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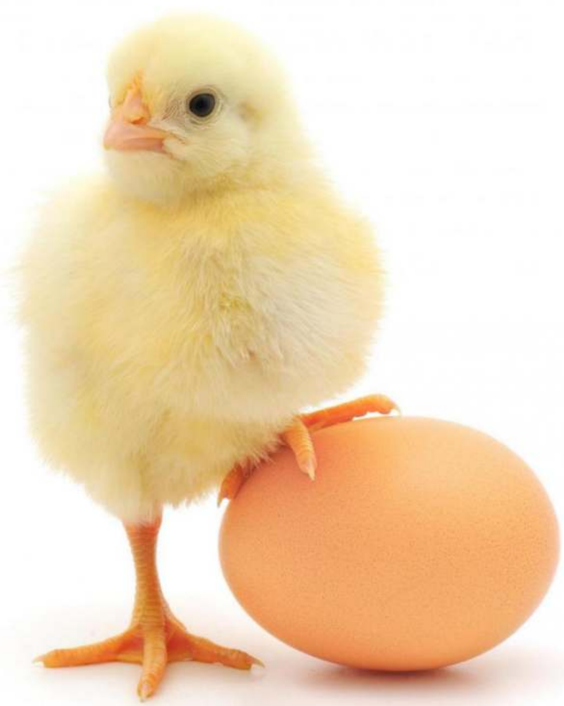

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Comparative Performance of Broiler Fed Diets Containing Raw and Processed *Mucuna* Seed Meal

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Abstract: The effects of raw and local processing methods on the nutritive value of *Mucuna utilis* seeds fed in diets to broiler performance were investigated. The processing methods were: seeds were soaked for 24 h in plain water, cooking of 24-h pre-soaked seeds for 60 min and cooking in a solution of potash (kanwa, trona) for 60 min. Five experimental diets were formulated such that diet 1 contained no *mucuna* (control), while raw, soaked, pre-soaked and cooked and cooked-in-potash *mucuna* seed meal were included at 20% dietary levels respectively. One hundred and fifty (150) 0ne-week old (Anak, 2000) broiler chicks were randomly assigned to the experimental diets in a completely randomized design. There were 3 replicates of the 5 treatments and 10 birds per replicate. 22% Crude Protein (CP) diets were fed during the starter phase and 20%CP diets during the finisher phase. Feed and water were supplied *ad libitum* throughout the 8-week trial period. At the end of the feeding trial, 3 birds were selected from replicates and slaughtered for carcass and blood evaluation. The different processing methods caused percentage reductions in Crude Protein (CP) and ether extract but increased the gross energy and ash content of the seeds. Cooking of pre-soaked beans and cooking in potash solution significantly ($p<0.05$) reduced most of the antinutrient factor contents of the seeds. During the starter phase, average fed intake and feed conversion efficiency f birds on cooked *mucuna* seed diets were similar to the control group. At the finisher phase better performance in terms of weight gain, feed conversion efficiency, protein efficiency ratio were significantly ($p<0.05$) achieved with a 25% reduction in cost of feed per kilogram gain in the group fed seeds cooked for 60 minutes diet. Birds on cooked *mucuna* seed diets had comparable dressing percentage, empty gizzard, liver, pancreas spleen and lungs weights with the birds fed the control diet. The packed cell volume, haemoglobin and white blood cell count values of the birds on the cooked *mucuna* diets were significantly similar to the control group.

Key words: *Mucuna* seeds, cooking, performance of broiler chickens, hematological values

INTRODUCTION

Most conventional vegetable protein feed ingredients in Nigeria are very expensive and have largely contributed to the high prices of poultry feeds and consequently the poultry products. To improve poultry production and daily animal protein intake of an average Nigerian from below 10-35 gm value as recommended by FAO, there is need to search for possible alternatives which are cheap, readily available and of comparable nutritive quality to the conventional protein sources.

