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PERFORMANCE, CARCASS QUALITY AND HAEMATOLOGICAL INDICES OF BROILER FINISHER CHICKENS FED RAW *Mucuna sloanei* MEAL

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ABSTRACT
Tolerance level of the raw *Mucuna sloanei* meal by broilers was determined by replacing soybean meal with raw *Mucuna sloanei* meal at 0, 10, 20, 30 and 40% using 135 Anak broiler birds in a completely randomized design (CRD) experiment. The birds were fed *ad-libitum* in all the experiments. Optimum tolerance level of Raw *Mucuna sloanei* by broiler finisher birds was 40% level of replacement of soyabean meal (or 8.12% RMS inclusion level) based on growth performance and economics of production. Raw *Mucuna sloanei* significantly ($P<0.05$) depressed nutrient utilization at all levels of replacement except for ether extract and NFE. Cut-parts values were also depressed ($P<0.05$) beyond 10% level of replacement. In both the starter and finisher phases, organ weights increased significantly ($P<0.05$) as level of RMS increased with the exception of the spleen which showed no significant difference. Hemoglobin, PCV, RBC and MCH values were within the normal range for most of the levels, whereas MCHC values were below the normal range at above 10% level of replacement and MCV values were above 20%. The total protein and albumin values were below the normal range whereas serum creatinine was within the normal range for broiler chickens. However, urea values were above the normal range at 20% and above. The values for alkaline phosphatase were above the normal range.

Keywords: Carcass Quality, Haematology, Broilers and Mucuna

Introducton

Among farm animals, poultry in general and broiler in particular, produce at a faster rate and gives return more quickly than other animals. Broiler is a table bird or meat type bird; it is generally acceptable to most Nigerians. It is the quickest source of meat and its production involves the least hazardous and arduous process in relation to other livestock enterprises (Obioha, 1992). Under good management, broilers attain live-weight of about 2kg on the average within 9 weeks (Oluyemi and Roberts, 2000). According to Nworgu and Egbunike. (1999) high cost of inputs, most especially feeds and day-old chicks limit the opportunity and advantages of poultry production in Nigeria as feed utilization accounts for about 70% of total production cost. The high cost of feed is due mainly to competition between man, livestock and industries for grains and conventional sources of plant and animal proteins (Ezeagu et al., 2003). It has become imperative therefore, to turn attention to the exploitation of the under-utilized unconventional feedstuff particularly those indigenous to the tropics (Akinmutimi *et al.*, 2006). One of the under-utilized legumes that come to mind is *Mucuna sloanei*. Aletor *et al.* (1989) reported that apart from changes in nitrogen balance and biochemical parameters, nutrition or dietary manipulation exert several effects on the development of carcass traits, organs and certain muscles. Also Oluyemi and Roberts (2000) suggested that carcass assessment reveals the final live weight of broileris made up of high percentage of the edible parts or inedible offals (Intestine, shank etc). Blood circulates in the vessels of man and animal, transporting oxygen from respiratory organs (lungs) to the body cells, carrying nutrients to the tissue and excretory products through the kidneys, guts, lungs, liver and skin. It also maintains homeostasis. The various blood functions are made possible by the

individual and or collective actions of its constituents- (Awoniyi *et al.*, 2000). Oke *et al.* (2001) reported that blood is very vital to life and before any meaningful work can be done on the biology of the birds the blood must be studied in details. Haematological indices are red blood cells, white blood cells, Haemoglobin and packed cell volume. Their values are used to calculate mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC). These constituents of the blood are affected by the quality, quantity and toxicity of the food taken by the animal (Onwukwe, 2000). Ross *et al.* (1978) showed the means and normal range of the haematological indices of broiler chicken.

