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INVESTIGATION OF DONKEYS' CAECAL CONTENT AND/OR BLOOD MEAL AS A SUSTAINABLE ALTERNATIVE FEEDSTUFFS FOR BROILER PRODUCTION.

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Abstract
The quest to reduce the cost of meat production as well as to enhance productivity of animal products (eggs and meat) for man consumptions has led to search for feed items that should be exploited in replacing conventional energy and protein sources of feed in poultry ration. This study focused on the investigation of cheaper and locally available alternative animal-by product particularly those that has no dietary values to human as an alternative to protein feedstuffs. Donkey's caecal content, donkey's blood and mixture of the caecal content and blood collected from the abattoir were mixed at a ratio of 3:1, and boiled separately for 30 minutes. The three (3) feed ingredients were sun-dried separately on concrete floor for four (4) days to about 12% moisture. The donkeys' caecal meal (DCM), donkeys' blood meal (DBM) and donkeys' blood-caecal mixture (DBCM) were milled in a hammer mill and stored for mixing with other feed ingredients for chemical analysis. All the parameters measured in proximate composition for donkey caecal meal had higher values than other tests ingredients. The result of the DBM was best since it reduced the anti-nutritional factor to 0.00%. The macro and micro minerals recorded highest values of sodium and iron in the DBM. The result of fibre fractions of the DCM recorded significantly ($P<0.05$) higher values (61.48%, 50.61% and 13.54%) for NDF, ADF and ADL than others respectively. All the parameters measured in macro mineral, micro mineral and anti-nutritional factors of DBM showed to be superior to others. This study concluded that the crude protein content of donkeys' blood meal (DBM) was 80.03 % while that of donkeys' blood-caecal meal (DBCM) was 27.73 %, hence, DBM can serve as a viable potential alternative protein source.

Keywords: Investigation, Donkeys' Caecal, Blood Meal, Sustainable Alternative Feedstuffs, Broiler Production

Description of Problem

In Nigeria poultry has contributed in improving the employment chances as well as food industries. Poultry and its products egg/meat is generally accepted worldwide. They serve as source of income and provide high-quality protein for man. Thus, poultry production as a sustainable enterprise, supports food security and economic productivity. However, the costs of conventional proteins source of feed increases from time to time and also becomes too expensive to utilize these ingredients in poultry feed. Feeding increases quality, fresh with nutritious feed ensures good health status, suitable growth as well as high productivity. Normally, poultry feeding practices depend deeply on grains such as corn, wheat, and soybeans, which are also staple foods for humans (3). The palatability of feed do not reduce/stop consumption of feed. Animal product meal provides valuable sources of nutrient once incorporated in diets for broiler chickens. Availability of feed is the basis of animal production (1). The increasing costs of poultry feeds continue to be the main constraint in developing countries like Nigeria. This high cost of convectional protein sources and environmental pollutions problem can be alleviated by the use of animal by-product like, caecal, blood, fat, bone and others (7).

This is a novel feedstuff, processed from the mixture of blood and caecal content of Donkeys' Caecal Content, Donkeys' Blood Meal and Donkeys' Blood-Caecal Content Mixture for production of monogastrics. The blood-caecal is

a likely viable alternative protein source, and of economic importance in reducing the cost of poultry feed. The donkey blood and caecal content are considered as wastes that cause disposal problems and environmental pollution in abattoirs. (7) Also suggested that subjecting the Donkeys' Caecal-Blood Content (DCBC) to additional processing steps, such as enzyme treatment, fermentation and heat treatment for better digestion and absorption. This study aims at determining the proximate compositions, mineral composition, fibre fractions of the donkeys' caecal content, donkeys' blood content and donkeys' blood-caecal content mixture sourced from slaughter houses and abattoirs in Ebonyi State, Nigeria.

Materials and Methods

The research was carried out at the Poultry Unit of the Teaching and Research Farm of Ebonyi State University, Abakaliki, Ebonyi State. The area is located between longitude 85^0C 59" East and latitude 6.19^0C 59" North. The area has a mean annual rainfall, which ranges from 1500mm to 1800mm and mean temperature of 30^0C during very hot weather (February – April) and 21^0C during the coldest period of the year (December – January). The area is a region of tropical rain forest, which passes through the tropical rain forest into a savanna area with a dump of trees. The vegetation of Abakaliki encompasses trees, shrubs, herbs, grasses and legumes.

