Nigerian J. Anim. Sci. 2020 Vol 22 (2):248-254 (ISSN:1119-4308)

Growth performance and haematology of Isa-brown pullets fed diets containing graded levels of *Centrosema pubescens* leaf meal.

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Target Audience: *Farmers, Agricultural extension agents, Researchers, Animal nutritionists and Feed millers.*

Abstract

This study was conducted to determine the effect of dietary levels of Centrosema pubescens leaf meal (CLM) on the growth performance and haematological parameters of pullets. Twenty-four, five weeks old Isa-Brown pullets were weighed and randomly allotted into three dietary treatment groups and was replicated twice with eight pullets per treatment and four pullets per replica in a completely randomized design (CRD). Each treatment was replicated two times giving four birds per replicate in a completely randomized design (CRD). Pullets were fed dietary levels of CLM at 0, 2.5 and 5% in T1, T2 and T3 respectively from the 5th week of age. Results on growth performance showed significant (P<0.05) difference in average daily feed intake. T3 had the highest average daily feed intake of 209.5±0.00 g. Results on haematology showed significant (P<0.05) differences in packed cell volume, red blood cell count, haemoglobin concentration, white blood cell count and lymphocyte. T3 had the highest packed cell volume, red blood cell count and haemoglobin concentration (29.00±0.58%, 29.00, 10.62±0.23x10^{6}/mm^{3} and 8.55±0.15g/100ml, respectively). T1 recorded the highest white blood cell count (11650±95.74x10^{3}/mm^{3}). T1 and T2 had the highest lymphocyte levels (79.00±0.58). In conclusion, CLM should be incorporated in the diets of pullets up to 5% inclusion level to improve their average daily feed intake and some haematological parameters.

Keywords: *Pullets; Isa-Brown; Centrosema pubescens; Growth performance; Haematology; Diet*

Description of the Problem

Continuous rising cost of poultry feeds is a major problem for developing countries, more so as feed cost is about 65-80% of total cost of production (1;2). This value is very high as compared to the developed countries where it is lower (50-60%) (3). High cost of conventional protein sources has necessitated the use of leaf meal supplements which are affordable locally and relatively available all year round. Various leaf meals such as: Amaranthus (4), *Centrosema pubescens* (5;6), *Gongronemalatifolia* (7), *Moringa oleifera* (8) has been worked on. *Centrosema pubescens* commonly known as Centro or butterfly pea is a legume in the family Fabaceace and tribe Phaseolae. *C. pubescens* can be used as a cheap source of protein and it also contains high amount of proteins, vitamins, minerals and some phytochemical substances such as: saponins, tannins, alkaloids, flavonoids, triterpenes and cardiac glycosides (9). Furthermore, (10) extensively reviewed the nutritional potentials of some non-conventional feedstuffs and reported that incorporation of these non-conventional feedstuffs at high levels can reduce the quality of feeds and may also have negative effect on the animal. In this context; (11) recommended 5 and 10% dietary inclusion levels of leaf meals for broiler chicks and laying hens respectively. Also, (12) reported that 2%

Centrosema pubescens leaf meal (CLM) was adequate for pullets.

Haematology is one of the cornerstones of medical diagnosis of disease and is currently considered as an integral part of clinical laboratory diagnostics in avian species (13). Haematological studies are important in both animals and humans because blood is the major transport system of the body and the input or output substances of almost all the body's metabolic processes, (14) reported that any deviations from the normal state of health are detectable in the blood profile.

However, there is dearth of information on the use of CLM as protein supplements in pullets unlike other leguminous and non-leguminous leaf meals, hence the main purpose of the study was to evaluate the effects of *Centrosema pubescens* on growth indices and haematological characteristics of pullets.

Materials and Methods

Location and duration of the study: The experiment was conducted at the Poultry Unit of the Department of Animal Science Teaching and Research Farm, University of Nigeria, Nsukka. Geographical coordinates of Nsukka reveal that Nsukka lies within latitude 6°51'28"N and longitude 7°23'44"E and is 423 m above sea level (15). The climate of the study area is typically humid tropical, with relative humidity ranging from 55-85 % with mean daily temperature of 20° – 23.9°C and maximum ranges of 29.5°–34.9°C. The rainy season of Nsukka is from April to October and the dry season from November to March with annual rainfall range of 1600 – 1700 mm (15). The entire study lasted for a period of eight weeks.

Experimental animals and management: A total of twenty-four 12 weeks old Isa-brown pullets were used for the study. Water was given *ad libitum* and routine vaccinations and medications were administered. Pullets were randomly allocated into three dietary treatments (T1, T2 and T3). Each treatment was replicated two (2) times having four (4) birds per replicate. T1 (control) contained 0% of CLM, T2 and T3 contained 2.5% and 5% of CLM in a completely randomized design (CRD).

Source and processing of test ingredients: *Centrosema pubescens* leaves used for the study were obtained from bushes in the communities around the experimental station. The leaves were air-dried at room temperature for two to three days, ground and preserved in a water proof nylon bag for storage. Proximate analysis of the *Centrosema pubescens* leaf meal was done according to (16) to determine its nitrogen free extract (NFE).