Table 1: Mean and normal range of haematological indices broiler chicken

Parameters/indices	Mean	Range
Red blood cell count (RBC)X 10^6/mm	3.0	2.0-4.0
Packed cell volume (PCV)%	34.0	25-45.0
Haemaglobin (gldl) (%)	10.0	7.0-13.0
MCH mean corpuscular haemaglobin(%)	30.0	26-35
Mean corpuscular haemaglobin concentration (%)	40	33-47
Mean corpuscular volume (%)	115	90-140

Adapted from Ross *et al,* (1978)

The biochemical indices include the following: Total protein (mg/100ml), serum albumen (mg/100ml), serum globulin (mg/dl), serum creatinine (mg/dl), cholesterol (mg/dl), urea (mg/100ml), serum glutamic oxalo acetic transaminase (SGOT), serum alkaline phosphatase and serum glutamic pyruvate transaminase (SGPT). Eggum (1970) reported that a decrease in serum total protein and albumin is an indication of poor quality protein of the test feed stuff. Low albumin value suggests poor clotting ability of the blood and hence poor prevention of haemorrhage (Robert *et al.,* 2003). Decrease in serum globulin is an indication of reduction in the disease fighting ability of the body system. This could result in high mortality (Eggum, 1970). High values of urea concentration and serum creatinine are indications of poor quality protein of test diet (Eggum, 1970; Ologhobo *et al.,* 1993).

Materials and Methods

Experimental Site

The experiments were conducted at the Poultry Unit of National Root Crops Research Institute, Umudike.

Procurement and processing of the test feedstuffs

The raw *Mucuna sloanei* seeds were purchased at Aba, Abia State of Nigeria. The undecorticated seeds were broken to pieces together with the seed coat and used in the raw state.

Determination of Optimum Level of Raw *Mucuna sloanei* seed in diets of Broiler Finisher Birds

One hundred and fifty (150) day-old Anak broilers were housed in 15 pens with 10 birds in each pen measuring 2.6m x 3m. Brooding was carried out for two weeks, one week was used to acclimatize the birds and heat for brooding was supplied using kerosene stove under a metal hover. Also, tarpaulin was used to cover the wire-netting parts of the building to prevent cold during brooding. The hover and tarpaulin was removed at the end of the brooding.

Feeding and drinking troughs were provided. Necessary vaccinations and medications were carried out as follows:

Day 1 – Lentogenic vaccine through intraocular route to prevent Newcastle disease.

Day 10 – Gumboro to prevent infectious bursal disease.

Day 21 – Lasota to prevent Newcastle disease.

Medications that were carried out include giving of biovite for the purpose of relieving stress and ESB3 to prevent coccidiosis.

At the age of five (5) weeks one hundred and fifty (150) broiler finisher birds were allotted to five (5) treatments with thirty (30) birds in each treatment. Each treatment had 3 replicates of 10 birds each. Five (5) experimental diets were formulated. Diet 1 was soybean-based (control). While the test feedstuff (raw Mucuna sloanei) replaced 10, 20, 30 and 40% soybean in diets 2,

3, 4 and 5 respectively in a completely randomized design experiment. The experiment started at the beginning of the sixth week till the end of eight week. Also, the diets were formulated based on the nutrient requirements for finisher birds. Feed and water were given *ad-libitum* throughout the experimental period. This experiment lasted for 28days.

Table 2: Percentage composition of Broiler Finisher Diets Containing Graded levels of Raw *Mucuna sloanei*

	Replacement level of RMS seed meal				
Ingredients	**0%**	**10%**	**20%**	**30%**	**40%**
Maize	54.00	54.00	54.00	54.00	54.00
Soybean meal	20.30	18.27	16.24	14.21	12.18
Raw *Mucuna sloanei*		2.03	4.06	6.09	8.12
Palm kernel meal	20.00	20.00	20.00	20.00	20.00
Fish meal	2.00	2.00	2.00	2.00	2.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Lysine	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10	0.10
VMP	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Calc. comp.					
% Crude Protein	19.24	18.95	18.67	18.38	18.09
ME (Kcal/kg)	2942	2837	2932	2926	2921
%Crude fibre	4.83	5.04	5.33	5.59	5.84
% Calcium	1.24	1.24	1.24	1.23	1.23
%Phosphorus	0.64	0.64	0.63	0.70	0.72
Determined analysis					
% ash	13.90	15.82	16.01	16.79	17.26
% crude protein	19.95	19.85	19.82	19.78	19.74
% crude fibre	5.00	5.26	5.40	6.80	6.38
% ether extract	3.85	3.62	3.60	3.88	4.31
% nitrogen free extract	57.30	55.45	55.17	53.75	52.31
Gross energy (Kcal/g)	3.250	3.106	2.984	2.969	2.947

