Effect of *Mucuna Pruriens* (Velvet Bean) Leaf Meal on Performance and Blood Composition of Finisher Broiler Chickens.

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Abstract

The effect of *Mucuna pruriens* (Velvet bean) leaf meal on the performance and blood composition of finisher broiler chickens were determined in a 35-day feeding trial. Chemical analysis indicated that the leaf meal is relatively high in crude protein (22.34%) and with estimated energy content of 1408.93kJ/kg DM. Maize based diets containing mucuna leaf meal (MLM) at 0, 5, 7.5 and 10% levels, respectively were formulated and fed to finisher broilers in a complete randomized design replicated four times. Each replicate contained 10 birds. Birds fed MLM diets had a statistically ($P>0.05$) similar feed intake values with the control group. Body weight gain of the birds compared favorably with the control except at 10% ($P<0.05$) dietary inclusion level. Birds fed 10% MLM diet had the lowest weight gain. Feed conversion ratios were similar among the 0, 5 and 7.5% diet groups. The blood compositions of finisher broilers in terms of packed cell volume, red blood cell and haemoglobin increased with increasing dietary level of the meal but the values were not significantly ($P>0.05$) different from the control. With increasing dietary inclusion levels of MLM in the diets, the erythrocytic and leucocytic (WBC, lymphocytes and neutrophils) parameters varied without any negative significant ($P>0.05$) effects. It is concluded that 7.5% MLM could be used in broiler finisher diets without any deleterious effects on the performance. Enhanced erythrocytes values were obtained at 10% dietary level.

Key words: *Mucuna leaf, Broilers, Performance, Chemical composition, blood composition.*

Introduction

Leaf meal made from fodder shrubs, leguminous crops and trees are currently helping small-scale farmers in many tropical countries to boost their yields (Esonu *et al*, 2002; Nworgu and Fapohunda, 2002). Bayslick mineral mix, which contains leaf meal from fodder shrubs

including ground leaf meal from the *Leucaena leucocephala* is widely produced and marketed in the Janga area of Tanzania (ICRAF, 2006). Leaf meals from tropical leguminous crops, browse plants and trees have been used as sources of nutrients and xanthophylls (pigmentation and yolk colour) in the diets of broiler chickens and

laying hens (Michael 1980; Udedibie and Igwe, 1989; Ngodigha, 1995; Udedibie and Opara, 1996; Esonu *et al*, 2002; Nworgu and Fapohunda, 2002; Madubuike and Ekenyem, 2006).

However, several plants species produce leaves that can be processed to provide high quality low costs feedstuff for non- ruminants, especially poultry if information on their nutritive values are available. Some of these plant leaves which are readily available and relatively cheap, will not lead to significant reduction in production parameters at certain dietary inclusion levels and are not major food items for humans. Many of these tropical browse plants and leguminous crops yield heavily in leaves but are little known and used as sources of leaf meal for non-ruminants. One of such leguminous crop is *Mucuna pruriens* (Velvet bean).

Mucuna pruriens (velvet bean) plants are widely used as cover crop/soil improvement crop in many tropical countries (Berhe, 2001). It yields heavily in seeds and foliage and tolerates a wide range of soils. (Skerman, 1977). The leaf contains about 19 – 30% crude protein on dry matter basis (Bienaime and Dunaud, 1989). The liquid extracts from the pounded mucuna leaves is said to build up blood cells and is consumed by local people in Southern Nigeria.

Factors such as physiological (Graczyk *et al*, 2003), diet contents (Odunsi *et al*, 1999; Kurtoglu *et al*, 2005), water and feed restriction (Galip, 1999; Al-Rawashdeh *et al*, 2000; Iheukwumere and Herbert, 2003), fasting (Lamosova *et al*, 2004), age (Furlan *et al*, 1999; Naziefy-Habibabadi, 1997; Seiser *et al*, 2000), administrations of drugs (Khan *et al*, 1994; Zaman *et al*, 1995), anti-aflatoxin premixes (Oguz *et al*, 2000) and continuous supplementations of vitamin E (Tras *et al*, 2000) affect the performances and blood profiles of healthy birds. Evaluation of the proximate

composition of mucuna leaf meal as well as performance and blood profiles of broilers fed graded levels of the leaf meal will provide valuable information for its assessment and use as a feed ingredient in poultry diets.

The present study was therefore designed to determine the proximate composition of *Mucuna pruriens* leaf meal as well as the performance and blood chemistry of finisher broilers chickens fed graded levels of the leaf meal.

Materials and Methods

Processing of Leaf Meal:

Fresh mucuna leaves were harvested from the wild at Owerri in the south-eastern ecological zone of Nigeria. The harvested leaves were dried under room temperature for 3 – 4 days prior to 2 – 3 hours of sun drying to make them crispy to touch. The dried leaves were then ground into meal using a motorized electric grinding mill (ASKO A11) to produce mucuna leaf meal (MLM).