Experimental design

The pullets were weighed at the beginning of the experiment (at 5 weeks old) and subsequently weighed weekly. Average daily feed intake was calculated each day by the weigh-back method while average daily weight gain and feed conversion ratio were calculated using the formula below.

Average body weight gain (g) = Final body weight − Initial body weight.

Average Daily weight gain (g) = $\frac{\text{Average body weight gain within the period of study}}{Number\ of\ days\ within\ the\ period\ of\ study}$

Daily feed intake was measured as = $\frac{Feed\ offered\ (g) - Feed\ recovered}{Number\ of\ birds\ in\ each\ replicate}$

Feed conversion ratio = $\frac{Average\ daily\ feed\ intake\ (g)}{Weight\ gain\ (g)}$.

Blood samples collected for haematological indices determination on the 8th week of the study. Four birds (2 birds per replicate) were randomly selected from each treatment for blood collection by slight and gentle puncture of the wing vein using sterilized needles. The samples were injected into tubes containing ethylene diamine tetra-acetic acid EDTA (anti-coagulant). The following haematological

indices were measured: Packed cell volume (%); Haemoglobin concentration (%); White blood cell count (Thousands/mm^3); Creatinine (%); Neutrophil (%); Lymphocyte (%); Monocyte (%); Basophil (%) and Eosinophil (%).

Table 1: Composition of experimental diets fed to pullets

Ingredients	**T1 (control) (%)**	**T2 (%)**	**T3 (%)**
Maize	40.54	39.49	38.43
Wheat offal	21.83	21.26	20.69
Soybean meal	16.3	15.81	15.34
Palm kernel cake	11.85	11.50	11.15
Fish meal	1.48	1.44	1.39
Lysine	0.25	0.25	0.25
Methionine	0.25	0.25	0.25
*Vitamin-Mineral Premix (VMP)	0.25	0.25	0.25
Salt	0.25	0.25	0.25
Limestone	4	4	4
Bone meal	3	3	3
CLM	0	2.5	5
Total	100	100	100
Calculated Analysis			
Crude protein (%)	18	18	18
Crude fibre (%)	5.68	5.60	5.94

*****Adivit-L VMP.

Table 2: Chemical Composition of Centrosema Leaf Meal

Parameters	(%)
Moisture	12.96
Ash	4.94
Ether extract	2.42
Crude fibre	3.34
Crude protein	19.84
Carbohydrate	56.50

Data collected on growth performance and haematological indices were subjected to Analysis of Variance (ANOVA) using the Statistical Package for Social Sciences (SPSS for windows, V21.0; SPSS Inc., Chicago, IL, USA). Significantly different means were separated using Duncan's New Multiple Range Test (DNMRT)(17). Significant means were determined at $P<0.05$, to determine the treatment effect, the following model was used:

$Y_{ij} = \mu + T_i + e_{ij}$

Where;

Y_{ij}= dependent variable;

μ = overall mean of the population;

T_i = mean effect of the ith treatment and

e_{ij}= unexplained residual element assumed to be independent and normally distributed.

Table 3: Growth performance values of Isa-brown pullets fed dietary levels of Centrosema Leaf Meal (CLM)

	Inclusion levels of CLM			
Parameters	**0%** **T1**	**2.5%** **T2**	**5%** **T3**	**P-value**
Initial body weight (g)	1075.00±0.16	1150.00±0.13	1185.00±0.14	0.86
Final body weight (g)	4387.50±0.41	4875.00±0.55	5587.00±0.47	0.26
Average daily weight gain (g)	59.00±0.00	66.50±0.00	78.50±0.00	0.17
Average daily feed intake (g)	181.50±0.00^{b}	157.80±0.00^{c}	209.50±0.00^{a}	0.00
Feed conversion ratio	3.08±0.25	2.37±0.29	2.67±0.23	0.24

^{a,b,c}Means with different superscripts in rows for different traits are significant (P<0.05).

Table 4: Haematological indices of Isa-brown pullets fed dietary levels of Centrosema Leaf Meal (CLM)

	Inclusion levels of CLM			
Parameters	**0%** **T1**	**2.5%** **T2**	**5%** **T3**	**P-value**
Packed cell volume (PCV) (%)	25.00± 0.58^{b}	26.00±0.00^{b}	29.00±0.58^{a}	0.00
Red blood cell count (RBC) (x10^{6}/mm^{3})	10.42 ±0.06^{b}	10.46±0.20^{b}	10.62±0.23^{a}	0.01
Haemoglobin conc. (Hb) (g/100 ml)	8.10±0.58^{b}	8.20±0.00^{b}	8.55±0.15^{a}	0.02
White blood cell count (WBC) (x10^{3}/mm^{3})	11650±95.74^{a}	11025±125.00^{b}	10500±57.74^{c}	0.00
Creatinine (%)	4.58±0.03	4.68±0.00	4.47±0.11	0.14
Neutrophil (%)	19.00±1.73	18.00±0.00	24.00±2.31	0.07
Lymphocyte (%)	79.00±0.58^{a}	79.00±0.00^{a}	73.50±2.02^{b}	0.02
Monocyte (%)	1.00±0.58	1.00±0.00	1.50±0.29	0.57
Basophil (%)	0.50±0.29	1.00±0.00	1.00±0.00	0.10
Eosinophil (%)	0.50±0.29	0.50±0.00	0.00±0.14	0.27

^{a,b,c}Means with different superscripts in rows for different traits are significant (P<0.05).