RMS- Raw *Mucuna sloanei*

*1kg of premix contains: vitamins A (5,000,000 I.U), VitaminD3 (1,000,000 I.U), Vitamin E (16,000mg), Vitamin K3 (800mg), Vitamin B1 (1,200mg), Vitamin B2 (22,000mg), Niacin (22,000mg), Calcium pantothanate (4,600mg), Vitamin B6 (2,000mg), Vitamin B12 (10mg), Folic acid (400mg), Biotin (32mg), Choline chloride (260,000mg), Manganese (948,000mg), iron (40,000mg), Zinc (32,000mg), Copper (3,400mg), Iodine (600mg), Cobalt (120mg), Selenium (48mg), Anti-oxidant (48,000mg).

VMP: vitamin mineral premix, ME: metabolisable energy, Kcal: kilocalorie, g: gram

Cut-up Yeilds (Cut-parts) and Organ Weights/Proportion Evaluation

Cut-up yeilds and organ weights/proportion evaluation were determined as described by Scott *et al.* (1982) and modified by Ojewola and Longe (1999). It involved the selection of 3 birds from each treatment (birds closest in mean weight per replicate). The selected birds were fasted overnight and weighed to obtain the live weight thereafter bled by severing the jugular vein. They were then dipped in hot water and defeathered. The head, neck and shank were removed to have the dressed weight and percentage dressed-weight was calculated as shown below. The wings were removed by cutting anteriorly, severing at the humero scapular joint. The cut was made close to the body line. Lateral cuts were made through the rib heads to the shoulder girdle and the breast were removed intact by pulling anteriorly. The thighs, drumsticks and back were also dissected from each carcass. Also organs like, heart, kidney, spleen and gizzard were dissected from each carcass. All parts were

weighed and expressed as percentage dressed weight.

Determination of Blood Constituents (Haematological and Biochemical indices)

a) Haematological indices

Blood samples from one bird from each of the replicates were collected into labeled sterile universal bottles containing anti-coagulant (EDTA –Ethyl diamine tetra acetic acid powder). These samples were used to determine values of haematological indices like red blood cells, white blood cells, haemoglobin and packed cell volume. Values obtained were used to calculate MCV, MCHC and MCH.

i) Determination of Haemoglobin (Hb)

Method: Cyanomethaemoglobin method (Coles, 1986)

Procedure: About 2ml of blood was collected from the heparinized bottle and diluted with 0.1N HCl in the haemoglobin calibrated test tube until the colour of the blood matched that of the haemometer and then, the value read from the calibrated tube as haemoglobin value.

ii) Determination of Packed Cell Volume (PCV)

Method: Micro haematocrit centrifugation method (Coles, 1986).

Procedure: Some blood were collected into the capillary tube sealed at the base with some seal. After which they were spun in the micro-haematocrit centrifuge for 5mins. and the value read with the use of a micro-haematocrit centrifuge reader as packed cell volume value.

iii) Determination of White Blood Cell (WBC)

Method: Improved Neubauer haemacytometer method (Coles, 1986)

Procedure: Some blood were collected from the heparinized bottle with the use of a red blood cell pipette and diluted with Hayems solution. After diluting the blood, it was filled into the counting chamber and then counted under the microscope.

b) Serum Chemistry

Blood samples were also collected into labelled sterile bottle but without anti-coagulants. These samples were used to obtain serum for determination of the biochemical indices such as total protein, serum creatinine and urea.

