Nig. J. Anim. Prod. 2017, 44(4): 241 - 247
Nigerian Journal of Animal Production

Blood profile and organ weights of broilers fed variously processed *Mucuna* seed meal

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Abstract

Blood profile and organ weights of broilers fed variously processed Mucuna seed meal were investigated. A total of 120 day old broiler chickens were used. There were 4 treatments each replicated into 3 with 10 birds per replicate in a completely randomized design (CRD). Four treatment diets were formulated. Diet 1 served as control containing raw Mucuna, while diets 2, 3, and 4 had boiled Mucuna, Mucuna boiled with ankanwu and boiled Mucuna mix with enzyme, respectively added to them. The birds were allowed 7 days to get stabilized before being randomly assigned to the experimental diets that lasted for 49 days. There were no significant (P>0.05) differences in the organ weights except for intestine, spleen and lungs. The value of the intestine ranged from 4.30% (D4) to 5.20% (D2). D4 was significantly ((P<0.05) lower than D2 but compared favourably with D1 (4.51) and D3 (4.62). Significant ((P<0.05) differences existed only in haemoglobin and mean corpuscular haemoglobin concentration (MCHC). The MCHC values ranged from 30.67 in D4 to 34.69% in D2. The value for D4 was significantly (P<0.05) lower than those of D1, D2, and D3 which was not significantly (P>0.05) different. The Hb and MCHC were significantly (P<0.05) affected by the processing of MSS. Total protein, albumin, urea, creatinine, globulin and alkaline phosphatase were significantly (P<0.05) affected by the processing method employed in conclusion it is observed that 5% inclusion of Mucuna either raw or processed to broiler chicken diets does, does not have any deleterious effect on them health wise since blood and organs characteristics are used to measure the health status of animal.

Keywords: Blood profile, organ, *Mucuna* seed, processed, broilers

Introduction

Protein intake of an average Nigerian is very low partly resulting from the fact that conventional plant protein sources for poultry ration are very costly. This has led to competition between man and industry, and the livestock which is being placed at a disadvantage position because man must first feed and take care of himself before giving off the left over to his animals. *Mucuna sloanei* is a potential protein source that is cheap and widely available and of low human preference and of little or no industrial use and also can meet nutritional requirements of poultry with or without processing (Akinmutimi *et al*., 2011; Amaefule *et al.*, 2013). The seed of *Mucuna sloanei* is highly resistant to diseases and pest, and exhibit good nutritional qualities. It yields about 0.8-2 tons of seeds/hectare with crude protein content of about 28% and high energy of about 2.71kcal/g (Akinmutimi *et al.*, 2011). It is relatively high in lysine content and compares favourably in terms of methionine content with soya bean meal, making it a potential source of protein for livestock and poultry (Sridhar and Bhat, 2007). This study therefore was aimed at assessing the effect differently processed *Mucuna* seed meal on blood profile and organ weights of broiler chicken.

Materials and methods

One hundred and twenty (120) a week old broiler chicken were randomly assigned to 4 treatment diets in a completely randomized experiment that lasted 49 days at The Poultry Unit of The Teaching and Research Farm, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria. *Mucuna sloanei* seed (Ukpo) was purchased in Aba main market in Aba,Abia State, Nigeria. The following methods were used in processing of *Mucuna* seed.

Preparation of test ingredients

The ratio of liquid to solute was 2:1 (i.e2litre of water was used for 1kg of *Mucuna* seed). The seed was added into the water at boiling point and allowed to boil for 30 minutes after which the heat was removed the water decanted and the seed dried and milled to pass through 2milimeter sieve, bagged and stored for use in feed formulation for the broiler chicken. The diets were made of control D1 (soya bean based) and treatment diets, D2, D3, D4 containing graded levels (7.5%, 10%, 12.5%)boiled *Mucunai sloanei* seed meal mix with enzyme(BME). The experiment was a completely randomized design (CRD). Feed and water were given *ad-libitum* throughout the period. The birds were given a measured quantity of feed every day and on the following day the left over were removed and measured to determine the quantity consumed by the birds. The birds were subjected to standard broiler management with necessary drugs and vaccines given as at when due. The experiment lasted 49 days. A total of five diets were formulated having crude protein range of 22.10-22.39% and energy level of 2933.60.5-3003.60kcal/kg as shown in Table 1.