Source and Processing of the Donkeys' Caecal Content, Donkeys' Blood Meal and Donkey Blood-Caecal Content

Donkeys' Caecal content, Donkeys' blood, Donkeys' blood-caecal were collected from the main abattoir in Ohaukwu at Nkwo-Ezzangbo main market while the slaughtering of the animals were in progress. The caecal was split open with the aid of sharp knife and the content was emptied into a 25 litres plastic bucket. The caecal and blood contents were boiled separately for 30 minutes and were mixed at a ratio of 3:1. The donkey caecal meal, (DCM) donkey blood meal (DBM) and donkey blood-caecal meal (DBM) were sun-dried on concrete floor for four (4) days to about 12% moisture. All the foreign objects were removed after drying. The donkeys' caecal content, donkeys' blood meal and donkeys' blood-caecal mixture were milled in a hammer mill and were stored for mixing with other feed ingredients for chemical analysis and ration feed formulation.

Data Analysis

The data collected are the values obtained from each test ingredients were analyzed using Duncan's New Multiple Range Test as outlined by (4) was used to separate the means.

Results and Discussion

The results of the Proximate and Gross Energy Composition of Donkey Blood Meal (DBM), Donkey Caecal Meal (DCM) and Donkey Blood-Caecal Meal (DBCM) are shown in Table 1

The high crude protein of donkey blood meal implies that it is a potential protein source that can be substituted for soyabean. This is an advantage being able to be substituted for low protein feedstuff like caecal, soyabean, wheat and thus will improve the feedstuff for livestock production. This is followed by donkey blood-caecal meal with crude protein content of 27.73%. The value got for crude protein of donkey blood-caecal meal was not in line with that obtained by (8) who found crude protein of blood-caecal content mixture of 36.93% and (5) also reported a higher crude protein content of (45.35%) at replacement of soyabean at 60% which had n**o** deleterious effect in poultry.

The results of the Anti-Nutritional Factors of the Test Ingredients are presented in Table 2

There were no significant ($P>0.05$) differences for values obtained for all the parameters measured between donkeys' caecal meal and donkeys' blood-caecal meal but the values were statistically ($P<0.05$) higher than the values obtained for donkey blood meal that had 0.00% values for all parameters determined. The donkey blood meal shows that donkey blood meal does not contain the above anti-nutritional factors. This implies that its usage in feed formulation will avert all the negative/deleterious effects of the above anti-nutritional factors. The value recorded in this study indicates that oxalate

content in plant species, shows significant (P<0.05) variation.

Table 1: Proximate and Gross Energy Composition of Donkey Blood Meal (DBM), Donkey Caecal Meal (DCM) and Donkey Blood-Caecal Meal (DBCM).

Parameters (%)	Donkey-blood meal	Caecal meal	Blood-caecal meal	SEM
Moisture (M)	8.34[c]	11.23[a]	9.64[b]	0.42
Crude Protein (CP)	80.03[a]	19.67[c]	27.73[b]	9.46
Crude Fibre (CF)	0.00[c]	7.04[a]	6.03[b]	1.09
Ether Extract (EE)	0.51[c]	1.81[a]	1.73[b]	0.21
Total Ash	2.73[c]	4.66[a]	4.53[b]	0.31
Nitrogen Free Extract (NFE)	8.39[c]	55.59[a]	50.34[b]	7.48
Gross Energy (GE kcal/kg)	1.81[c]	3.85[a]	3.53[b]	0.31

a,b,c Means in a row with different superscripts are significantly (P<0.05)different SEM = Standard Error of mean. %NFE = 100 – (%CP+%CFAT+%CFIBRE+%ASH+%M); %DM = 100 -%M

Table 2: The Anti-Nutritional Factors of the Test Ingredients

Parameters (%)	Donkey Blood Meal	Donkey Caecal Meal	Donkey Blood-Caecal Meal	SEM
%Phytate	0.00[b]	0.45[a]	0.45[a]	0.07
%Oxalate	0.00[b]	0.38[a]	0.37[a]	0.06
%Tannin	0.00[b]	0.003[a]	0.002[a]	0.0004
%Saponin	0.00[b]	0.24[a]	0.23[a]	0.02

[a,b,] Means in a row with different superscripts are significantly (P<0.05) different

The results of the Mineral Composition (Macro) of the Test ingredient are presented in Table 3.