i) Determination of Total Protein

Method: Biruet method (Strove and Makarova, 1986)

Procedure: 0.1ml of serum was put into a clean test tube followed with the addition of 5mls of biruet reagent and allowed to stand for 30mins for colour to develop. After 30mins, the solution was poured into a photocolorimeter and the reading taken in a spectrophotometer at 550nm as wavelength. The contamination of total protein was then determined by the plotting of analytical curve.

ii) Urea Determination according to Silverton and Baker (1976)

The principle of determination of serum urea is based on the fact that when the enzyme urease comes in contact with urea it is hydrolysed to ammonia and finally a blue coloured indophenol is formed.

iii) Serum Creatinine Determination

Serum Creatinine Determination was according to Silverton and Baker (1976). The principle guiding the determination of serum creatinine is that in alkaline solution creatinine reacts with picric acid to form a coloured complex.

Statistical Analysis

All collected data were subjected to analysis of variance in Completely Randomized Design (CRD) as described by Steel and Torrie (1980) using SPSS statistical package. Mean separation were carried out using the multiple range test as described by Duncan (1955).

Results and Discussion

Growth Performance of Broiler Finisher Chicken Fed Levels of Raw Mucuna Sloanei

Table 3 shows the growth performance of broiler finisher birds fed levels of raw *Mucuna sloanei*. Treatment 1 (0%) performed better in final weight gain than other treatments. Treatment 2 (10%) is statistically the same ($p>0.05$) as treatment 3 (20%) and 4 (30%) but significantly higher ($p<0.05$) than treatment 5 (40%). This could be associated with the presence of anti-nutritional substances in the raw *Mucuna sloanei* that influences the nutrient utilization of the test diet. The similarity ($p>0.05$) between the control and the test diets in feed consumption could be due to the ambient temperature, as low temperature enhances feed intake. As the raw *Mucuna sloanei* increased in the diet, dietary fibre level also increased. This may have also contributed to the consumption of the test diets. Since higher dietary fibre results in energy dilution of the diets, the birds had to consume

more to meet their energy requirement. This agrees with the report of Sandford (1986) and Lebas *et al.* (1986) that growing animals adjust their feed intake according to energy and crude fibre content of the feed given to them. From the table (2) the control was better in terms of final live weight, Average daily weight gain, feed conversion ratio and protein efficiency ratio, whereas these parameters were not significantly ($p>0.05$) different among the test diets. This shows that finisher birds could tolerate raw *Mucuna* diets at up to 40% level of partial replacement of soybean meal and therefore raw *Mucuna sloanei* protein can partially replace dietary soybean protein at levels up to 40% without any adverse effects on the performance of the finisher birds. This partial replacement translates to 8.12% inclusion of raw *Mucuna sloanei* in a broiler finisher diet.

Table 3: Growth Performance of Broiler Finisher Birds Fed Graded Levels of Raw *Mucuna sloanei* Meal-based Diets

Parametrs	Treatment 1 (0%)	Treatment 2 (10%)	Treatment 3 (20%)	Treatment 4 (30%)	Treatment 5 (40%)	SEM
Initl Wt (g)	996.67	996.50	996.67	996.67	996.50	0.408
Final Wt (g)	1830 [a]	1623 [b]	1603.33 [bc]	1543.67 [bc]	1526.67 [c]	34.37
ADFI (g)	123 [a]	121.7 [a]	121.0 [a]	117.7 [a]	117.7 [a]	3.520
ADWG (g)	39.66 [a]	30.32 [b]	28.89 [bc]	26.03 [cd]	25.24 [d]	1.53
FCR	3.12 [b]	4.07 [a]	4.22 [a]	4.54 [a]	4.64 [a]	0.254
PI	22.36 [a]	21.93 [a]	21.73 [a]	21.05 [a]	20.98 [a]	0.631
PER	1.78 [a]	1.39 [b]	1.24 [b]	1.23 [b]	1.20 [b]	0.885

Initl Wt: initial liveweight, Final Wt: final liveweight, ADFI: average daily fee intake, ADWG: average daily weight gain, FCR: feed conversion ratio, PI: protein intake, PER: protein efficiency ratio, g: gram.