Table 1: Composition of experimental diets containing graded levels of boiled *Mucunasloanei* seed meal mix with multi-enzyme and fed to broiler chickens

	Levels of inclusion of *M. sloanei*			
Ingredients	0%	7.50%	10%	12.50%
Maize	60.00	56.25	55.00	53.75
Soya bean meal	30.00	26.25	25.00	23.75
Mucunasloanei	-	7.50	10.00	12.50
Palm kernel meal	3.40	3.40	3.40	3.40
Fish meal	3.00	3.00	3.00	3.00
Bone meal	3.00	3.00	3.00	3.00
Vit premix	0.25	0.25	0.25	0.25
CommonSalt	0.25	0.25	0.25	0.25
Dl methionine	0.10	0.10	0.10	0.10
Total	100.00	100.00	100..00	100.00
Calculated composition				
Crude protein (%)	22.10	22.20	22.24	22.28
Crude fibre (%)	3.06	3.51	3.84	3.77
Calcium (%)	o.24	0.37	0.41	0.46
Phosphorus (%)	0.43	0.42	0.41	0.41
Methionine (%)	0.47	0.55	0.57	0.60
Lysine (%)	1.11	1.50	1.63	1.76
Metabolizable Energy(Kcal/Kg)	3003.60	2977.35	2968.60	2859.85

Each 2.5kg of premix contains Vitamin A (8,500000 Iμ), Vitamin D, (1,50000000 Iμ), Vit E (10,000000mg), Vitamin K3 (1,500,00mg), Vitamin B1 (1,600000mg), Vitamin B2 (4,00000mg), Niacin (20,0000mg), Pentathenic Acid (5,000,00mg), Vit B6 (1,50000mg), Vit B12 (10,000mg), Folic Acid (500,00mg), Biotin (750,00mg), Chlorine Chloride (175,000,00mg), Cobalt (200,00mg), Copper (3000,00mg), Iodine (1000,00mg), Z inc (30,000,00mg), Selenium (200,00mg), Managanese (40,000,00 Mg), Iron (20,000,00mg).

D1=control diet (noMucuna ,no enzyme); D2=.7.5% Mucuna with enzyme; D3=10% Mucuna with enzyme; D4=12.5%Mucuna with enzyme.

Maxi-grain multi enzyme supplemented at the rate of 100g/ton of feed to diets 2, 3 and4 only

Results and discussions

Blood samples were collected twice (4th week and 7th week) through the wing vein using sterile syringe and needle. Blood samples per chicken were collected into labeled sterile bottles containing anti-coagulant (EDTA – Ethyl-diamine tetra acetic acid powder) for haematology, and into another set without EDTA for serum analysis according to Mitruka and Rawsley (1977) and Ross *et al.* (1978). The set of bottles containing anti-coagulant was used to determine the values of haematological indices such as size of red blood cell (RBC), white blood cell (WBC), haemoglobin (Hb), packed cell volume (PCV) and red blood cell count. Values obtained were used to calculate Mean corpuscular volume (MCV), Mean corpuscular haemoglobin (MCH), Mean Corpuscular Haemoglobin Concentration (MCHC). As follows:

Mean corpuscular volume (MCV) = $\frac{PCV \times 10}{RBC}$

Mean corpuscular haemoglobin MCH) = $\frac{Hb \times 10}{RBC}$

Mean CorpuscularHaemoglobin Concentration (MCHC) = $\frac{Hb \times 100}{PCV}$

The set of bottles that contain the blood serum were used to determine the biochemical indices such as total protein, albumin, serum alkaline phosphatase, serum creatinine, and urea.

Results and discussion

Table 2 shows the organ weight of broiler chicken fed variously processed *Mucuna sloanei* seed meal diet.

Table 2: Organ weight of broiler chicken fed diets containing processed *Mucuna sloanei* seed meal.

Parameters	D1	D2	D3	D4	SEM
Liver (%)	1.89	1.97	1.95	1.75	0.14
Heart (%)	0.47	0.49	0.47	0.36	0.03
Empty Gizzard (%)	2.56	2.20	2.43	2.27	0.22
Kidney (%)	0.67	0.61	0.74	0.59	0.03
Intestine (%)	4.51^{ab}	5.20^{a}	4.62^{ab}	$4.30.^{b}$	0.17
Gal blader (%)	0.13	0.10	0.13	0.12	0.04
Spleen (%)	0.16^{ab}	0.16^{a}	0.15^{ab}	0.13^{b}	0.01
Proventriculus (%)	0.55	0.49	0.47	0.42	0.31
Lungs (%)	0.66^{bc}	0.54^{c}	0.82^{a}	0.73^{ab}	0.37

