Nig. J. Anim. Prod. 2017, 44(4): 184 - 189

Haematological and serum biochemistry of broiler finisher treated with toasted *Afzelia africana* (Mahogany Seed) meal

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Abstract

The experiment was conducted to determine the effect of Afzelia africana (Mahogany) seed meal on the haematology and serum biochemistry of broiler finisher. One hundred and twenty (120) four weeks old broilers were assigned to four treatment groups, T_1 (control), T_2, T_3 and T_4 at a level of 0%, 5%, 10% and 15% respectively, each treatment group was replicated into 3 of 10 birds per replicate in a completely randomized design. Feed and water was given ad-libitum for the period of the experiment (35 days). The result of the study shows reduced level of cholesterol and Total protein as the level of Afzelia africana increases from 150gm/100ml to 100gm/100mls and 7.00 to 4.5% respectively, and increase in the levels of the following as the level of Afzelia africana increases, Bicarbonate (HCO3), ALT and ASTfrom 18.5mmol/L to 19.1mmol/L, 16iu/L to 22.1iu/L and 10 to 17.6 iµ/L respectively. Haematological report indicate reduction in the following with increase in Afzelia Africana seed meal, WBC from 4,700 x 10^{-6}/dl to 3,500x10^{-6}/dl, HB from 8.9 -7.0g/dl, PCV % from 29% to 22%, MCH 18 – 14 and platelets count from 207, 066 to 13, 300. While there were no changes in the Neutrophil lymphocytes, Eosinophils, Monocytes, Basophils and MCHCP. With the above result, the blood chemistry thus indicate evidence of anaemia, this could be as a result of the processing method (toasting only) of Afzelia Africana seed. Afzelia africana, though used by human without negative effect should not be used in birds unless further studies are carried out on the detoxification of the toxic phytochemical components.

Keywords: Broiler finisher, *Afzelia africana*, Haematology and serum biochemistry

Introduction

The high cost of animal products in most African countries especially Nigeria can be attributed to high cost of livestock feed which generally accounts for 60 – 70 percent of total cost of production (Rafiu *et al*., 2017). To sustain the livestock and poultry industry, it is very urgent to look for readily available plant protein and energy source that are affordable. The drive for attainment of self-sufficiency in meat and other animal products in Nigeria calls for total exploitation of the potential sources of animal protein to ensure a satisfactory level of human protein intake (Nworgu, 2015). The FAO (2015) reported high level of malnutrition in developing countries of the world. The West Africa rain forest area is endowed with wonderful vegetation unequally by any other continents of the world. Most of the vegetative species are underutilized and or are not utilized at all. Some of these species are used as vegetables, wooden species and as browse to livestock species and the seeds or nuts with less value to human utilization. These vast species have added wide range of animal feed resources with which the formulation of good quality livestock feed. To sustain the livestock and poultry industries, it is very urgent to look for readily available materials that has low human value that can replace either or partially the conventional feed resources like soya bean or maize for continued and consistent production of meat, milk, egg and other animal products and by-products for mankind (Okorie, 2014). Some underutilized wild leguminous plants have been explored for their nutritional values but Mahogany (*Afzelia africana* is one of such legumes whose potentials has not been fully harnessed by nutritionist and livestock industries. It can grow in all parts of the country. The tree is commonly known as Mahogany, then Akparata or Akpalata, Kawo and Apa in Igbo, Hausa and Yoruba respectively. This plant is one of the plants whose seed is used in soup thickening for man and may have the ability to improve feed efficiency of birds if well processed. There are little or no literatures of where it has been used in birds but it is used locally by man in thickening soup and as spice.

Materials and methods

The experiment was carried out at the teaching and Research Farm, Imo State University Owerri, Imo State. Raw seed of *Afzelia africana* were bought from Eke market in Afikpo North LGA and Onu-Eke market in Ezza local Government Area, Ebonyi State, Nigeria. The seeds were processed by toasting at temperature of 100^0C for about 25 minutes until they started cracking and opening on their own and the colours changed to brown. The seeds were decoated manually. After which the toasted endosperm were milled/grinded with a hammer mill to particle sizes which could pass through 0.02 mm sieve in order to obtain the *Afzelia africana* seed meal (AASM).