Proximate Composition

The leaf meal moisture was determined by following the method of Rajaran and Janardhanan (1990). Samples of the fine leaf meal was stored in screw cap bottles at room temperature and used for further analysis. Nitrogen content was determined according to the Kjeldahl method (Humphries, 1956) and the percentage of crude protein was calculated using the factor 6.25. The crude lipid contents, crude fibre and ash were determined in accordance with the standard methods of the AOAC (1990). Carbohydrate was obtained by difference. The energy value of the meal was estimated (in KJ) according to Siddhuraju *et al* (1996) by

multiplying the percentage of crude protein, crude fat and carbohydrates by the factors 16.7, 37.7 and 16.7, respectively.

Experimental Diets:

Four experimental broiler finisher diets were formulated such that the diets contained 0, 5, 7.5 and 10% levels of MLM, respectively (Table 1).

Experimental birds and design

Mixed sex (female and male) broiler chickens (Anak strain) were obtained from a local hatchery and raised in brooders on leaf meal free commercial starter diets. At 35-day of age, the chickens were weighed in groups of forty and

assigned to the four experimental diets in a complete randomized design replicated 4 times. Each diet was fed as a mash for 38 days (day 35 – 63 of age) in a deep litter pen measuring 3m x 2m. Feed and water were provided *ad libitum*.

The birds were weighed at the beginning of the experiment and weekly thereafter. Feed intake and mortality were recorded over the period. At day-63, two birds were randomly selected from each replicate, making a total of 8 birds per treatment. The sampled birds were bled between 8am – 10am from punctured brachial vein to aspirate 5mls of blood from each bird from which 2mls each was collected into bijon bottle treated with ethylenediamine tetra acetic acid (EDTA)

Table 1: Ingredient composition of the experimental diets

Ingredients (%)	0%	5%	7.5%	10%
Maize	55.0	55.0	55.0	55.0
Soybean meal	19.0	19.0	19.0	19.0
Brewer's dried grain	12.0	9.0	7.0	5.0
Mucuna leaf meal (MLM)	0.0	5.0	7.5	10.0
Palm kernel cake	6.0	4.0	3.5	3.0
Fish meal	4.0	4.0	4.0	4.0
Bone meal	3.0	3.0	3.0	3.0
Vit/Mineral premix*	0.5	0.5	0.5	0.5
Salt	0.5	0.5	0.5	0.5
Total	100.0	100.0	100.0	100.0

Determined chemical Analysis:

Crude protein	20.27	20.40	21.00	20.65
Crude fibre	7.48	5.96	5.66	11.36
Ether extract	1.12	1.15	1.34	1.10
Carbohydrate	46.77	57.73	45.67	54.37
Energy (Kcal/100g)	275.44	302.87	278.74	309.98
Calcium %	0.12	0.19	0.08	0.08
Phosphorus	1.52	1.01	1.50	0.73

*To provide the following per kg of feed: Vitamin A, 10,000iu; vitamin D₃, 2000iu; vitamin E, 5iu; vitamin k, 2mg; riboflavin, 4.2mg; vitamin B₁₂, 0.01mg; pantothenic acid, 5mg; nicotinic acid, 20mg; folic acid, 0.5mg; choline, 3mg; mg, 56mg; fe, 20mg; cu, 1.0mg; zn, 5.0mg; co, 1.25mg; iodine, 0.8mg.

for haematological assay (Bermudez and Stewart-Brown, 2003). Blood samples were labeled according to treatment and replicates.

Haematological Tests

Haematological parameters such as red blood cells (RBC), white blood cells (WBC), packed cell volume (PCV), haemoglobin (Hb) and mean corpuscular concentration (MCHC) together with absolute counts of neutrophils and lymphocytes were determined by routine methods as previously described (Campbell, 1988).

Data Analysis

Data generated were subjected to one-way analysis of variance (Steel and Torrie, 1960) and significant differences between treatment means were determined using standard error of means

Results and Discussion

The mean value of the proximate composition for mucuna leaf meal is shown in table 2. The leaf meal of *M. pruriens* contains an average of 22.34% crude protein on dry matter basis, which seems to be higher compared to an

earlier report (Esonu *et al*, 2002). This suggests that it is a potential source of nutrient like other tropical forage crops and browse plants (D'Mello, 1995). The relatively high level of crude fibre (11.3%) in the leaf meal could be an advantage in the maintenance of a healthy gastrointestinal tract of animals thus indicating that *M pruriens* leaf can also serve as a fibre source in the diet of non-ruminant animals.

Data on the performance and haematological parameters of the broilers fed mucuna leaf meal diets are shown in table 3. Feed intakes among the dietary treatment groups were similar. Body weight gain and feed conversion ratio were comparable among groups fed 0% (control) 5, and 7.5% MLM diets respectively. Birds fed the control diet had the highest weight gain (41.8g/b/d) and best feed conversion ratio (3.43), which differed significantly ($P<0.05$) only with the 10% MLM diet group.

The depressed weight gain and feed conversion ratio of birds fed 10% MLM diets has also been reported for *Leucaena leucocephala* (D'Mello *et al*, 1987), *Microdesmis puberula* (Esonu *et al*, 2002), and *Gliricidia sepium* (Mishra *et al*, 1977) on broilers. Tangendjaja *et al* (1990) reported that

Table 2: Chemical composition of mucuna leaf meal.

