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Short Communication

Comparative performance of broiler chicks fed diets containing differently processed *Mucuna pruriens* seed meals

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Abstract

A 28-day feeding trial was conducted to determine the effects of dietary inclusion of Mucuna seeds: soaked in Calcium hydroxide ($Ca(OH)_2$) solution, soaked in $Ca(OH)_2$ and cracked water-soaked and cooked, on the performance of broiler chicks. Two batches of raw Mucuna seeds were used. The first batch was soaked in 3% $Ca(OH)_2$ for 48 hours. Part of the soaked seeds were sun-dried and milled. The remaining part were cooked, sun-dried and milled. The second batch was cracked, soaked in water for 48 hours and cooked before sun drying and milling. Both meals were analyzed for their proximate composition and included in broiler starter diets at 20% dietary level respectively. The control diet contained no mucuna meal. Each diet was fed to a group of 40 broiler chicks in a completely randomized design replicated four times. At 20% dietary level containing $Ca(OH)_2$ soaked seed meal significantly ($P<0.05$) depressed the performance of the birds in terms of feed intake, growth rate and feed conversion ratio. However, soaking in $Ca(OH)_2$ prior to cooking and cracking prior to soaking in water and cooking did not adversely affect the performance of the birds in all parameters measured.

Key words: *Mucuna pruriens* seed, water soaked, $Ca(OH)_2$ soaked, feed intake, growth rate, feed conversion ratio.

Introduction

Nutrition and feeds are the critical cornerstones of livestock development for all farmers around the World. The first step in moving from a survival, free range environment to a high level of production is to improve the nutrition of the animal through the appropriate use of different types of feedstuffs. The soybean (*Glycine max)* and groundnut (*Arachis hypogaea)* have been playing key roles in the feeding of non-ruminant animals in many tropical countries. However, there is a serious competition between man and animals over these feedstuffs. This has given rise to increased feed costs, which is now beyond the reach of an average farmer. It has become imperative therefore to turn attention to the exploitation of other novel legumes, particularly those indigenous to the tropics. A number of these legumes have become low status products and have been neglected for a long time in all respects from research and production to consumption for a long time in all respects from research and production to consumption and nutrition. One of such legume is *Mucuna pruriens.*

Mucuna pruriens, commonly known as velvet bean in Nigeriua, Austrialia, South Africa and USA, Pica Pica in Venezuela and Bengal bean in India is a vigorously growing, black seeded tropical legume, that require a hot, moist climate

[redacted] growth and productivities. Thus, it [redacted] both as a cover crop and soil [redacted] crop (Mulongoy and Akobundu, [redacted] SG 2000), and yields heavily in seed and [redacted] in the humid climate of South-Eastern [redacted]. The crude protein content of the ripe [redacted] ranges from 24 – 32% on dry matter basis [redacted] the protein has relatively good amino acid [redacted] (Ravindran and Ravindran, 1988; Udedibie and Carlinin, 1998; Emenalom and Udedibie, 1998).

However, the use of raw mucuna seed as feedstuff for non-ruminants is limited by its content of toxic and antinutritional factors. These include protease inhibitors, tannins, cyanide and phytic acid (Ravindran and Ravindran, 1988; Siddhuraju *et al.*, 1996; Udedibie and Carlini 1998). In addition to these antinutritional factors, mucuna contains amylase glycosides and dihydroxphenyalanine (L-Dopa) (Josephine and Janardhanan, 1992; Siddhuraju *et al.*, 1996).

Earlier studies have shown that heat treatment alone (Emenalom and Udedibie 1998; Esonu, 2001) only gave indication of partial detoxification; hence its dietary inclusion could not exceed 10%. Studies by Udedibie and Carlini (1998) have shown that cracking the seed prior to soaking in water and cooking eliminated the protease inhibitors in the seed, while soaking the seed in calcium hydroxide solution ($Ca(OH)_2$) (SG 2000) reduced the L-Sopa content of the seed to about 0.1%. however, mucuna seeds so processed have not been tested on animals. This study was therefore designed to determine the response of broiler chicks to diets containing cracked, water-saoked and cooked and $Ca(OH)_2$ treated mucuna seed meal.

Materials and Methods

The mucuna seeds used for the study were harvested from the wild around villages in Ikeduru Local Government Area of Imo State in the South East ecological zone of Nigeria. The harvested seeds were divided into two batches. One batch was cracked (2- 3 pieces using ASKO A11 grinding machine, soaked in water for 48 hours and cooked for none hour. The other batch was soaked (whole seed) in 3% calcium hydroxide solution for 48 hours and divided into two parts. One part was cooked for one hour while the other was not. Both samples were sun-dried and milled. The resultant meals were labeled water soaked and cooked mucuna (WSCM), calcium hydroxide soaked and cooked mucuna (CSCM) and calcium hydroxide soaked mucuna (CSM), respectively.

Samples of the processed meals were analyzed for proximate xompsition according to A.O.A.C (1995) and then used to formulate diets for broiler chicks at 20% dietary inclusion level, respectively, with a 0% dietary inclusion level as the control (Table 1).