The AASM was taken to the laboratory for phytochemical analysis, amino-acid profile test and proximate analysis prior to ration formulation according to Association of official Analytical Chemist (AOAC, 2000) to determine crude protein, ether extract, crude fibre, ash content, moisture and carbohydrate.

The TAASM was used to formulate 4 broiler treatment finisher diets at 0.00%, 5. 00%, 10.00% and 15.00% inclusion levels representing T_1 (Control), T_2, T_3 and T_4 in partial replacement of soya bean meal, respectively.

A total of one hundred and twenty (120) marshal strain, finisher broiler, 28 days old were used for the experiment. The birds were randomly divided into four (4) treatment groups of 30 birds per treatment in a completely randomized design and further replicated into 3 of 10 birds per replicate.

Data collection commenced immediately after the introduction of experimental diets. Daily feed intake, weekly feed intake, initial weight gain and feed conversion ratio, haematological and serum biochemical assessment were taken. At the end of the 35 days feeding trial, 3 birds per treatment group were randomly selected and 10 mLs of blood sample was taken from the bird through the wing vein with 10 mLs sterile syringe. 5 mLs of blood collected from each bird was put into sample bottle containing Ethylene Diane Tetraceti Acid (EDTA) as an anticoagulant for haematological assay, while the remaining 5mLs was put into bottle without anticoagulant (No EDTA) to produce sera used for serum biochemical assay. The haematological indices assessed include packed cell volume (PCV), Haemoglobin (HB), white Blood Concentration (WBC), Red Blood Cell (RBC), Mean Cell Volume (MCV), Mean Cell Haemoglobin (MCHC), Platelets Neutrophils, Lymphocytes, Monocytes, Eosinophils and Basophils using the windrobes's micro haematocrit, improved Neubaurerhaemocytemeter and cyanomethaemoglobin method, respectively (Coles, 1986). Mean Corpuscular Haemoglobin (MCH) was calculated according to Bush (1991). Serum samples were separated using the centrifuge commercially available kits (Randox Laboratory limited) were used for the analysis. The separated sera were used to determine, urea, creatinine, cholesterol, Albumin, Globulin, Serum protein, Aspartate, Alanine phosphate, Sodium ion (Na^+), Potassium ion (K^+), Chlorine (Cl^-) and Hydrogen carbonate (HCO_3), Urea and Creatinine was analysed using the method of Richmond (1973) while Albumin and globulin were determined using the method of Spencer and Price (1977).

Table 1: Proximate composition of toasted *Afzelia africana* seed meal

Nutrient	Amount (% Dm)
Moisture	6.2
Crude protein	28.7
Crude fibre	5.3
Ether extract	12.5
Ash Content	2.9
Nitrogen Free Extract	50.6

Table 2: Ingredient composition of the experimental diets

Ingredients	T_1 (0.00%)	T_2 (5.00%)	T_3 (10.00%)	T_4 (15.00%)
Maize (yellow maize)	55	55	55	55
Afzelia africana	0.00	5.00	10.00	15.00
Soya bean	15.00	15.00	15.00	15.00
Groundnut cake	10.00	10.00	10.00	10.00
Palm Kernel cake	3.00	3.00	3.00	3.00
Brewers dried grain	3.00	3.00	3.00	3.00
Wheat bran	4.00	4.00	4.00	4.00
Fish meal	3.00	3.00	3.00	3.00
Bone meal	3.00	3.00	3.00	3.00
Blood meal	0.25	0.25	0.25	0.25
Vitamin mineral premix	0.25	0.25	0.25	0.25
Common salt	0.25	0.25	0.25	0.25
l-Lysine	0.25	0.25	0.25	0.25
Total	100	100	100	100

Data analysis

Data collected from the study were subjected to analysis of variance (ANOVA) by Steel and Torrie (1980) while significant treatment means were separated using Duncan's New Multiple Range Test (DUNMRT) as outlined by Obi (2002).