Constituents	Composition (%)
Moisture	12.64
Crude fibre	12.93
Crude protein	22.34
Ether extracts	2.40
Carbohydrate	56.13
Ash	6.16
Gross energy (kcal/kg)	1408.93

Table 3: Performance and blood composition of finisher broilers fed mucuna leaf meal diets

Performance Parameters	0%	5%	7.5%	10%	SEM
Initial weights (kg)	1.13	1.13	1.13	1.12	0.01
Final weight (kg)	2.30 ^a	2.17 ^{ab}	2.20 ^{ab}	1.93 ^b	0.12
Weight gain (g/b/d)	41.79 ^a	37.14 ^{ab}	38.22 ^{ab}	28.93 ^b	4.49
Feed intake g/b/d	143.00	140.00	154.00	147.00	8.42
Feed conversion ratio	3.43 ^b	3.81 ^b	4.09 ^{ab}	4.91 ^a	0.32
Haematological parameters:					
Red blood cells ($\times 10^6/\text{mm}^3$)	2.75	2.90	3.12	3.21	1.21
Packed cell volume (%)	25.00	26.00	29.50	31.00	4.88
Haemoglobin (%)	9.65	10.30	11.15	11.65	1.64
Mean corpuscular haemoglobin conc.(%)	33.10	33.00	33.15	33.15	0.15
White blood cells ($10^6/\text{mm}^3$)	6.00	6.65	6.85	6.60	1.08
Neutrophils %	21.00	20.00	25.50	24.00	3.20
Lymphocytes %	89.00	90.00	94.50	96.00	3.40

abc: means within rows not identified by the same superscript are significantly different ($P < 0.05$).

when leaf meal forms substantial part of concentrate diets, digestibility of the crude protein component of the whole diet is markedly reduced. If that is the case, the depressed body weight gain and feed conversion ratio observed in broilers fed 10% leaf meal could be attributed to low protein digestibility and utilization by the birds.

Haematological values such as RBC, PCV and Hb were not significantly ($P > 0.05$) affected by the treatments but increased slightly with increasing dietary inclusion of mucuna leaf meal. The MCHC values of birds fed MLM diets were comparable with that of birds fed the control diet. The leucocytes components (WBC, lymphocytes and neutrophil) did not differ significantly ($P > 0.05$) between diet groups.

However, available information indicates that the number of red blood corpuscles (erythrocytes) and white corpuscles (leucocytes) of animals in good health varies between species, individuals and in the same individuals according to its condition and health (Jean, 1993) and are influenced by many factors including diets (Talebi *et al*, 2005). Parasitism and under-feeding are known to cause anemia, which reveals itself in a reduction of the red blood cell count and a reduction of the haemoglobin contained within each blood cell. The varied but non-significant ($P > 0.05$) haematological values observed in the present study are within normal range (Merk Veterinary Manual, 1979) and indicate a normal health condition of the birds. The RBC, PCV and Hb values of birds increased with increasing dietary inclusion of the leaf meal with the control

recording the lowest non-significant ($P>0.05$) values. Contrary to this finding, Madubike and Ekenyem (2006) reported decreasing erythrocyte values with increasing dietary inclusion of *Ipomoea asarifolia* leaf meal. This tends to confirm the report that diets affect the blood profile of birds (Talebi *et al*, 2005; Odunsi *et al*, 1999) and implies that the inclusion of MLM had a positive effect on the relative quantity of blood cell as well as total volume of blood. This confirms the blood building properties of mucuna leaf as claimed by local people in Nigeria.

The values of white blood cells and their deferential counts were within normal range (Health and Olusanya, 1985). White blood cell in the avian species in general serves phagocytes functions similar to those of their mammalian counterparts (Campbell and Coles, 1986) and differential leucocytes were used as indicators of stress response and sensitive biomarkers crucial to immune functions (Graczyk *et al*, 2003). It has however been reported that bacterial and viral illness affects the number of white corpuscles and the ratio between the different types of white corpuscles and the percentages of the various types in healthy animals vary little but are greatly modified in sick animals (Jean, 1993). The result of the white blood cell, neutrophil and lymphocytes in the present study clearly points to the fact that the birds were not at stress and had no bacterial or viral illness hence the non-significant ($P>0.05$) leucocytes values observed among the treatments. This tends to show that birds in both diets performed their normal phagocytes functions.

Conclusion

The information presented herein has strongly shown that *M. pruriens* leaf has very bright future as a source of feed ingredient in poultry and therefore merits processing attention as a leaf meal. The meal positively affected the performance and haematological parameters (especially the erythrocytes) at 7.5% and 10% levels respectively. It is suggested therefore that the use of *M. pruriens* leaf meal in poultry diets be explored to add to poultry feedstuff for performance and blood quality. Knowledge of its xanthophylls level will also encourage its use in broiler pigmentation and egg yolk coloration in laying hens.

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