One of such under exploited legumes of great nutritional potential is *mucuna* spp. It is little known or used for human food or animal feed but has a high potential as an energy or protein supplement in livestock feed. The crude protein content of the dried seeds ranges from 24-32% on dry matter basis (Emenalom and Udedibie, 1998) and the protein have relatively good amino acid profile (Siddhuraju *et al*., 1996; Tuleun *et al*., 2008). Siddhuraju *et al.* (1996) also reported a gross energy content of 16565kj/kg DM.

The use of *mucuna* as a plant protein source for non-ruminants animals is limited by its content of anti-nutritional factors with possible chronic toxic effects (Ukachukwu *et al*., 1999; Carew *et al*., 2002; Emiola *et al*., 2003). Elimination and/or reduction of the effects of these antinutrients factors can be achieved by thermal treatments. Such treatments make the constituent nutrients more biologically available, thereby improving the nutritive value as well as making the otherwise toxic ingredients harmless for consumption by farm animals. To gain this knowledge and understanding a bioassay study involving animals' experimentation was undertaken to assess the effects of *mucuna* seeds subjected to different locally adaptable and economical processing methods on the performance of broilers chickens.

MATERIALS AND METHODS

Mucuna seeds were purchased from the International Institute of Tropical Agriculture (IITA), Ibadan and divided

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Table 1: Composition and calculated analysis of broiler starter diets containing none, raw, soaked, pre-soaked and cooked and potash cooked *M. utilis* seed (%)

	Diets				
Feed ingredients	CD	RMS	SMS	PMS	CSM
Maize	48.58	42.81	42.99	42.73	41.30
Full-fat soybean	39.52	33.29	33.11	33.42	34.80
Maize offal	10.00	-	-	-	-
Mucuna seed meal	-	20.20	20.00	20.00	20.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Salt	0.50	0.50	0.50	0.50	0.50
Dl-methionine	0.15	0.15	0.15	0.15	0.15
Premixes*	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Calculated analysis					
ME (kcal/kg)	3135.00	3006.00	3003.00	3014.00	3026.00
Crude protein (%)	22.00	22.00	22.00	22.00	22.00
Crude fibre (%)	4.39	3.93	4.01	4.08	4.23
Available phosphorus (%)	0.74	0.79	0.77	0.78	0.83
Calcium (%)	1.22	1.23	1.22	1.25	1.24
Methionine (%)	0.49	0.45	0.45	0.46	0.45
Lysine (%)	1.24	1.21	1.20	1.22	1.22
Feed cost (#/kg)	59.06	59.28	59.43	58.98	58.83

1kg of *premix contains. Vitamin A (5,000,000 1.U), Vit. D3 (1,000,000 1.U) Vit. E (16,000 mg), Vit K3 (800 mg), Vit.B, (1,200 mg), Vit B2 (22,000 mg), Niacin (22,000 mg) calcium Pantothenate (4,600 mg), Vit. B6 (2,000 mg), Vit B12 (10 mg), Folic acid (400 mg), Biotin (32 mg), choline chloride (200,000 mg), Manganese (48,000 mg) Iron (40,000 mg), zinc (32,000 mg) copper (3,400 mg), Iodine (600 mg), cobolt (120 mg), selenium (48 mg), antioxidant (48,000 mg)

Table 2: Composition and calculated analysis of broiler finisher diets containing none, raw, pre-soaked and cooked *M. utilis* seed (%)

