Dietary Effect of Velvet Bean (*Mucuna utilis*) Leaf Meal on Haematology and Serum Biochemistry of Broiler Finisher Birds

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Abstract. A study was conducted to investigate the effect of feeding varying levels of *Mucuna utilis* leaf meal (MULM) on the haematological and serum biochemistry parameters of broiler finisher birds using ninety six four-week-old chicks for 29 days. The birds were randomly assigned to the four treatments, each replicated three times with eight birds constituting a replicate. The birds were allotted to four treatments containing 0, 10, 20, and 30% MULM. The haematological parameters evaluated showed no significant difference ($p>0.05$) on PCV, Hb, RBC and WBC. MCHC was improved and better at D birds in comparison to other treatments. MCV and MCH differ significantly ($p<0.05$) with birds on control showing higher values than those on C and D. Total protein, albumin and globulin showed better ($p<0.05$) values for the treatment groups when compared with the control group. The study concluded that, on account of adequate haematocrit and immune status, incorporation of MULM at 30% in the diets of broiler finisher birds had no deleterious effect on haematological and serum biochemical indices and therefore recommend for production of healthy broilers.

Introduction

Poultry nutritionists aim to formulate diets to enhance the performance of the birds by supplying all the nutrients required for growth, maintenance or any other productive function without compromising the physiological/health status of the birds. The diets should however be formulated at a cheaper rate and at the same time supply the required nutrients without altering the physiological status of the animal. This has necessitated the need for cheaper available alternative feedstuffs like *Mucuna utilis* leaf meal. *Mucuna utilis* commonly known as velvet bean is a vigorous annual climbing plant, originated from South Asia and Malaysia, but can grow well in the tropics due to its outstanding adaptability to extreme climatic conditions and disease resistance profile. It has been reported to be rich in energy, protein, amino acids, vitamins and minerals [13], [15], [3], [16]. The plant is known to have multipurpose properties. Its high medicinal [17], [9], [16] and blood boosting [16] properties have been documented. However, the reported anti-nutritional factors like trypsin inhibitors, haemagglutinins, phytic acid, hydrocyanic acid and tannins [13] which abound in *Mucuna utilis* thrust the blood examination in this study.

Blood parameters are indispensable indicators in measuring the nutritional and health status of humans and animals. They play pivotal role in clinical evaluation, diagnostic and prognostic evaluation of various types of diseases in farm animals. Haematology is the branch of physiology that is concerned with the study of blood, blood-forming organs and blood diseases. The haematological components are helpful in monitoring feed toxicity especially with feed constituents that affect the blood as well as the health status of farm animals [4]. Jiwuba et al. [5] noted the importance of packed cell volume and red blood cells in determining feed toxicity and anemia in farm animals. Serum biochemical parameters tend to have specificity for an organ and/or a limited range of pathological processes. Serum creatinine and total protein help in evaluation of liver and kidney function and diseases while serum urea evaluates renal function [6]. This study is therefore

designed to determine the effects of different levels of *Mucuna utilis* leaf meal on the haematology and serum biochemistry of broiler finisher birds.

Materials and Methods

Experimental site: The experiment was carried out at the Poultry Unit, Federal College of Agriculture, Ishiagu, Ebonyi state, Nigeria. The College is located at about three kilometers (3km) away from Ishiagu main town. The College is situated at latitude 5.56°N and longitude 7.31°E, with an average rainfall of 1653mm and a prevailing temperature condition of 28.50°C and relative humidity of about 80%.

Processing of *Mucuna utilis* leaf meal (MULM): Freshly succulent leaves of *Mucuna utilis* without flowers were harvested within the College farms. Thereafter, the leaves were air dried to reduce/eliminate possible anti-nutritional factors present in the fresh leaves for subsequent milling and also to obtain about 10% moisture content. They were thereafter milled by passing through hammer mill, before been used to formulate the experimental diets.

Experimental Diets: Four experimental diets designated as A, B, C, and D where formulated to contain 0, 10, 20, 30, levels of MULM. The compositions of the experimental diets are presented in Table 1.