Carcass Characteristics

Table 4 shows the effect of the graded levels of raw *Mucuna sloanei* on the carcass characteristics (Cut-up yeilds) of finisher broiler. There were significant differences among the treatments for all the parameters considered in the cut parts of finisher broiler birds expressed as percentage of dressed weight. There were significant differences among the treatments for percentage dressed weight, it ranged from 86.38% in treatment 1(0%) to 65.0% in treatment 5(40%). It could be observed that the percent dressed weight reduced as the level of raw *Mucuna sloanei* increased in the diet. However, treatments 1,2,3,4, and 5 had a good dressing percentage that suggests that the live weight is made of mostly edible portion (Oluyemi and Roberts, 2000 Akinmutimi, 2004). For thigh, treatments 1(0%) and 2(10%) were similar ($p>0.05$) but higher ($p<0.05$) than treatments 3(20%), 4(30%) and 5(40%) that were significantly ($p<0.05$) different from each other. The value for thigh ranged from 13.29% in the control (treatment 1) to 10.75% in treatment 5(40%). The value for drumstick in treatment 1(14.09%) was similar ($p>0.05$) to that of treatment 2(13.26%) but different from that of treatments 3(12.36%), 4(11.36%) and 5(10.83%). However, treatment 3 was similar ($p>0.05$) to treatments 2, 4 and 5. For breastcut, treatment 1(24.13%) was similar ($p>0.05$) to treatments 2(24.11%) but higher ($p<0.05$) than treatments 3(21.53%), 4(21.09%) and 5(18.86%). However, treatments 3 and 4 were similar ($p>0.05$).

Table 4: The Effect of The Graded Levels of Raw *Mucuna Sloanei* on the Carcass Characteristics (Cut-up yeilds) of Finisher Broiler

Parameters	Treatment 1(0%)	Treatment 2 (10%)	Treatment 3 (20%)	Treatment 4 (30%)	Treatment (40%)	SEM
LiveWeight(g)	1725.0 [a]	1525.0 [b]	1475.0[c]	1375.0 [d]	1300.0 [e]	18.257
(%)Dressed wt	86.38 [a]	79.67 [b]	73.21 [c]	68.73 [d]	65.00 [e]	0.349
(%)Thigh	13.29 [a]	13.44 [a]	12.52 [b]	11.12 [c]	10.75 [d]	0.164
(%)Drumstick	14.09 [a]	13.26 [ab]	12.36 [bc]	11.36 [c]	10.83 [c]	0.744
(%)Breastcut	24.13 [a]	24.11 [a]	21.53 [b]	21.09 [b]	18.86 [c]	0.527
(%)Backcut	25.85 [a]	24.23 [ab]	22.30 [ab]	21.26 [ab]	19.11 [b]	0.319
(%)Wing	11.76 [a]	11.24 [ab]	10.92[b]	10.01 [c]	9.85 [d]	0.158

The values for wing ranged from 11.76% in treatment 1 to 9.85% in treatment 5. Treatments 2, 3 and 4 were 11.24%, 10.92% and 10.01% respectively. Treatment 1 was not significantly ($p>0.05$ different from treatment 2 but was significantly ($p<0.05$) different from treatment 3, 4 and 5, however, treatment 3 was not significantly ($p>0.05$) different from treatment 2. The significant ($p<0.05$) difference observed among all the parameters considered was also seen in the starter phase. For thigh and breastcut up to 10% level of partial replacement of soybean meal could be used in broiler finisher diet when thigh and breast cut are the primary focus for profit making. However, up to 40% of partial replacement of soybean gave good percentage for drumstick and backcut. For wing up to 30% level of partial replacement is encouraging.