	Diets				
Feed ingredients	CD	RMS	SMS	PMS	CSM
Maize	50.70	49.93	50.16	49.88	48.55
Full-fat soybean	32.40	26.17	26.00	26.27	26.97
Maize offal	10.00	-	-	-	-
Blood meal	3.00	-	-	-	-
Mucuna seed meal	-	20.00	20.00	20.00	20.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Salt	0.50	0.50	0.50	0.50	0.50
Dl-methionine	1.15	1.15	1.15	1.15	1.15
Vitamin premixes*	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Calculated analysis					
ME (kcal/kg)	3145.00	3015.00	3012.00	3020.00	3036.00
Crude protein (%)	20.00	20.00	20.00	20.00	20.00
Crude fibre (%)	4.12	3.77	3.84	3.92	4.06
Available phosphorus (%)	0.71	0.76	0.73	0.78	0.80
Calcium (%)	1.21	1.21	1.21	1.21	1.21
Methionine (%)	0.46	0.42	0.42	0.43	0.43
Lysine (%)	1.10	1.05	1.05	1.06	1.06
Feed cost (#/kg)	61.24	61.42	61.47	61.42	61.01

*Same as in Table 1

into four batches. Three batches were subjected to different processing methods respectively: (1) Soaked *Mucuna* Seed (SMS) involved soaking the seeds in water for 24 h after which the water was then decanted and seeds were sun dried. (2) Potash-treated *mucuna* seed was obtained by cooking *mucuna* seeds in water with potash at 5g per kilogram of *mucuna* seeds. A Cooked Pre-Soaked *Mucuna* Seeds (CSM) was soaked for 24 h and after water was drained, the seeds were then cooked for 60 min, drained of water and sun dried for 4 days. The resulting seeds from the different batches were ground to desirable particles sizes and kept for later use. The fourth batch was left untreated (RMS). Both the raw and processed *mucuna* seed meal were analyzed for proximate composition using the standard methods (AOAC, 1995). The antinutritional constituents (hydrocyanide, tannin, phytic acid, trypsin inhibitor, oxalate and saponin) common with other *mucuna* species were investigated (Tuleun and Igba, 2008). Five iso-nitrogenous Starter and Finisher Experimental diets were formulated to contain no *mucuna* and 20% of raw, soaked, cooked with potash and pre-soaked and cooked *mucuna* seed meal respectively (Tables 1 and 2). A total of 150 unsexed 7-day old 'Anak 2000' broiler chicks were randomly allocated to the dietary treatments using a Completely Randomized Design.

Each treatment was replicated 3 times with 10 birds per replicate. The birds were raised in a deep litter house throughout the experiment. Feed and water were provided *ad libitum*. The birds and feed were weighed on weekly basis to determine the weekly body weight gains and feed intake. The feeding trial lasted 56 days; at the end of which 3 birds per replicate were slaughtered for carcass assessments. The blood of slaughtered birds was also used for the aspect of haematological studies in accordance to the method of Device and Lewis (1991).

Data collected were subjected to Analysis of Variance (ANOVA) and where significant differences were observed between treatments, the means were compared using the Duncan's New Multiple Range Test as outlined by Obi (2002).

RESULTS AND DISCUSSION

Proximate composition of test material: Data on the proximate composition of the raw and processed *mucuna* seeds are presented in Table 3. The crude protein content of the raw and the processed *mucuna* agreed with values earlier reported (Ukachukwu *et al*., 2002; Emiola *et al*., 2003). The lower crude protein values recorded for soaked and cooked (CMS) and cooked-in-potash (PMS) was an indication that some nitrogenous compounds were solubilized and removed in the course of the cooking. The crude fibre content (5.53-6.87%) comparable with soybean (5.50%) and does not make it undesirable for inclusion in the diet of farm animals. Fibre acts as a diluent but its absence in diets leads to incidence of wide range of diseases including diabetes mellitus (Oke *et al*., 1996).

Anti-nutritional content of test materials: The levels of anti-nutritional factors content of the raw and processed *mucuna* seeds are shown in Table 4. Processing the seeds by soaking for 24 h had no effect on the tannin, phytate and saponin contents of the seeds although significant ($p<0.05$) reductions in hydrocyanide, trypsin inhibitor and oxalates were recorded. Cooking the seeds in water or in potash solution resulted in greater significant ($p<0.05$) reductions in the raw seeds content of hydrocyanide, tannin and highly significant ($p<0.01$) reductions in trypsin inhibitor, oxalates and saponins when compared with raw and the 24-h soaked seeds. This could probably be the effect of temperature and solubilization which wet-heat treatment offers (Ukachukwu and Obioha, 2000). There were however no differences between the cooking treatment in hydrocyanide, tannins and oxalates. Cooking the seeds in potash solution had the significantly greater effect ($p<0.01$) on saponin reduction than soaking in water only.

