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Effect of Cooked *Mucuna sloanei* Seed Meal on the Performance and Hematological Indices of Starter Broilers

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Abstract
Hamburger (*Mucuna sloanei*) is a tropical legume crop grown for its seeds used as soup thickener by humans. Few data are available on its use in poultry diets. We examined the effect of cooked *Mucuna sloanei* seed meal on the performance, hematology and biochemical indices of broilers in a 28 day feeding trial. Cooked *Mucuna sloanei* seed meal was analyzed for its chemical composition and incorporated into starter broiler diets at 0.0, 5.0, 10.0 and 15.0 %(T_1, T_2, T_3 and T_4) inclusion levels, respectively. A total of 120 day-old broiler chicks divided into four groups of 30 birds each. Each group was further divided into 3 replicates of 10 birds and fed the diets in a complete randomized design. Cooked *Mucuna sloanei* contains 26.10. 3.20, 8.30 and 3.83% crude protein, crude fibre, ether extract and ash, respectively. The seed meal is high in tannins, saponin, alkaloid, flavonoids and cardiac glycoside but low in oxalate, phytate and phenols. Body weight gain and feed intake decreased significantly ($p<0.05$) with increasing dietary level of cooked *Mucuna sloanei* seed meal. Birds fed the control diet had significant ($p<0.05$) better feed conversion ratio than the *Mucuna sloanei* diet groups. The hematological analysis showed a significant ($p< 0.05$) reduction in the Hemoglobin concentration, packed cell volume, mean cell volume, mean cell hemoglobin and heterophil while the value for lymphocytes increased with inclusion of the test ingredient. There was no significant difference ($p> 0.05$) in all thebiochemical parameters analyzed except the globulin which was similar for the control, T_2 and T_3 but significantly low for the T_4 group. It was concluded that, though no mortality was recorded, cooked *Mucuna sloanei* meal could not improve the performance of starter broilers at the different dietary inclusionlevels.

Keywords: *Mucuna sloanei*, phytochemicals, starter broiler, blood indices

Introduction

Thesearch for alternatives to conventional poultry feedstuffs has been the focus of many research activities in recent times.This has led to a great effort by animal nutritionist towards the discovery of new feed ingredients that can be used in alternative to the conventional feed ingredients (Ndubuisi, 2011).*Mucuna sloanei* (Hamburger) plant, commonly known as Ukpo by the Ibos in Nigeria is a high seed yielding tropical legume crop. Its seeds are used for the thickening of soup by humans. According to Tuleun *et al*., (2008)*Mucuna sloanei* seeds is one material that has the potential to fit into feed ingredients in poultry nutrition.

This study therefore, is aimed at determining the chemical composition of cooked *Mucuna sloanei* seed meal and its effect on performance, hematology and biochemical indices of starter broiler chicks.

Materials and Method

The study was conducted at the Teaching and Research Farm of the Imo State University, Owerri. Owerri is located in the rain forest belt of Nigeria and lies within latitude 5°45' N and 7°15' N and longitude 6°50' E and 7°25' E, with an annual temperature range of 26 - 29°C, an annual relative humidity that is between 70-75% and an annual rainfall range of 2400 - 2500mm (NIMET, 2016).

The *Mucuna sloanei* seeds used for the experiment were procured from Relief market, Owerri. The seeds were cracked into 2-4 parts using a hammer mill. The hard seed coats were then removed, cooked in boiling water for 30 minutes, dried in an oven to a moisture content of 9-10%. The dried seeds were then ground into meal using a hammer mill.Sample of the seed meal was analyzed for its proximate and phytochemical composition according to the methods of AOAC, (2000) and Harborne (1998), respectively.

Four experimental starter broiler diets were formulated such that the diets contained 0.0, 5.0, 10.0 and 15.0 % (T_1 T_2, T_3 and T_4) *Mucuna sloanei* seed meal as replacement for soybean meal, respectively. The ingredient composition of the experimental diets is presented in table 1.

A total of 120 day- old Marshal Broiler chicks were used for the experiment. The birds were divided into four groups of 30 birds each. Each group was replicated 3 times with 10 birds per replicate and housed in pens measuring 0.5$m^2$with wood shavings as litter material. Each pen contains feeder and waterer, and a stove for

heat supply. The groups were randomly assigned to the four experimental diets in a complete randomizeddesign (CRD). The birds were fed a conventional broiler starter feed during the first four days while the treatment diets were introduced from the fifth day by mixing each of the diets with commercial starter mash at a combination percentage of 75% commercial feed and 25% experimental diet on the first day of introduction and gradually reducing the quantity of the commercial feed to 50%, and 25% on the second and third day respectively while on the fourth day of introducing the experimental feed, only the experimental diet was fed to the birds. Feed and water were given *ad-libitum,* and proper routine brooding management practices and medications adopted. The experiment lasted for four weeks.