Organ Weights

Table 5 shows the effect of raw *Mucuna* seed meal-based diet on the internal organ weight expressed as percentage dressed weight of broiler finisher. There were significant ($p<0.05$) differences among the treatment means for all the parameters considered in the organ weights of broiler finisher birds. For heart, the value ranged from 0.55% in treatment 1(0%) to 1.13% in treatment 5(40%), the values for treatments 2(10%), 3(20%) and 4(30%) were 0.63%, 0.76% and 0.91% respectively. It could be observed that the percentage weight of heart increased with increasing levels of raw *Mucuna sloanei* among the treatments. This could be associated with increased activity of the heart due to the presence of anti-nutritional factors contained in raw *Mucuna sloanei*. The value for liver ranged from 1.80% in treatment 1 to 2.37% in treatment 5. The values for treatment 2, 3, and 4 were 1.97%, 1.99% and 2.27%. The values became significant ($p<0.05$) at above 20% level of partial replacement of soybean meal. The values for kidney ranged from 0.71% in treatment 1 to 1.47% in treatment 5. Furthermore, the values for treatments 2, 3, and 4 were 1.10%, 1.18% and 1.34% respectively. The value increased with increase in the level of raw *Mucuna sloanei*. The significant ($p<0.05$) differences observed among the treatments for kidney, heart and liver could be as a result of increase in the activities of these organs due to the effect of anti-nutritional factors contained in the raw *Mucuna sloanei* (Ologhobo *et al.* 1993).

Table 5: The Effect of Raw *Mucuna* Seed Meal-Based Diet on the Internal Organ Weight Expressed as Percentage Dressed Weight of Broiler Finisher

	Treatment 1 (0%)	Treatment 2 (10%)	Treatment 3 (20%)	Treatment 4 (30%)	Treatment 5 (40%)	SEM
(%)Heart	0.55 [e]	0.63 [d]	0.76 [c]	0.91 [b]	1.13 [a]	0.031
(%)Liver	1.80 [b]	1.97 [b]	1.99 [b]	2.27 [a]	2.37 [a]	0.118
(%)Kidney	0.71 [d]	1.10 [c]	1.18 [c]	1.34 [b]	1.47 [a]	0.051
(%)Spleen	0.14 [a]	0.16 [a]	0.17 [a]	0.15 [a]	0.16 [a]	0.006
(%)Intestine	4.33 [d]	4.52 [d]	4.92 [c]	6.81 [b]	7.27 [a]	0.100
(%)Proventriculus	0.84 [d]	0.86 [d]	0.99 [c]	1.36 [b]	1.65 [a]	0.020
(%)Gizzard	5.38 [c]	5.23 [c]	6.05 [b]	6.60 [a]	6.71 [a]	0.233

For intestine, the values ranged from 4.33% in treatment 1 to 7.27% in treatment 5. The values for treatments 2, 3, and 4 were 4.52%, 4.92% and 6.81%. For proventriculus, the values ranged from 0.84% in treatment 1 to 1.65% in treatment 5. The values for treatments 2, 3, and 4 were 0.86%, 0.99% and 1.36% respectively. The values for gizzard were 5.23% in treatment 2, 5.38 in treatment 1 and 6.71% in treatment 5, while treatments 3 and 4 were 6.05% and 6.60%. The values for intestine, proventriculus and gizzard were significantly higher at above 10% level of partial replacement of soybean meal. These values increased with increase in the level of raw *Mucuna sloanei* in the diet. This could be associated with the increase in the activity of these organs due to the presence of anti-nutritional factors in the test diets and also due to high fibre content of the test diet (Ukachukwu, 2000) and (Tuleun and Igba, 2008).

Hematological Components

Table 6 shows the hematological components of broiler finisher birds fed diets containing graded levels of raw *Mucuna sloanei*. Significant ($p<0.05$) differences were observed for all the parameters considered. The value for haemoglobin (Hb) was 11.633g in treatment 1 and 7.533g in treatment 5. The values for treatments 2, 3 and 4 were 10.767g, 9.667g and 8.433g respectively.