Production performance: The performances of the broiler birds fed on the experimental diets are presented in Tables 5 and 6 for starter and finisher phases respectively. At the starter phase, the broiler chicks fed diets containing cooked *mucuna* seeds with or without

Table 3: Nutrients composition and gross energy content of raw and processed *M. utilis* seeds (% dry matter basis)

Nutrients	RMS	SMS	PMS	CMS
Dry matter (%)	89.70	90.14	90.25	89.31
Crude protein (%)	29.37	29.62	28.95	27.93
Crude fibre (%)	5.53	5.97	5.81	6.87
Ether extract (%)	5.90	5.78	5.80	3.17
Ash (%)	4.43	5.56	6.41	7.76
Nitrogen free extract (%)	44.47	43.20	43.28	43.75
Gross energy (kcal/g)	3.49	3.46	3.54	3.67

Table 4: Anti-nutritional factor content of raw and processed *M. utilis* seed meal

Parameter	RMS	SMS	PMS	CSM	SEM
Hydrocyanide (%)	33.46[c]	31.88[b]	28.97[a]	29.81[a]	0.237*
Destruction (%)	0.00	4.80	13.42	10.90	-
Tannin (%)	1.41[b]	1.38[b]	1.03[a]	0.99[a]	0.103*
Destruction (%)	0.00	2.20	26.95	29.80	-
Phytic acid (g/Kg DM)	1.56	1.38	1.47	1.52	0.341[ns]
Destruction (%)	0.00	11.60	5.77	2.60	-
TIA (Tiu/mg)	33.59[c]	20.40[b]	18.09[ab]	17.77[a]	0.698**
Destruction (%)	0.00	39.30	46.14	47.10	-
Oxalates (g/Kg DM)	1.95[c]	1.56[b]	1.33[a]	1.38[a]	0.077**
Destruction (%)	0.00	20.00	31.79	29.30	-
Saponnin (%)	0.11[a]	0.10[a]	0.14[a]	0.94[b]	0.048**
Destruction (%)	0.00	9.00	27.00	18.18	-

[a,b,c]Means in the same row with different superscripts are significantly at 5% (*) and 1% (**). TIA = Trypsin Inhitor Activity, SEM = Standard Error of Mean

Table 5: Performance of broiler starter fed raw or processed forms of *Mucuna utilis* seed meal diets

	Diets					
Parameters	CD	RMS	SMS	PMS	CSM	SEM
Initial body weight (/bird)	100.36	100.42	100.38	100.35	100.30	-
Daily weight gain (g/d/bird)	42.49[a]	24.63[d]	27.84[c]	34.92[b]	35.70[b]	1.16**
Daily feed intake (g/bird/day)	73.00[a]	63.43[b]	65.63[b]	72.03[a]	70.01[a]	1.11**
Feed conversion ratio	17.72[a]	2.58[b]	2.36[b]	2.06[ab]	1.96[a]	0.10**
Daily protein intake (g/day/bird)	16.06[a]	13.95[c]	14.44[c]	15.85[b]	15.40[b]	0.25
Protein efficiency ratio	2.65[a]	1.77[d]	1.93[c]	2.20[b]	2.46[b]	0.06**
Feed cost (kg gain/Naira)	101.58	152.94	140.04	121.40	115.31	-

[a,b,c]Means in the same raw followed by different superscripts are significantly different at 5% (p<0.05) and **1%** (p<0.01). SEM = Standard Error of Mean

Table 6: Performance of broiler finisher fed raw or processed forms of *M. utilis* seed meal diets