Means within the same row with different superscripts (a –c) are significantly (P< 0.05) different .SEM-Standard error of mean D1=control (soya bean based diet), D2=boiled *Mucuna* based diet, D3=*Mucuna* Boiled with akanwu for 30 minutes (BWA, D4=boiled *Mucuna* for 30 minutes and mix with enzyme (BME)

There were no significant (P>0.05) differences except for intestine, spleen and lung. The non-significant (P>0.05) differences observed in the kidney and liver which are the major sites of detoxification and excretion (Ologhobo *et al*., 1993; Ukachukwu, 2000; Akinmutimi, 2004; Ekwe, 2012) could be attributed to the fact that the anti-nutrional factors were within a tolerable level. The value of the intestine ranged from 4.30% (D 4) to 5.20% (D2). D4 was significantly (P<0.05) lower than D2 but compared favourably with D1 (4.51) and D3 (4.62). The reduced weight of the intestine inD4(diets containing boiled *Mucuna* for 30 minutes and mix with enzyme**)** is associated with enzyme supplementation as have been reported by many researchers (Viveros *et al*., 1993; Baiao *et al*., 1997; Augustine *et al*., 2011)

Viveros *et al*. (1993) reported that addition of enzyme to barley-based diets produced an

effect on digestive tract of the bird, reducing the relative weight of upper tract (mainly proventriculus and gizzard), and the size of the small intestine and colon of chicks. This is due to the fact that enzyme supplementation brings about a reduction in intestinal transit time thereby leading to the growth of micro flora in the intestine resulting in reduced viscosity of the jejunum content and accelerates the rate of passage of digester through gastrointestinal tracts of birds (Lazaro *et al*., 2003). The reduced load and activity in these tracts resulted to reduced weight of the intestinal tracts. In an earlier study Baiao *et al*. (1997) reported that enzyme supplementation to rye diets reduced viscosity of intestinal content and the weight of digestive organs. Augustine *et al*. (2011) also reported a similar finding that internal organs decreased with increasing level of enzyme supplemented.

The haematological indicies of 8 weeks old broiler chickens fed diet containing 5% differently processed *Mucuna sloanei* seed meal is presented in Table 3.

Table 3: Haematological indicies of broiler chicken fed diet containing 5% processed *mucuna sloanei* seed meal

Parameters	D1	D2	D3	D4	SEM
Hb (g/dl)	12.40[a]	12.10[a]	11.80[a]	10.73[b]	0.23
PCV (%)	37.55	35.33	35.33	35.00	0.55
WBC (x106/cm3)	7. 77	4.43	5.53	5. 70	0.59
RBC (x106/cm3)	5.23	4.20	5.10	4.20	0.39
MCV (%)	74.00	86.71	70.01	109.88	11.81
MCH (%)	24.80	29.06	24.89	30.40	2.87
MCHC (%)	33.22[a]	34.69[a]	34.05[a]	30.67[b]	0.56

Means within the same row with different superscripts (a – e) mare significantly (P< 0.05) different .SEM- Standard error of mean D1=control (soya bean based diet), D2=boiled *Mucuna* based diet, D3=*Mucuna B*oiled with *akanwu* for 30 minutes (BWA, D4=boiled *Mucuna* for 30 minutes and mix with enzyme (BME); Hb=haemoglobin, PVC= packed cell volume, WBC=white blood cell, RBC=red blood cell, MCV=mean corpuscular volume, MCH=mean corpuscular haemoglobin, MCHC=mean corpuscular haemohlobin concentration

Significant (P<0.05) differences existed only in haemoglobin and MCHC. The MCHC values ranged from 30.67 in D4 to 34.69% in D2. The value for D4 was significantly (P<0.05) lower than those of D1, D2 and D3 which was not significantly (P>0.05) different. This notwithstanding, they were all within the standard for broiler chicken as was recommended by Mitruka and Rawnsley (1977) and Ross *et al*. (1978). This suggests good quality protein resulting from absence or reduced anti-nutritional factors which could be associated to the effect of processing. This reflected in the high live weight, good dressing percentage and quality cut parts percentages recorded on these birds across the different processing methods. The value for the haemoglobin ranged from 10.73g/dl for D4 to 12.40g/dl for D1. Again D4 was significantly (P<0.05) lower than the other two treatments (D2=12.10g/dl; D3=11.80g/dl) and the control. However, they all fall within the recommended standard for broiler chicken by Mitruka and Rawnsley (1977) and Ross *et al*. (1978). This implies good blood formation due to absence of a toxic factor such as haemagglutinin which normally have adverse effect on blood formation when there is reduced concentration of haemoglobin in the blood of the animal (Oyawoye and Ogunkunle, 1998). This also suggests high feed intake and good quality of

the diets because abnormal values of haemoglobin are always associated with low feed intake and poor quality of diets (Mitruka and Rawnsley, 1977 and Ross *et al*., 1978). The normal haemoglobin concentration in the blood of these birds would also be associated to normal transportation of oxygen from the respiratory organs to the peripheral tissues and subsequent carbon dioxide excretion.