Results and Discussion

The percentage composition of the experimental diet is shown in Table 1. The proximate analysis of the *Centrosema pubescens* leaf meal is presented in Table 2.

The growth performance values of Isa-Brown pullets fed diet containing varying levels of dried *Centrosema pubescens* leaf meal (CLM) are presented in Table 3 while the haematological indices are presented in Table 4.

In growth performance (Table 3), significant (P<0.05) differences existed in average daily feed intake. The highest value of 209.50±0.00 g was recorded in T3 with the lowest value of 157.80±0.00 g recorded in T2. The results agree with findings of (18) who reported similar change in average daily feed intake of *Archachatina marginata* snails fed graded levels of CLM. However, it partially disagrees with report of (12) that 2% inclusion of CLM is adequate in laying birds as 5% proved to be more adequate in this study as it even had better improvement on average daily feed intake. There were no significant (P>0.05) differences in initial body weight, final body weight (FBW), average daily weight gain (ADWG) and feed conversion ratio (FCR). (19) reported that animals consume leafy forages more voluntarily than grasses due to their lower fibre content and higher digestibility. The result shows that growing pullets did better when higher levels of leaf proteins were included in the diet. (20) had

earlier reported that protein functions mainly in tissue growth of animals, this may also be the reason why Isa-Brown pullets fed dietary T3 had the highest value for weight gain (78.50±0.00 g) compared to those fed T1 and T2 with 59.00±0.00 g and 66.50±0.00 g, respectively even though without a significant (P>0.05) difference. It may equally suggest that increased levels of CLM in the meal of Isa-Brown diet will have the capacity to impact on the average daily weight gain significantly.

In haematological indices (Table 4), there were significant (P<0.05) differences in packed cell volume (PCV), red blood cell (RBC) count, haemoglobin (HB), white Blood Cell (WBC) count and lymphocyte. There were no significant (P>0.05) differences in creatinine, neutrophil, monocyte, basophil and eosinophil. In PCV, the highest value of 29.00±0.58% was recorded in T3 with the values of 26.00±0.00 % and 25.00±0.58% recorded in T2 and T1 respectively. The PCV value range of 25.00–29.00% obtained in the study is within the range of 24.9–45.5% reported by (21) and within the range of 30.75–34.25% obtained by (22) for healthy birds. The results are equally within the normal range of PCV values for chickens of 22-35% (23). This indicated that the CLM inclusion in the diet of birds did not cause any health impairment. In RBC count, the highest value of $10.62\pm0.23x10^6/mm^3$ was recorded in T3 with the values of $10.46\pm0.20x10^6/mm^3$ and $10.42\pm0.00x10^6/mm^3$ recorded in T2 and T1. These are higher than the normal range of RBC values for chickens of 2.5-3.5 x 10^6 µl, (1 mm^3=1 µl) (23). The highest value recorded in T3 may suggest that higher CLM inclusion improves RBC in pullets. In HB concentration, the highest value of 8.55±0.15g/100 ml was recorded in T3 with the values of 8.20±0.00g/100 ml and 8.10±0.00g/100 ml recorded in T2 and T1. The results agreed with the findings of (24) who observed that high mineral and vitamin contents of feed materials like leaves stimulate the synthesis of haemoglobin leading to its increase in the blood. The results are equally within the normal range of HB values for chickens of 7-13 g/dl, (1 dl=100 ml) (23). In WBC count, the highest value of $11650\pm95.74x10^3/mm^3$ was recorded in T1 with the lowest value of $10500\pm57.74x10^3/mm^3$ recorded in T3. The results are equally within the normal range of WBC values for chickens of 12-30 µl, (1 mm^3=1 µl) (23). The recorded low WBC counts with increased levels of CLM in diets may be due to the fact that CLM helps to fight pathogens or reduces stress. In Lymphocyte levels, the highest value of 79.00±0.58% was recorded in T1 and T2 with the lowest value of 73.50± 2.02% recorded in T3. These are within the range of lymphocyte values of 71-75.45% reported in chickens (25).

Conclusion and Application

1. From the results obtained in this study, it can be concluded that inclusion of *Centrosema pubescens* leaf meal in diets of pullets improved their feed intake but not their growth performance.
2. However, it can have the capacity to reduce feed cost as it compared favourably with the control and as such, farmers are encouraged to incorporate CLM in the diets of pullets to reduce feed cost and increase their profit margins.
3. Therefore, *Centrosema pubescens* Leaf meal inclusion at 5% level is adequate for laying birds. It is equally recommended that inclusion at higher levels should be experimentally investigated.

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