	Diets					
Parameters	CD	RMS	SMS	PMS	CSM	SEM
Daily weight gain (g/d/bird)	46.93[a]	26.32[d]	31.22[c]	36.05[b]	39.79[b]	0.88**
Daily feed intake (g/d/bird)	99.65[a]	84.93[d]	89.06[c]	90.31[bc]	94.62[b]	0.86*
Feed conversion ratio	2.12[a]	3.23[b]	2.85[ab]	2.51[a]	2.38[a]	0.21*
Daily protein intake (g/d/bird)	19.93[a]	16.99[d]	17.81[c]	18.07[b]	18.93[b]	0.05**
Protein efficiency ratio	2.36[a]	1.55[d]	1.76[c]	1.95[b]	2.10[b]	0.06**
Feed cost/kg gain (Naira)	129.83	198.39	175.19	154.16	145.20	-

[a,b,c,d]Means in the same raw followed by different superscripts are significantly different at 5% (p<0.05), 1% (p<0.01), SEM = Standard Error of Means

potash consumed feed as much as the Control Diet (CD) and their intake were significantly higher than that of diets containing soaked *mucuna* seed meal. The raw *mucuna* diet (RMS) was the least consumed. The depressed feed intake with the raw *mucuna* diet is attributed to its unpalatability, which has also been observed by Del Carmen *et al.* (1999) who fed starter broilers with 10% raw *mucuna* in their diets. The daily weight gain of broilers on the control group (CD) was 42.49 g and it was significantly (p<0.01) higher than 35.7, 34.9k, 24.63 and 27.84 g for chickens in CMS, PMS, SMS and RMS respectively. There were no significant differences in the weight gains of broilers receiving the cooked *mucuna* seed diets but these were significantly (p<0.05) better than the soaked seed which in turn were significantly better than the raw seed treatment. The non-significant differences between the thermally-treated *mucuna* seed diets shows that there was no inhibition in the consumption and utilization of either of the diets. Ukachukwu and Obioha (2007) have also reported similar effects. Feed conversion data showed highly significant differences (p<0.01) between dietary treatments. There were no differences between the control and the cooked *mucuna* diets but the raw and soaked *mucuna* seed diets were not different in effects with the potash treated seeds. The soaked and cooked *mucuna* seed treatment held the best processing method comparable to the control as evidenced in this parameter. Protein efficiency ratio as a measure of how much of the consumed protein is invested in growth shows highly significant differences (p<0.01) with the control diet supporting the best conversions (2.65) followed by the cooked seeds (2.2-2.46); the soaked seeds (1.73) and the least by the raw seeds (1.77). The poorer feed conversion efficiency ratio and protein conversion efficiency of broilers on raw and soaked *mucuna* seed diets than birds on the other cooked *mucuna* diets could be attributed to the lower haemagglutinin activity levels of the cooked in plain water (Ukachukwu and Obioha, 2007) and cooked with potash *mucuna* seeds, which permitted better utilization of the diets that contained them.

Feed cost per kilogram weight gained followed the same trend potash solution of improvement as the data for feed conversion efficiency and the protein efficiency ratios. In any case, the result showed that cooking in water or potash solution elicited important economic savings. Sonaiya *et al.* (1986), Ukachukwu and Anugwa (1995) and Ukachukwu and Obioha (2007) have made similar observations.