There were significant (P<0.05) differences in all the parameters measured. The sodium had highest value in the donkey blood meal followed by the donkey blood-caecal meal and then donkey caecal meal respectively. The values for potassium, calcium, phosphorus and magnesium were statistically (P<0.05) higher in donkey caecal meal than others. The highest value of sodium in the donkey blood meal implies reduction in the cost of production purchasing salt (Nacl) if this test ingredient is used in feed formulation.

Table 3: Mineral Composition (Macro) of the Test ingredient

Parmeters (%)	Donkey Blood Meal	Donkey Caecal Meal	Donkey Blood- Caecal Meal	SEM
% Sodium (Na)	0.31[a]	0.26[c]	0.28[b]	0.01
% Potassium (K)	0.51[c]	0.79[a]	0.75[b]	0.04
% Calcium (Ca)	0.18[c]	0.24[a]	0.22[b]	0.01
% Phosphorus (P)	0.22[c]	0.33[a]	0.29[b]	0.02
% Magnesium (Mg)	0.02[c]	0.28[a]	025[b]	0.04

a,b,c Means in a row with different superscripts are significantly (P<0.05) different

The results of the Mineral Compositions (Micro) of the Feed Ingredients are shown in Table 4.

There were significant (P<0.05) differences in all the parameters measured. The iron values obtained in donkey rumen meal were statistically (P<0.05) lower than values found in the donkey blood-caecal meal and for donkey blood meal. For the copper, zinc and manganese followed the same pattern. There marked statistically (P<0.05)

higher value in the donkey caecal meal followed by donkey blood-caecal meal and the least was recorded for donkey blood meal. This can be attributed to the impact of the processing methods on the test ingredient.

Table 4: Mineral Compositions (Micro) of the Feed Ingredients

Parameters Determined	Donkey Blood Meal	Donkey Caecal Meal	Donkey Blood-Caecal Meal	SEM
Iron Fe (mg/kg)	179.10[a]	177.39[c]	178.74[b]	268.82
Copper Cu (mg/kg)	5.85[c]	7.39[a]	7.09[b]	0.23
Zinc Zn (mg/kg)	25.23[c]	55.43[a]	44.48[b]	4.41
Manganese (Mn) (mg/kg)	0.017[c]	0.027[a]	0.021[b]	0.002

a,b,c Means in a row with different superscripts are significantly (P<0.05) different

The results of the Fibre Fraction of the Test Ingredients are shown in Table 5.

It was observed that Donkeys' Caecal Meal (DCM) recorded significantly (P<0.05) higher values (61.48%, 50.61% and 13.54%) for NDF, ADF and ADL respectively. This is an indication that DCM contains much more cell wall constituents than the other two test ingredients. This could be attributed to the undigested fibrous materials that might have escaped the microbial degradation of such complex organic compound during entric fermentation occurring inside the donkey fermentation vat known as reticulo-caecal. Meanwhile, Donkey Blood Meal (DBM) having recorded least values for all the fibre fractions as shown in the Table 5 is an indication that it has no cell wall constituents. In other words, such feed ingredients would have complete digestibility as it devoid of any fibrous material. The implication of this to the nutrition of the livestock is that available nutrients in such feed ingredient will be easily made available for absorption and utilization by the poultry birds. Donkey Blood- Caecal Meal (DBCM) recorded lower NDF and ADF values, suggested that, such feed ingredient would have a better digestibility than DCM. This is predicted on the premise that the feed ingredient that has low cellulose, lignin and hemmicellulose would occupy less space in the stomach and are able to provide higher energy content (2).

Table 5: Fibre Fraction of the Test Ingredients

Parameters (%)	Donkey blood Meal	Donkey caecal meal	Donkey blood- caecal meal	SEM
% Neutral Detergent Fibre (NDF)	0.00[c]	61.48[a]	61.44[b]	0.04
% Acid Detergent Fibre (ADF)	0.00[c]	50.61[a]	50.57[b]	0.04
% Acid Detergent Lignin (ADL)	0.00[c]	13.54[a]	13.38[b]	0.03

a,b,c Means in a row with different superscripts are significantly different (P<0.05).

Conclusion and Application

This study concluded that the crude protein content of donkeys' blood meal (DBM) was 80.03 % while that of donkeys' blood-caecal meal (DBCM) was 27.73 %, hence, DBM can serve as a viable potential alternative protein source.

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