GNC meal protein

## Materials and Methods

### Location

This study was carried out at the Poultry unit of the Teaching and Research Farm, Michael Okpara University of Agriculture, Umudike, Abia State. Umudike is located on latitude 05° 29' N and longitude 07° 32' E, with an elevation of about 123m above sea level. The location has an annual rainfall of 2177mm per annum, with a relative humidity of about 50-90% and temperature range of 22°C – 36°C (Meteorological Station, NRCRI, Umudike, 2021).

### Experimental Birds and Management

A total of 120 day-old broilers was used in the study. The birds were divided into 4 treatment groups of 30 birds per treatment group. Each treatment group was further divided into 3 replicates of 10 birds per replicate. The birds were housed and reared deep litter poultry house. The experimental feed is shown in Table 1 (Starter) and Table 2 (Finisher): Treatment <sub>1</sub> (T<sub>1</sub>) = 0% Pro-Vit-A-CLM, T<sub>2</sub> = 5% Pro Vit-A-CLM, T<sub>3</sub> = 10%, Pro Vit-A-CLM, and T<sub>4</sub> = 15% Pro Vit-A-CLM, respectively.

**Table 1: Gross composition of the experimental Starter Broiler Chickens Diet**

Ingredients	T <sub>1</sub> (%)	T <sub>2</sub> (%)	T <sub>3</sub> (%)	T <sub>4</sub> (%)
White maize	51.3	51.3	51.3	51.3
Soya bean meal	17	17	17	17
Fishmeal	5.00	5.00	5.00	5.00
GNC	18.00	16.80?	15.60	14.40
Wheat offal	5	5	5	5
PVACLAM	00.00	1.20	2.40	3.60
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
<b>Bone meal why bold?</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
Total	100	100	100	100
<b>CALCULATED ANALYSIS</b>				
Crude protein	23.23	22.98	22.74	22.50
ME (Kcal/Kg)	2770.3	2744.11	22717.92	2691.73

**Table 2: Gross composition of the experimental Finisher Broiler Chickens Diet**

Ingredients	T <sub>1</sub> (%)	T <sub>2</sub> (%)	T <sub>3</sub> (%)	T <sub>4</sub> (%)
White maize	59.3	59.3	59.3	59.3
Soya bean meal	16	16	16	16
Fishmeal	4.00	4.00	4.00	4.00
GNC	13.00	12.35	11.7	11.05
Wheat offal	4	4	4	4
PVACLM	00.00	0.65	1.3	1.95
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
<b>Bone meal</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
Total	100	100	100	100
Calculated Analysis				
Crude protein	20.06	19.95	19.83	19.71
ME (Kcal/Kg)	2831.6	2817.43	2803.23	2789.04

## RESULTS AND DISCUSSION

The result of the haematological parameters of broilers fed graded levels of Pro-Vit-A Cassava leaf for replacement to groundnut cake protein is presented in Table 3. The results showed that there were significant differences ( $P < 0.05$ ) in most of the parameters measured. The red blood cell (RBC) increased with increase in the Pro-Vit-A Cassava leave meal. Packed cell volume, PCV and Hb, followed the same trend with RBC while WBC reduced with increase in PVACLM inclusion level. There were no significant differences ( $P > 0.05$ ) in the treatment groups in Platelet, MCVC, (MEAN CORPUSCULAR VOLUME CONCENTRATION), MCH, and MCHC. The highest value recorded in RBC, PCV and Hb were 3.5, 29.67, and 11.47 respectively all in T1. The highest values in WBC (19.03) were recorded in T1 while the lowest value (15.95) was recorded in T4. However, all values fall within the normal range for healthy chickens but higher than the range reported by Esonu *et al.*, 2001.

The values of packed cell volume (PCV) recorded in this work did not tally with the report by Udedibia and Opara, (1998) who recorded high values between 32.95 and 33.27 for broilers fed BSM but tallied with report of Adedokun *et al.* (2017) who reported range of 29.7 and 31.6. But recorded similar values with (16) in HB .who recorded the following values 11.81 and 11.68 g/dl obtained at different levels of BSM inclusion. PCV and Hb concentration are generally affected by inadequate intake of energy and protein with lower values which indicating anaemia. The result obtained in this study suggests the nutritional adequacy of the test material. Red blood cell (RBC) counts recorded in T4 ( $3.35 \times 10^6 / \text{mm}^3$ ) was higher ( $p < 0.05$ ) than the values obtained for birds in T1 ( $2.79 \times 10^6 / \text{mm}^3$ ) and ( $2.96 \times 10^6 / \text{mm}^3$ ) T2 group. Thus, animals with low white blood cell count are exposed to high risk of disease infection, while those with high counts can generate antibodies in the process of phagocytosis and have higher degree of resistance to diseases (Adedokun *et al.* (2017).