At the finisher phase, average daily feed intake, weight gain, protein intake and protein efficiency ratio were found to be significantly poorest (p<0.05) in the group fed the raw *mucuna* diet than other groups fed the soaked and cooked *mucuna* seed meal diets. This is an indication that raw *mucuna* seeds like other legumes contain some anti-nutritional factors which impaired nutrient availability and utilization hence the depressed performance. Del Carmen *et al.* (1999) and Ukachukwu and Obiola (2007) also observed similar effects. The deleterious effects of the inhibitory substances contained in the raw seeds can manifest at both phases of growth. This implies that prolonged feeding does not lead to any adaptation of broiler birds to a raw *mucuna* diet (Ukachukwu and Szarbo, 2003). The observed significant improvement in performance of the groups fed the cooked *mucuna* seed diets suggest that these treatments detoxified the seeds better than soaking in plain water alone. Similar reports have been made by Amaefule and Obioha (1998) and Iorgyer and Carew (2007) on Pigeon pea; Kaankuka *et al.* (1995) and Ukachukwu and Anugwa (1995) on soybean; Ologhobo *et al.* (1993) and Udedibie *et al.* (1996) on jackbean; Emenalom and Udedibie (1998), Ukachukwu and Obioha (1997, 2000), Tuleun and Patrick (2007) and Tuleun *et al.* (2008) on *M. utilis*.

The improved feed conversion ratio and protein efficiency ratio could be attributed to the highly reduced anti-nutrient content levels of the soaked and cooked and cooked with potash, which allowed a better utilization of the diets that contained them. It was also recognized that the addition of potash (Kanwa) in boiling water did not significantly ($p>0.05$) improve the performance of birds compared to the group fed *mucuna* pre-soaked and cooked diets. This implies that cooking with potash/kanwa has not improved the nutrient quality of *mucuna* seed meal over the pre-soaked and cooked in plain water alone. This finding agrees with earlier report of Ukachukwu and Szarbo (2003) who obtained similar results when they considered the performance of broilers fed wood ash and ordinary water boiled *mucuna* diets. The cost of feed per kilogram gain (Naira) reduced steadily from Naira 198.39 in the raw diet to #145.20 in diet CMS. The poorest performance of broilers on raw *mucuna* diet reflected the cost per unit weight gain. This could be attributed to the poorer feed conversion ratio and PER of the RMS birds.

The haematological conditions of broiler chickens fed experimental diets are summarized in Table 7.

The haematological data of the birds showed that there were no significant differences in the Red Blood Cell Count (RBC) across the treatments although the raw seed treatment had the least cell count (1.19) when compared with 1.42,1.35, 1.33 and 1.39 for the control, soaked, soaked/cooked and the cooked in potash *mucuna* treatments. There were significant differences ($p<0.05$) in the results for the White Blood Cell Count (WBC), Haemoglobin (Hb) content and Packed Cell Volume (PCV). While the control, soaked/ cooked and potash cooked *mucuna* diets gave comparable values, the raw and soaked *mucuna* diets showed significantly lower values for PCV and Hb and increased in WBC counts. The decreased PCV, Hb and RBC in the group fed raw *mucuna* diet could be attributed to the interference of anti-nutritional factors with precursor vitamins (B-complex) required for erythropoietin, while the increase WBC could be linked to nutritional stress or liver damage (Adenkola *et al.*, 2009). Ologhobo *et al.* (1993) associated reduction in the values of RBC and Hb with the direct involvement of haemagglutinins when they included protein fractions prepared from lima bean in broiler starter diets.

Table 7: Effect of raw/processed *M. utilis* on the haematological conditions broiler finisher chickens

	Diets					
Parameters	Control	RMSD	SMSD	PMSD	SBMD	SEM
RBC	1.42	1.19	1.35	1.33	1.39	0.17^{ns}
WBC	32.00^{c}	48.00^{b}	56.00^{a}	35.00^{c}	32.8^{c}	0.27*
Hb	10.83^{a}	8.34^{b}	8.83^{b}	9.81^{ab}	10.67^{a}	0.54*
PCV	32.50^{a}	2500.00^{b}	26.50^{b}	30.00^{a}	32.00^{a}	1.72*

RBC = Red Blood Cells, WBC = White Blood Cells, Hb = Haemoglobin, PCV = Packed Cell Volume. ^{a,b,c,d}Means in the same raw followed by different superscripts are significantly different at 5% ($p<0.05$), 1% ($p<0.01$), SEM = Standard Error of Means