Table 1: Ingredient composition of the experiment diets

Ingredients	Dietary levels in %			
	T_1 (0.00)	T_2 (5.00)	T_3 (10.00)	T_4(15.00)
Maize	49.00	49.00	49.00	49.00
Soya Bean Meal	15.00	10.00	5.00	0.00
Mucuna sloanei Meal	0.00	5.00	10.00	15.00
Groundnut Cake	15.00	15.00	15.00	15.00
Wheat bran	7.00	7.00	7.00	7.00
Palm Kernel Cake	5.00	5.00	5.00	5.00
Fish Meal	3.00	3.00	3.00	3.00
Blood Meal	2.00	2.00	2.00	2.00
Bone meal	3.00	3.00	3.00	3.00
Methionine	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25
**Mineral-Vit. Premix	0.25	0.25	0.25	0.25
Common salt	0.25	0.25	0.25	0.25
Total	100	100	100	100
Calculated nutrient composition of the diets				
Crude protein	23.28	22.39	21.49	20.60
Crude fiber	4.24	4.07	3.91	3.74
Calcium	1.27	1.28	1.30	1.31
Phosphorus	1.02	1.00	0.98	0.96
Lysine	1.40	1.48	1.57	1.66
Methionine	0.68	0.87	1.06	1.25
Metabolizable energy (kcal/kg)	2790.43	2843.59	2896.74	2949.90

** To provide the following per kilogram of feed; vit. A 10,000IU; vit. $D_3$1,500 IU; vit. E 2mg; riboflavin 3mg; pantothenic acid 10mg; nicotinic acid, 2.5mg; choline 3.5mg; folic acid 1mg; magnesium 56mg; lysine 1mg; iron 20mg; zinc 50mg; cobalt 1.25mg.

The birds were weighed at the beginning of the experiment and weekly thereafter.Daily feed intake was determined by subtracting the weight of left over from weigh of feed given. At the end of the fourth week, three broilers were randomly selected from each of the replicates for blood sample collection. Blood samples were obtained by puncturing the webal sub-clavicles vein with five milliliters scalp vein needle and collected into ethylene diamine tetra-acetic acid (EDTA) and non EDTA bottles for hematological and biochemical assay, respectively. Both samples were analyzed using Auto analyzer.

The data obtained from this study, were subjected to statistical analysis using analysis of variance procedure and computed with IBM SPSS Version 22.

Results and Discussion

The results of the proximate and phytochemical analyses of *Mucuna sloanei* seed meal are presented in tables 2 and 3, respectively.The proximate composition values were within the levels obtained by Tuleun *et al*., (2009).Cooked *M. sloanei* seed meal contains variable levels of phytochemicals measured.Oxalate and tannin contents were relatively higher than those of the components. Igwenyi *et al.* (2014) reported similar phytochemical values forcooked *M. sloanei* seed meal.

Data on the performance of starter broilers fed diets containing varying levels of *Mucuna sloanei* seed meal is presented in table 4. Body weight gain and daily feed intake decreased significantly ($p< 0.05$) with increasing dietary level of the meal. Birds fed the control diet had the highest values followed by those fed the T1

diet. Birds on control diet also had a significantly ($p< 0.05$) better feed conversion ratio than the *Mucuna* diet groups. No mortality was recorded during the period of the experiment. The relatively better performance of starter broilers fed the control diet could be attributed to a better utilization of soya bean meal compared to *M. sloanei* meal. The result thus, affirms the assertion of Ravindran (2013) that when compared to the protein meal of other oilseed grains, soybean protein is favored due to its well-balanced amino acid profile, especially the essential ones, enabling it to balance most cereal-based diets.