**Table 3: Haematological indices of broiler chickens fed diets containing graded levels of pro-vitamin-A-cassava leaf meal as replacement for groundnut cake protein**

Parameters	T1	T2	T3	T4	SEM
RBC	2.79 <sup>c</sup>	2.97 <sup>bc</sup>	3.19 <sup>ab</sup>	3.35 <sup>a</sup>	0.07
PCV	24.66 <sup>c</sup>	25.67 <sup>bc</sup>	27.67 <sup>ab</sup>	29.67 <sup>a</sup>	0.67
Hb	9.23 <sup>b</sup>	9.60 <sup>b</sup>	10.83 <sup>a</sup>	11.47 <sup>a</sup>	0.31
WBC	19.03 <sup>a</sup>	16.03 <sup>b</sup>	18.77 <sup>a</sup>	15.93 <sup>b</sup>	0.48
Platelets	93.33	103.67	97.67	98.33	1.74
MCV	88.51	86.41	86.64	88.44	0.55
MCH	33.15	32.29	33.61	34.20	0.39
MCHC	37.46	39.22	39.17	38.68	0.52

The result of the serum indices of broiler chickens fed diet containing Pro Vit A cassava leaf meal in replacement of Groundnut cake protein. ( $P < 0.05$ ) is shown in Table 4. The result shows significant differences ( $P < 0.05$ ) in total protein, globulin, and cholesterol. Total Protein and Globulin increased with increased levels of PVACLM while Cholesterol decreased with increased levels of PVACLM. The highest values 3.49, and 1.32 recorded in total protein and Globulin respectively were found in T<sub>3</sub>, while the least values were recorded in T1 for both, However, reverse was the case in Cholesterol that recorded the highest value of 85.70 in T1 and the least value of 74.55 in T4 respectively. There was significant difference in Glucose that increased with increased levels of PVACLM with highest value of 172.33 recorded in T4 while the least value of 95.67 was recorded in T1. The value recorded in total protein in this work tallied with the record reported by Adedokun *et al.* (2017) The Albumin value recorded

in this work was within the range of 0.08 and 1.15 recorded by Esonu *et al.* (2001) but lower than values recorded by Adedokun *et al.* (2017) on Globulin level who recorded between 0.9 and 2.05. The result also showed decrease in the cholesterol level as the level of the PVACLM which indicate a healthy status of the birds. The combination of Groundnut cake meal (GNC) and Pro-Vit-A cassava leaf meal (CLM) gave a good protein concentrate with a good balance of amino acid and enriches the diet with lysine. The result of this study showed that feeding diets containing Pro Vitamin-A-Cassava Leaf Meal can lead to reduction in the cost of feed and poultry production since the high cost of feed is mostly hinged in the high cost of major feed ingredient like the Soybean, Ground Nut Cake etc. and availability of feed at all season since cassava leaf is readily available at all seasons and its use has no deleterious effect on broilers rather it enhanced the health status of the birds

**Table 4: Serum indices of broiler chickens fed diets containing graded levels of pro-vitamin-A-cassava leaf meal as replacement for groundnut cake protein**

Parameters	T1	T2	T3	T4	SEM
Total Protein	3.22 <sup>b</sup>	2.98 <sup>c</sup>	3.49 <sup>a</sup>	3.21 <sup>b</sup>	0.06
Albumin	2.15	1.95	2.17	2.15	0.04
Globulin	1.07 <sup>b</sup>	1.03 <sup>b</sup>	1.32 <sup>a</sup>	1.06 <sup>b</sup>	0.04
Cholesterol	85.70 <sup>a</sup>	79.56 <sup>b</sup>	79.90 <sup>b</sup>	74.55 <sup>c</sup>	1.32
Urea	10.07	10.63	11.07	10.65	0.32
Creatinine	0.87	0.73	0.68	0.78	0.03
Glucose	95.67 <sup>c</sup>	166.67 <sup>ab</sup>	157.00 <sup>b</sup>	172.33 <sup>a</sup>	9.42

### CONCLUSION AND RECOMMENDATION

Pro vitamin A Cassava leaves meal are a good source of protein, high in lysine but deficient in methionine and tryptophan, and are rich in vitamins and minerals. Cassava leaf meal can replace other ingredients as a protein source at inclusions of 10 to 15% in broiler species. The findings of my study suggest that broilers can be placed at 15% level of inclusion of pro vitamin A cassava Leaf meal in their diet without detrimental health challenge while at 5%, the haematological and serum indices was not encouraging which could be because of the deficiency of the nutrient contained in the pro vit A cassava leaf meal. 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 bird's physiological performance.

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