Table 8: Effects of raw or processed *Mucuna utilis* seed meal on the carcass quality and visceral parts of broiler finisher chickens

	Diets					
Carcass quality	CD	RMS	SMS	PMS	BMS	SEM
Live weight (kg)	2.37^{a}	1.70^{c}	1.73^{c}	1.99^{b}	2.09^{b}	0.03*
Dressed weight (kg)	1.80^{a}	1.15^{d}	1.29^{c}	1.63^{b}	1.59^{b}	0.03**
Dressing percentage	75.95	67.65	74.61	75.1	75.84	1.86^{ns}
*Visceral parts						
Empty gizzard	2.12^{c}	3.25^{a}	2.57^{b}	2.24^{c}	2.11^{c}	0.05*
Liver	2.13^{c}	2.65^{a}	2.34^{b}	2.09^{c}	2.08^{c}	0.06**
Pancreas	0.25^{c}	0.63^{a}	0.86^{c}	0.27^{c}	0.26^{c}	0.07**
Kidney	0.79^{d}	1.22^{a}	0.86^{c}	1.03^{b}	1.06^{b}	0.02**
Spleen	0.14^{a}	0.10^{b}	0.09^{b}	0.18^{a}	0.15^{a}	0.004**
Lungs	0.68^{c}	$0. 86^{a}$	0.80^{b}	0.75^{bc}	0.67^{c}	0.02**
Abdominal fat	1.68^{d}	2.56^{a}	1.45^{a}	2.04^{c}	2.32^{b}	0.03***
Large intestine (cm)	11.00^{b}	14.71^{a}	12.01^{b}	11.52^{b}	11.31^{b}	0.91*
Small intestine (cm)	105.75^{a}	79.56^{c}	104.60^{ab}	102.00^{b}	101.11^{b}	1.60**
Calcium (cm)	0.47^{d}	0.82^{a}	0.83^{a}	0.68^{b}	0.54^{c}	0.01**

^{a,b,c,d}Means in the same row with different superscripts are significantly different at 5% ($p<0.05$), 1% ($p<0.01$). SEM = Standard Error of Mean. *Expressed as percent of the dressed weight

Broiler carcass and visceral organ weight data and the result of the statistical analysis are in Table 8. Dressed weight of birds were significantly affected ($p<0.01$) by the processing methods. Birds on control diet had the highest value followed by the groups fed pre-soaked and cooked and cooked with potash while the least was with raw *mucuna* diet. The significant ($p<0.05$) differences observed in all visceral organs leads to a suspicion that they might be target organs of the toxic factors contained in the bean. The liver is the primary organ responsible for metabolism of any toxic element that has been absorbed into blood circulation. This places an extra demand on the functionality of liver in birds fed raw *mucuna* diet and hence the increase in size and weight. The significant ($p<0.01$) increased in pancreatic weight of birds fed raw *mucuna* diet suggest that the inclusion forced the pancreas to work hard to produce pancreatic enzyme to counteract effects of trypsin inhibitor. The comparable reduction in pancreatic weight of birds fed the cooked *mucuna* shows that trypsin inhibitor is heat-labile. This view was earlier upheld by Del Carmen *et al.* (1999) that trypsin inhibitor was readily reduced to zero by heating.

Conclusion: The proximate composition of *mucuna* seeds makes it look a promising alternative plant protein feedstuff in the raw state.

The anti-nutritional content identified could make the seeds unacceptable feedstuff.

Pre-soaking plus cooking *mucuna* seeds for 60 min detoxified the anti-nutrients and rendered the seeds safe for livestock consumption.

Comparable performance in terms of weight gain, feed conversion efficiency and protein efficiency ratio was also achieved with pre-soaked and cooked *mucuna* birds over the control diet.

It is gladdening to note that *mucuna* seed has prospects for cost effective use as an alternative protein feedstuff in livestock's feeds.

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