Table 6: The Hematological Components of Broiler Finisher Birds Fed Diets Containing Graded Levels of Raw *Mucuna sloanei* Meal-based Diets

Parameters	Treatment 1 (0%)	Treatment 2 (10%)	Treatment 3 (20%)	Treatment 4 (30%)	Treatment 5 (40%)	SEM
Hb(g)	11.633 [a]	10.767 [b]	9.667 [c]	8.433 [d]	7.533 [e]	0.282
PCV(%)	34.767 [a]	31.467 [b]	29.433 [c]	27.567 [d]	26.433[d]	0.545
RBC($x10^6mm^3$)	3.533 [a]	3.367 [a]	2.767 [b]	1.933 [c]	1.733 [c]	0.162
WBC($x10^3mm^3$)	27.467 [b]	26.80 [c]	27.867[b]	28.300 [a]	28.733 [a]	0.429
MCH(%)	32.943 [b]	31.998 [b]	35.03 [b]	43.947 [a]	43.60 [a]	1.865
MCHC(%)	33.460 [a]	34.213 [a]	33.0 [a]	30.587 [b]	28.497 [c]	0.408
MCV(%)	93.540 [b]	98.467 [b]	106.777 [b]	143.937[a]	153.123 [a]	7.393

Hb: haemoglobin, PCV: packed cell volume, RBC: red blood cell, WBC: white blood cell, MCH: mean corpuscular haemoglobin, MCHC: mean corpuscular haemoglobin, MCV: mean corpuscular volume.

Packed cell volume (PCV) values were 34.76% in treatment 1 and 26.433 in treatment 5. However, treatments 2, 3 and 4 were 31.46%, 29.433% and 27.567% respectively. For red blood cell (RBC) the values were 3.533 in treatment 1 and 1.733 in treatment 5. However, the values for treatments 2, 3 and 4 were 3.367, 2.767 and 1.933 respectively. The values for Hb and PCV were within the normal range (Ross *et al.*,1978). However, the values of the RBC were out of the normal range at above 20% level of partial replacement of soybean meal. The reduction in the value of RBC in treatments 4 and 5 suggests that haemagglutimin is the implicated toxic component in the experiment and hence in the feeding of raw *Mucuna sloanei* to broiler birds (Ologhobo *et al.*, 1993). This also implies that the low value could have led to anaemic condition of the birds which may be due to iron deficiency in the diet (Bolu *et al*., 1979). Awoniyi *et al*., (2000) suggested low quality feed and protein deficiency to be responsible for this. Ologhobo *et al.*, (1993) reported localization of haemagglutinin in a base soluble protein fraction of lima bean. They fed the base soluble protein fraction to broilers and observed consistent reduction in the values of RBC and Hb. The values for white blood cell (WBC) ranged from 27.467 in treatment 1 to 28.733 in treatment 5. The values were within the normal range suggesting that there were neither microbial infection nor the presence of foreign body or antigen in the circulating system. Mean corpuscular haemaglobin (MCH) value was 32.943% in treatment 1 and 43.947% in treatment 4. The values in treatments 2, 3 and 5 were 31.998%, 35.03% and 43.60% respectively. Significant ($p<0.05$) difference was observed for MCH when raw *Mucuna sloanei* replaced soybean meal at above 20%. From 30% level of replacement of soybean meal it was outside the normal range. For mean corpuscular haemaglobin concentration (MCHC), the values ranged from 28.49% in treatment 5 to 33.460 in treatment 1.

The values for treatments 1, 2, and 3 were within the normal range and similar, at a level above 20% (treatment 3) level it was below the normal range. For MCV, Treatment 1 (93.540%), 2(98.467%) and 3(106.777%) were similar and within the normal range. At a level above 20% (treatment 3) level it was out of the normal range as established by Ross *et al.* (1978). The high values of MCH and MCV could imply the presence of haematological features of Megaloblastic anaemia (Macrocytosis) due to folic acid and vitamin B_{12} deficiencies (Abu *et al.*, 1999). The lower values of MCHC at 30% and 40% levels of partial replacement could suggest toxicity of the test diets that contain anti-nutritional factors (Onwukwe, 2000).