Table 1. Composition of experimental diets.

Ingredients	A	B	C	D
Maize	54.00	52.00	50.00	47.00
Wheat meal	17.00	10.00	6.00	2.00
Soyabean meal	21.50	20.50	16.50	13.50
Mucuna leaf meal	0.00	10.00	20.00	30.00
Fish meal	3.00	3.00	3.00	3.00
Bone meal	3.00	3.00	3.00	3.00
Vitamin/premix	0.50	0.50	0.50	0.50
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Common salt	0.50	0.50	0.50	0.50
Total	100	100	100	100

*Vitamin and mineral premix contributed the following to each kilogram of diet: vitamin A 500 IU; vitamin D 1500 IU; vitamin E 3 IU; vitamin K 2 mg; riboflavin 3 mg; pantothenic acid 6 mg; niacin 15 mg; vitamin B 12 0.8 mg; choline, 3 mg; folic acid 4 mg; manganese 8 mg; zinc 0.5 mg; iodine 1.0 mg; Co 1.2 mg.

Experimental Animal and Management: Ninety six four-week-old chicks were used for this experiment. They were randomly assigned to the four treatments, each replicated three times with eight birds constituting a replicate. The four treatment groups were fed the four experimental diets in a Completely Randomized Design for 29 days. Each replicate was housed in a concrete floor covered with wood shavings as the litter material. The chicks were weighed using digital sensitive balance and randomly distributed accordingly. The chicks were reared in a deep litter system whose floor was covered with wood shavings at about 5 cm depth. Sufficient management conditions like floor space, light, temperature, ventilation and relative humidity were provided to each of the groups. The chickens were vaccinated against major poultry viral and bacterial diseases as per the recommended vaccination schedule. During the experimental period, they were fed *ad libitum* on replicate basis and provided with clean and wholesome water.

Blood profile analysis: Blood samples (5ml) were drawn from three birds per replicate on the last day of the study. The birds were bled through the marginal wing vein. The samples were separated into two lots and used for biochemical and haematological studies. An initial 2.5 ml was collected from each sample in labelled sterile universal bottle containing 1.0 mg/ml ethyldiamine tetracetic acid and used for haematological analysis. Another 2.5 ml was collected over anti-coagulant free bottle. The blood was allowed to clot at room temperature and serum separated by centrifuging within three hours of collection. Serum biochemistry and haematological parameters were measured using Beckman Coulter Ac-T10 Laboratory Haematology Blood Analyzer and Bayer DCA 2000+ HbA1c analyzer, respectively. Mean cells haemoglobin (MCH), mean cell volume (MCV) and mean cell haemoglobin concentrations (MCHC) were calculated.

Statistical Analysis: The results were analysed using the Statistical Package for Social Sciences (SPSS 17.0). One - way analysis of variance was employed to determine the means and standard error. Differences between means were separated by Duncan Multiple Range Test (Duncan, 1955).

Results and Discussion

The haematological parameters of broiler finishers fed varying levels of *Mucuna utilis* leaf meal is presented in Table 2. The results showed no significant effect ($p>0.05$) on PCV, RBC, Hb, and WBC between the control and the treatment groups. This is an indication that MULM is not toxic to the blood formation and immune system of the birds and hence has no deleterious effects on the broiler finishers. The values fall within the normal physiological range for healthy broilers as reported by Mitruka and Rawnsley [10]. This is an indication that MULM is nutritionally adequate for broiler finishers. However, MCHC, MCH and MCV were significantly ($p<0.05$) influenced by the treatment diets. MCHC, MCH and MCV fall within the normal reported by Mitruka and Rawnsley [10] and Johnson-Delaney [8] for broilers. The red blood cell differentials could reflect anaemic condition. The normal range found in this study for the birds gave a clear indication of the absence of anaemia among the experimental groups. The result of this study is in agreement with the results of Sese et al. [12] for growing rabbits fed MULM. This may be attributed to the blood boosting properties of *Mucuna utilis* as reported by Ujowundu et al. [16]. This showed that MULM had no adverse effect on erythropoiesis and is an indication that the diet did not cause nutrient restriction.