Table 1: *Ingredient composition of the experimental diets (g/100g)*

Ingredients	Control (0)	CSM (20)	CSM (20)	WSCM (20)
Maize	55.00	50.00	50.00	50.00
Mucuna seed meal	0.00	20.00	20.00	20.00
Soybean meal	20.00	5.00	5.00	5.00
Brewers' dried grain	8.00	8.00	8.00	8.00
Palm kernel cake	2.00	2.00	2.00	2.00
Wheat offal	5.00	5.00	5.00	5.00
Fish meal	3.00	3.00	3.00	3.00
Blood meal	3.00	3.00	3.00	3.00
Bone meal	3.00	3.00	3.00	3.00
Lysine	0.25	0.25	0.25	0.25
Methinione	0.25	0.25	0.25	0.25
Vit/TM premix*	0.25	0.25	0.25	0.25
Total	**100.00**	**100.00**	**100.00**	**100.00**
Calculated analysis (%)				
Crude protein (CP)	22.29	22.20	22.10	22.00
Crude fibre (CF)	3.26	4.15	4.26	4.07
Ether extract (EE)	4.27	4.17	4.48	4.21
MEKcal/kg	2830.89	2875.55	2990.00	2945.93

*To provide the following per kg of feed: Vit A, 10,000iu;D3 1500iu; Vit E, 3iu; Vit K 2mg; ribofl, 3mg; pantothentic acid, 6mg, miacin, 15mg; choline, 5mg; Vit B12, 0.09mg; folic acid 4mg; Mn, 8mg; Zn, 0.5mg; Iodine, 10g;Co, 1.2mg; Cu, 10mg; Fe, 20mg

One hundred and sixty (160), 7-day old Anak broiler chicks were divided into four groups of 40 birds each and randomly assigned to the four dietary treatments in a completely randomized design (CRD). Each treatment group was further subdivided into four replicates of 10 birds and kept in a pen measuring 2m x 3m.

The birds were weighed initially and thereafter on a weekly basis. Feed and water were provided *ad libitum*. Feed intake was recorded daily. The trial lasted for 28 days. Data on feed intake, growth rate and feed conversion ratio of the treatment groups were subjected to analysis of variance (Snedecor and Cochran, 1978).

Results and Discussion

The proximate composition of the processed mucuna seed meals are presented in Table 2. Both WSCM and CSCM meals appeared to have similar proximate composition with WSCM giving a slightly lower value. The crude protein value of 31.97% recorded for the $Ca(OH)_2$ soaked seeds is in agreement with the values in literatures for raw seeds. Raw *M. pruriens* seeds from India have been reported to contain 31.4% crude protein (Siddhuraju *et al.*, 1998) and from Nigeria 30.33% (Emenalom and Udedibie, 1998). Cooking reduced the crude protein possibly due to solubilization of some nitrogenous compounds during cooking.

Table 2: *Proximate chemical composition of the processed mucuna seed meals.*

Nutrients (%DM)	CSM (20)	CSM (20)	WSCM (20)
Moisture content	12.20	12.50	12.20
Dry matter	87.80	87.50	87.80
Crude protein	31.97	28.23	26.92
Crude fibre	7.65	8.30	8.30
Ether extract	8.00	7.52	6.00
Ash	4.50	4.00	2.20

The data on the performance of the experimental birds is shown in Table 3. Birds on 20% CSM diet recorded a significantly ($P<0.05$) depressed feed intake, growth rate and feed conversion ratios, when compared with the other mucuna diet groups. At 20% dietary levels of both WSCM and CSCM meals the feed intake, growth rate and feed conversion ratio of the birds statistically ($P<0.05$) compared favourably with the control group even though their values were slightly lower. The poor performance of the group on 20% CSM was somehow, difficult to explain but could be attributed to inhibitory activity of the toxic factors in the seed. Similar growth depressing effects was also observed in finisher broiler (Emenalom and Udedibie, 1998) and starter broilers (Esonu, 2001) fed raw or urea toasted mucuna seed meals.

Although the nature of the solubilized components arising from the three processing methods were not determined, it is likely that the antinutritional substance in mucuna seed formed a substantial proportion of the solubilized compounds. It is likely also that soaking in $Ca(OH)_2$ solution prior to cooking was more effective in removing the antinutritional compounds, hence the slight improvement in performance of birds fed the diet over birds fed cracked water soaked and cooked diet. The result of this trail suggest that soaking in $Ca(OH)_2$ solution without cooking is not an efficient method of detoxifying the seed and that broiler chicks could tolerate WSCM and CSCM meals at 20% dietary inclusion level respectively, without any adverse effect on performance.

Table 3: *Performance of broiler chicks fed processed Mucuna seed meal diets.*

Parameters	Levels				
	Control (0)	CSM (20)	CSCM (20)	WSCM (20)	SEM
Initial body wt(g)	101.0	102.0	101.0	102.0	0.29
Final body wt (g)	775.0^{a}	398.0^{b}	690.0^{a}	665.0^{a}	81.48
Average wt gain (g)	674.0^{a}	296.0^{b}	580.0^{a}	553.0^{a}	81.39
Growth rate (g/d)	32.1^{a}	14.1^{b}	28.1^{a}	26.3^{a}	3.88
Feed intake (g/b/d)	56.2^{ab}	48.1^{b}	60.8^{a}	63.24^{a}	3.33
Feed conversion ratio	1.75^{b}	3.41^{a}	2.16^{b}	2.41^{b}	0.32
Mortality	-	-	-	-	-

ab: Means within a row with a different superscripts are significantly different ($P<0.05$)

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