Blood Chemistry

Table 7 shows the blood chemistry values of broiler finisher birds fed graded levels of raw *Mucuna sloanei*-based diet. Significant ($p<0.05$) differences were observed for all the parameters measured except for albumin which showed no significant ($p>0.05$) difference among the treatments. The values of albumin fall below the range. Eggum (1970) reported that a decrease in serum albumin is an indication of poor quality protein of the test feed stuff. Low albumin values suggest poor clotting ability of the blood hence poor prevention of haemorrhage (Robert *et al*., 2003). The values for total protein ranged from 3.567 mg/100ml in treatment 3 to 1.90 mg/100ml treatment 5. The values for treatment 1, 2 and 4 were 2.10mg/100ml, 3.733mg/100ml and 2.633mg/100ml respectively.

Table 7: The Blood Chemistry Values of Broiler Finisher Birds Fed Graded Levels of Raw *Mucuna sloanei*-Based Diet

Parameters	0%	10%	20%	30%	40%	SEM
Total Protein(mg/100ml)	2.100 [c]	3.733 [a]	3.567 [a]	2.633 [b]	1.900 [c]	0.126
Albumin(mg/100ml)	0.800 [a]	0.600 [a]	0.633 [a]	0.867 [a]	0.900 [a]	0.140
Creatinine(mg/100ml)	0.350 [c]	1.367 [b]	1.433 [b]	1.500 [ab]	1.667 [a]	0.075
AlkPhosphatase(mg/dl)	159.00 [b]	164.667 [a]	128.000[d]	138.000 [c]	163.000 [ab]	1.909
Urea(mg/100ml)	5.500 [d]	5.367 [d]	7.500 [c]	10.333 [b]	12.733 [a]	0.787

AlkPhosphatase: alkaline phosphatase

The value of total protein is an indication of poor quality protein of the test diet (Eggum, 1970). The value of serum creatinine ranged from 0.350 mg/100ml in treatment 1 to 1.667mg/100ml in treatment 5. Moreover, the values for treatments 2, 3 and 4 were 1.367mg/100ml, 1.433mg/100ml and 1.500mg/100ml respectively. The values for serum creatinine were within the normal range. However, the values increased with increase in the level of *Mucuna sloanei* in the diet. This suggests no kidney disease and renal failure since high values of creatinine suggest kidney disease and renal failure due to damage to the glomerulus, and hence poor glomerular filteration and excretion (Green, 1972). The values for alkaline phosphatase were higher than the normal range. The values ranged from 128mg/dl in treatment 3 to 164.667mg/dl in treatment 2. However, the alkaline phosphatase values did not follow any specific pattern that could be attributed to the effect of test diet. For urea, the values were within the normal range up to 10% level of partial replacement of soybean meal (treatment 2) but at above 10% level the values increasingly were above the normal range as established by Jain (1989). The value ranged from 5.367mg/100ml in treatment 2 to 12.733 in treatment 5. The high values as observed in treatments 3, 4 and 5 suggests poor protein quality, this implies that the control diet and 10% level of partial replacement of soybean meal (treatment 2) that had normal values had better protein quality than all the test diets.

Conclusion

The growth performance of the broiler chickens fed on raw *Mucuna sloanei* reduced with increase in the level of *Mucuna sloanei* in the diets. The organ weights of the broiler birds increased with increase in the level of raw *Mucuna sloanei* suggesting increase in the activity of these organs due to the effect of anti-nutritional factors. The values of hemoglobin, packed cell volume and red blood cell reduced with the increase in the level of raw *Mucuna sloanei*. The increase in the values of urea and alkaline phosphatase when raw Mucuna sloanei was fed suggests poor protein utilization.

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