Table 2. Haematological indices of broiler finisher bird fed *Mucuna utilis* leaf meal.

Parameters	A	B	C	D	SEM
PCV (%)	28.67	29.67	27.67	29.00	0.42
Hb (g/dl)	9.70	9.97	9.40	9.77	0.45
RBC ($\times 10^{12}/l$)	3.31	3.62	3.52	3.64	0.08
MCHC (%)	33.59 ^b	33.73 ^b	34.10 ^{ab}	34.29 ^a	0.12
MCH (pg)	29.39 ^a	27.47 ^{ab}	26.70 ^b	26.79 ^b	0.44
MCV (f)	86.75 ^a	81.84 ^{ab}	78.56 ^b	78.09 ^b	1.13
WBC ($\times 10^{12}/l$)	10.80	12.70	9.00	11.50	0.68

^{a, b} Means within the same row with different superscripts are significantly different ($p<0.05$)

The serum biochemical indices of broiler finishers fed *Mucuna utilis* leaf meal is presented in Table 3. The result showed significant ($p<0.05$) difference for total protein, albumin and globulin. Total serum protein range of 26.60 – 34.30 g/l is comparable with the reported values of 27.38-31.0g/l [14] for broilers. High total protein could be attributed to good protein reserve, thus reflecting the ability of the chickens to store protein for tissue development. This is in agreement with Muhammad et al. [11], who attributed increased serum protein in broilers to dietary inclusion of velvet bean. The serum albumin (17.10 – 20.80g/l) obtained in this study is in agreement with the reported range of 17.00 - 28.00g/l by Aderinola et al. [1] for broilers. Jiwuba et al. [6-7] attributed

serum albumin to liver functioning. Hence the higher albumin reported in this study for the treatment groups may indicate a better liver functioning to the birds fed the respective diets. Ujowundu et al. [16] however reported that the leaf extract of *Mucuna utilis* are used to reduce high concentration of some anti-nutritional constituents in the body; thus a liver functioning property of *Mucuna utilis* leaves. Serum globulin was lowest in birds on the control diet in comparison with other treatment groups. This may suggest high immune response and sufficient antibody production as a result of diets containing *Mucuna utilis* leaf meal. Warriar et al. [17] and Manjunatha et al. [9] earlier reported the medicinal and antibacterial properties of *M. utilis* plant parts. Urea, creatinine and cholesterol were not ($p > 0.05$) influenced by the treatment diets. The non-significance ($p > 0.05$) reported for urea and creatinine implies that the diets had similar effects on the kidney of the broiler finishers across the dietary treatments. This demonstrated the nutritional adequacy of MULM on broiler birds. Similarly, the cholesterol similarities ($p > 0.05$) obtained in this study may imply normal fat metabolism; an indication of health benefit of incorporating MULM in the diets of finisher broilers.

Table 3. Serum biochemical indices of broiler finishers fed *Mucuna utilis* leaf meal.

Parameters	A	B	C	D	SEM
Total protein (g/l)	26.60 ^c	34.30 ^a	33.10 ^{ab}	29.10 ^b	0.09
Albumin (g/l)	17.10 ^b	19.50 ^a	20.80 ^a	19.60 ^a	0.34
Globulin (g/l)	9.30 ^b	14.70 ^a	12.00 ^{ab}	11.97 ^{ab}	0.46
Urea (Mg/dl)	4.30	4.71	4.87	3.53	0.20
Creatinine (Mg/dl)	0.20	0.18	0.19	0.19	0.70
Cholesterol (Mg/dl)	97.68	95.26	103.87	108.27	2.86

^{a-c} Means within the same row with different superscripts are significantly different ($p < 0.05$)

Conclusion

The results of this study revealed that finisher broilers can be fed with up to 30% MULM in their diets without any detrimental effect on the haematology and serum biochemical indices. MULM could therefore be recommended for finisher broiler production for enhanced blood formation and better immune response.

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