The serum biochemical indices of 8 weeks old broiler chicken fed processed *Mucuna sloanei* seed meal based diets is shown in Table 4

Table 4: Serum biochemical indices of broiler chicken fed diets containing processed *Mucuna sloanei* seed meal

Parameters	D1	D2	D3	D4	SEM
Total protein (g/dl)	6.03^{b}	6.53^{a}	6.23^{ab}	6.40^{a}	0.08
Albumin (g/dl)	2.90^{b}	3.13^{b}	3.50^{a}	2.90^{b}	0.08
Urea (mg/dl)	32.00^{ab}	35.33^{a}	26.33^{b}	26.00^{b}	1.57
Creatinine (mg/dl)	$0.90b^{c}$	0.83^{c}	1.13^{ab}	1.23^{a}	0.06
Alkaline phosphatase (iu)	109.33	146.33	136.67	127.67	11.14
Globulin (g/dl)	3.13^{a}	3.40^{a}	2.50^{b}	3.16^{a}	1.25

Means within the same row with diferent superscripts ($^{a-c}$) are significantly (P< 0.05) different .SEM- Standard error of mean D1=Control), D2=Boiled *Mucuna* based diet, D3=*Mucuna B*oiled with akanwu for 30 minutes (BWA), D4=boiled *Mucuna*for 30 minutes and mix with enzyme (BME)

There were significant (P<0.05) differences in all the parameters considered except for alkaline phosphatase. D4 had a total protein value (6.40g/dl) that was significantly higher (P<0.05) than that of the control (6.03g/dl) but compared favourably with those of D2 (6.53g/dl) and D3 (6.40g/dl). The total protein though significant (P<0.05) across the treatment means were all within the normal range for broiler chicken and this could be attributed to quality dietary protein (Eggum, 1970). For serum albumin, D4 (2.90g/dl), D1 (2.90g/dl) and D2 (3.13g/dl) were not significantly (P>0.05) different but were significantly (P<0.05) lower than D3 (3.50g/dl). These values however, were within normal range for broiler chicken and thus implies equal ability in blood clotting to prevent haemorhage. The urea content of D2 (35.33mg/dl) was significantly (P<0.05) higher than those of D3 (26.33mg/dl) and D4 (26.00mg/dl) was not significantly (P>0.05) different from that ofD1 (32.00mg/dl). The values were all within normal for range for broiler production across the treatment means signifying quality protein which could be attributed to treatment effect. Creatinine had values ranging from 0.83mg/dl) in D2 to 1.23g/dl in D4. D4 had the highest value of creatinine that was only compared with D3 (1.13mg/dl). D2 had the lowest value of creatinine that was only compared to D1.This implies the nutritional superiority of the protein quality of diet 2 (boiled) since the lower the serum creatinine the higher the protein quality (Aletor *et al*., 1998). D3 and D1 were not significantly (P<0.05) different, though there existed significant (P<0.05) differences among the treatment means but were within the normal range for broiler chicken recommended by Mitruka and Rawnsley (1977) and Ross *et al*. (1978) which can be associated to the effect of processing. The values of urea and serum creatinine were indications of good quality protein as reported by Eggum (1970).From the result there is clear evidence that the different processing methods compared

favorably in all the serum biochemical indices evaluated which could be attributed to the effect of the various processing methods employed that were able to reduce the toxicity level of the test ingredients, improve nutrient and the quality of dietary protein. Despite this, comparing the values in the different parameters determined for serum biochemical indices around the *Mucuna* based diet, D4 (boiled *Mucuna sloanei* seed and mixed with enzyme) could be selected among the treatments as the processing method that gave superior consideration in terms of high globulin, high total protein and low urea content.

Conclusion

In conclusion it is observed that 5% inclusion of *Mucuna* either raw or processed to broiler chicken diets does, does not have any deleterious effect on the broiler birds health wise judging from the results in the different parameters considered.

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Received: 10th July, 2017
Accepted: 9th December, 2017