Results and discussion

Table 3: Effect of *Afzelia africana* seed meal diet on the haematological indices of finisher broilers

Test(s) Parameters	ST1	ST2	ST3	ST4	SEM	Normal Range
ESR	6 per hr[c]	9 per hr[a]	9 per hr[a]	8 per hr[a]	0.16	3-7 per hr
Total WBC x 10^{-6}/µl	4,700[a]	3,900[b]	3,750[c]	3,500[d]	0.09	4000-11000x10^{-6}/dl
HB	8.9[a]	7.0[b]	7.0[b]	7.2[b]	0.86	9-19g/dl
PCV %	29[a]	22[c]	22[c]	26[b]	2.58	30-40%
MCV	53[a]	43[c]	41[c]	45[b]	0.21	⩾40μm
MCH	18[a]	14[b]	14[b]	14.4[b]	0.55	⩽10Pg
Platelet count µl	207,066[b]	139,994[b]	139,562[b]	131,300[c]	1.23	150,00-4000µl
Neutrophils	49[b]	50[a]	50[a]	50[a]	0.04	40-75%
Lymphocytes	48[a]	48[a]	48[a]	48[a]	3.23	20-45%
Eosinophils	2[a]	1[b]	1[b]	1[b]	0.86	1-6%
Monocytes	1[a]	1[a]	1a	1[a]	1.28	2-10%
Basophils	Nil	Nil	Nil	Nil	Nil	0-1%
MCH Pg	21[a]	15[b]	15[b]	16.6[b]	0.83	32-36%
RBC x 10^{-6}/ µl	4.96[a]	4.80[b]	4.28[c]	3.96[d]	2.12	4.5-5.9x10^{-6}/µl

[abcd] means in the same row with different superscripts differed significantly (P<0.05)
SEM – Standard Error of Mean

The result of the toasted *Afzelia africana* seed meal diet on the haematological indices of finisher broilers presented in table 3 shows significant differences (p<0.05) in all the parameter measured in the treatment groups, except in neutrophil, Lymphocytes, Eosinophil, Lymphocyte and monocyte.. Total white Blood Cell showed significant differences (p<0.05) in the treatment groups, with the highest value of 4.7 recorded in T_1 and lowest value 3.5 recorded in T_4.Haemoglobin,recorded the following result in T_1, (8.9,) T_2 (7.0), T_3 (7.0) and T_4 (7.2g/dl), with the highest value found in T_1 and lowest value of 7.0 recorded in T3.PVC had the following values (T_1, 29, T_2 -22, T_3 -22 and T_4 -26) g/dl, MCV (T_1 -53, T_2 -43, T_3 -41 and T_4 -45) % MCH – (T_1 -18, T_2 -14, T_3 -14 and T_4 -14.4) µm and WBC (T_1-4700, T_2 -3,900, T_3 -3,750 and T_4-3,500) x 10.6/µl, All these parameters had the highest values in T1 and least values in T_3 and T_4 respectively and all fell below the normal range as reported in Merks Veterinary Manual 2006,HB and PVC value in the present work are within the range reported by Nworgu *et al*. (2013) for HB (8.55 – 12.50%) and for PVC (23.50 – 28.00%) but higher than what was recorded by Ajayi *et al*.(2017). Odoh and Bratte (2015) reported PVC of 27.33-29.10% when the authors fed laying hens with graded levels of neem leaf meal. The value from their study was similar to that obtained in this study. The result of the present study indicates that all the parameters recorded in the hematological indices reduced with increase in the level of *Afzelia africana* or Mahogany seed meal.