Table 2: Proximate composition of cooked *Mucuna sloanei* seed meal

Nutrient	Proximate Composition (%DM)
Dry matter content	94.69
Crude Protein	26.10
Crude fiber	3.2
Ether extract	8.3
Ash content	3.83
Nitrogen free extract	94.69 - 26.1- 3.2 - 8.3 - 3.83 = 53.26

Table 3: Phytochemical compositions of cooked *Mucunasloanei* seed meal

Parameter	Qualitative score	Quantity (%)
Tannin	++	29.28
Saponins	++	3.40
Alkaloids	++	6.03
Flavanoids	++	8.94
Phytate	+	0.66
Cardiac Glycosides	++	8.13
Oxalate	+	53460mg/100g
Phenol (absorbance of sample at 505nm)	+	0.110

Table 4: Performance of starter broilers fed different levels of cooked *Mucunasolanei*

Parameter	T1(0.00)	T2(5.00)	T3(10.00)	T4(15.00)	SEM
Initial Av body weight (g)	150.00	149.33	150.00	150.00	0.31
Final Av body weight (g)	870.33^{a}	780.67^{b}	700.67^{c}	650^{d}	4.57
Body weight gain (g)	720.33^{a}	631.34^{b}	550.67^{c}	500.33^{d}	2.55
Average Daily weight gain (g/day)	34.30^{a}	30.06^{b}	26.22^{c}	23.83^{d}	1.18
Average Daily feed Intake	68.84^{a}	67.16^{b}	60.92^{c}	54.16^{d}	1.58
Feed conversion ratio (g/day)(daily feed intake/daily wt gain)	2.01^{b}	2.23^{a}	2.32^{a}	2.27^{a}	0.02
Mortality	0	0	0	0	

Without superscript = not significant. a,b,c,d means with different superscript in the same row differ significantly ($p< 0.05$). SEM = Standard Error Mean

The *M. sloanei* used for the experiment contained 29.28% tannin andthe presence of tannins in diets for livestock has been reported to have anti-nutritional and toxic effects, including reduced feed intake, growth rate, feed efficiency and net metabolizable energy (Jasman, 1993; King-Thom Chung *et al.,* 2010). Tannins have a major negative impact on animal nutrition especially monogastric animals because of their ability to form complexes with numerous types of molecules, including, but not limited to carbohydrates, proteins, polysaccharides, bacterial cell membranes and enzymes involved in protein and carbohydrates digestion, and that in poultry 3-7% levels in diet can cause death (Antonello, 2014).Data on the hematological indices of the starter broilers fed diets containing different levels of cooked *M.sloanei* seed meal is presented in table 5. Birds fed the control diet had a significantly ($p< 0.05$) increased Hemoglobin (Hb), Packed Cell Volume (PCV), lymphocytes,Mean Cell Volume (MCV) and Mean Cell Hemoglobin (MCH) but decreased heterophils. The values varied significantly ($p< 0.05$) among the *Mucuna* diet groups with birds fed 15% *Mucuna* having the least value. The other parameters measured were not affected by the treatments. The WBC and its differential parameters showed no significant difference ($p> 0.05$) among the treatment groups except the heterophil and

lymphocytes.

Conclusion and Recommendation

Cooked *M. sloanei* seed meal though high in crude protein, contained anti-nutritional factors, reduced the performance of broilers, negatively affected some blood parameter and could not replace soya bean meal at 5% inclusion level in starter broiler diets.

Table 5: Hematological Indices of Starter Broiler Fed Different Levels of the Treatment Diets

Parameter	T_1 (0.00)	T_2(5.00)	T_3(10.00)	T_4(15.00)	SEM
HB(g/dl)	12.38^a	11.15^b	11.30^b	10.70^c	0.19
PVC (%)	39.50^a	36.00^b	35.00^b	33.00^c	0.5
WBC (x10^9/L)	11.00	11.20	10.60	10.8	0.24
WBC-Differential (%)					
Hetrophils	50.50^a	52.50^b	52.75^b	53.62^c	0.29
Eosinophils	1	2	1	1	0.16
Basophils	0	0	0	0	
Lymphocytes	47.00^c	45.00^b	45.00^b	42.00^a	0.67
Monocytes	2	2	2	1	0.18
RBC (x10^{12}/l)	12.40	11.96	12.20	12.00	0.18
ESR(mm/1st1Hr)	50	50	50	50	0.58
MCV(fl)	31.7^a	29.3^b	29.5^b	27.1^c	0.11
MCH(pg)	9.85^a	9.40^b	9.37^b	8.9^c	0.19
MCHC(g/dl)	31.9	32.6	32.53	31.57	0.45

Without subscript = not significant. a,b,c,d Mean with different superscript on same row differ significantly ($P < 0.05$). SEM = Standard Error Mean.

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