The Serum biochemistry as presented in table 4 showed significant differences (p<0.05) among the treatment groups in Cholesterol, Alanine Transferase, Urea, Aspartate, Creatinine, Total protein, and Albumins. From the result, Cholesterol's level reduced with increase in the level of *Afzelia africana* seed meal from 180 in T1 to 100 in T3.Urea's level increased with increased levels of *Afzelia africana* seed meal from 42 in T1 to 48 in T3. Total protein reduced as the level of *Afzelia* africana seed meal increased. Also, albumin level reduced with increase in level of *Afzelia africana*

Table 4: Effect of toasted *Afzelia a fricana* seed meal diet on the serum bio chemistry of finisher broilers

Test (s)	ST1	ST2	ST3	ST4	SEM	Normal range
Cholesterol	180[a]	104[c]	100 [c]	132[b]	0.44	100-230gm per 100MLS
Gluyamyl/Transferase	44[c]	62a	55[b]	44[c]	2.65	<40U/L
Total Bilirubin	0.6[a]	0.5b	0.5[b]	0.6[a]	13.00	0.1-1.0 mg per 100MLS
Conj Bilirubin	0.4 [a]	0.4 [a]	0.4[a]	0.4 [a]	0.07	0-0.5mg per 100MLS
Alanine (ALT) Transferase	16[b]	22 [a]	22[a]	16[b]	0.20	3-12 IU/L
Aspartate (AST)	10[b]	16.9 [a]	17.6 [a]	10[b]	5.79	3-12 IU/L
Alkaline Phosphatase	66[b]	78[a]	78[a]	66[b]	0.80	25-92IU/L
Urea	42[d]	46[b]	48[a]	44[c]	5.21	15-40mg per dl
Creatinine	0.8[c]	1.0[a]	1.0[a]	0.9[b]	0.35	0.7-1.4 mg per dl
Total protein	7.0[a]	5.0[c]	4.8[c]	5.4[b]	12.12	6-8g/dl
Albumin	5.0[a]	3.6 [a]	3.0[c]	4.1[b]	5.23	3.2-4.5g/dl
Globulin	2.0 [a]	1.4[b]	1.8[a]	1.3[b]	0.39	2.3-4.5g/dl
Sodium (Na^+)	133 [a]	13.3[a]	131[a]	133[a]	0.09	135-145MMOL/L
Potassium (K^+)	4.8 [a]	4.8[a]	4.8[a]	4.8[a]	2.16	3.5-4.8MMOL/L
Chloride (Cl^-)	90 [a]	90[a]	90[a]	90[a]	3.02	96-106MMOL/L
Bicarbonate (HCO_3)	18.5[b]	19.1[a]	19.1[a]	19.0[a]	0.03	21-31MMOL/L

[abcd] **means in the same row with different superscripts differed significantly (P<0.05)**

SEM – Standard Error of Mean

seed meal from 5.0 in T_1 to 3.0 in T_3.There were no significant differences (p>0.05) in the treatment groups in Serum potassium, Sodium, Chlorine and Bicabonate. The range recorded in this experiment for urea (42-48 mg/dl), cholesterol (180-180gm/100mls), Total protein (4.8 – 7.00g/dL) glutayle/transferase (44-62µ/L) Total bilirubin (0.5 -0.6mg/100mls), conc. Bilirubin, (0.4mg/100ls) Alamine/transferase (44-62µ/L) aspartate (10-17.6iµ/L) Alk. Phosphate (66-78iµ/L), creatinine (0.8-1.0mg/dl), chloride ion (90mmoi/L) and bicarbonate (18.5-19mmol/L) fell within the normal range as shown on the table of Merk Veterinary Journal 2006. The cholesterol level in this study (100-180) is a little above the report of 100 – 150mg/dL recorded by Sturkie *et al*. (2000) and above the range of 86.67-92.38mg/dl recorded by Okorie-Kanu *et al*. (2016) when the blood sample of cockerels were examined. The ALT and AST in this report is lower than reports of Nworgu *et al*. (2007). However, Obikaonu *et al*. (2012) reported that broiler chickens fed neem leaf meal had decreased concentration of ALT, AST and Alkaline phosphatase.

Conclusion

A general assay shows evidence of liver damage co-existing with cardiac disease and salt depletion which could be due to shock or intestinal obstruction.

The inclusion of *Afzelia africana* to the diets of finisher broiler is deleterious to the broilers, performance since the protein reduced with increased in the level of *Afzelia african* (Mahogamy). The researchers more research should be carried out in processing of Mahogany seed before further use in broilers.

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