MON -43

Performance and Economic Benefits of Broilers Fed Diets Containing Raw and Variously Processed *Mucuna Sloanei* (Velvet Bean) Seed Meal

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Abstract
A study was conducted using one hundred and fifty day old broiler chicks to evaluate the performance of broilers fed raw and variously processed *Mucuna sloanei* seed meal diet. The birds were obtained from a reputable hatchery (Fidan hatchery, Ibadan, Oyo State, Nigeria). The birds were allowed to stabilize for 10days before being randomly assigned to five dietary treatments each replicated into 3 of 10 birds per replicate in a completely randomized design (CRD). Enzyme used was maxigrain. Five experimental diets were formulated, thus; T_1 (control), T_2 (raw), T_3 (raw with enzyme), T_4 (boiled with enzyme), and T_5 (toasted with enzyme), and the inclusion level was 10% for all treatments. Feed and water were given *ad-libitum* throughout the duration of the experiment which lasted for 49 days. Parameters considered were; growth performance and economics of production. There were significant differences in all parameters considered under growth performance except for initial weight. The control performed significantly ($p<0.05$) better than all in all parameters closely followed by diet 5 (Toasted and mixed with enzyme) while the T_2 (raw) performed worst in all parameters. Control had 2.54 for feed to gain ratio while T_2, T_3, T_4 and T_5 had 3.48, 3.35, 3.38 and 3.15 respectively. Control had 1693.30g for Total weight gain while T_2, T_3, T_4 and T_5 had 919.83g, 1068.40, 1080.33 and 1162.07 respectively. For total feed intake, control had 4295.33g while T_2, T_3 T_4 and T_5 had 3190.00g, 371.33g, 3650.67g and 3651.17g respectively. For revenue, control had N1658.65 that was significantly ($p<0.05$) higher than others closely followed by T_5 (N1180.26), T_4 (N1107.00), T_3 (N1096.26) and lastly T_2 (N962.25). Control had (1124.82) for gross margin which was significantly ($p<0.05$) higher than all closely followed by T_5 (727.38), T_3 (656.86), T_4 (654.19) and lastly T_2 (569.76). The result showed that T_1(birds fed soya bean based diet) performed better in all parameters considered and that *Mucuna sloanei* inclusion up to 10% in broiler diet even when mix with enzyme could not compare with birds fed soya bean based diet.

Keywords: *Mucuna*, maxi-grain, toasting, boiling, raw

Introduction

It is well known that animal protein malnutrition has been the major challenge in many developing countries including Nigeria. Daily dietary intake of animal protein by an average Nigerian is still quite low when compared to the recommended 34g per day by Food and Agriculture Organization (Wafar *et al*., 2015). This acute shortage of animal protein in the diets of many Nigerians has been attributed to low production of animal protein in relation to increase in human population and high cost of production especially the cost of feeds which accounts for more than 85% of the total cost of production(Wafar *et al.,* 2015). Due to high cost of conventional feed, its scarcity and the competition between man and animal and total dependence on it for broiler ration, it becomes quite obvious that any effort targeted towards reducing the cost of feeding will be one of the possible solutions. However, one of the remedies that have drawn the attention of several researchers is the use of alternative feed resources, which have comparative nutritive value but are cheaper than the conventional feed stuff.

One of the underutilized legumes that come to mind is *Mucuna sloanei*. Its consumption by humans is localized and in many cases, it appears to be a last resort legume in circumstances of famine or scarcity of more popular legume (Ewa, 2015). The seeds are highly resistant to disease and pest and exhibit good nutritional qualities (Janardhanan and Vadiviel, 1994). It yields about 0.8-2tonnes of seeds/hectare with crude protein of about 28% and high energy of about 271kcal/g (Akinmutimi *et al.,* 2011). *Mucuna sloanei*, a neglected crop, is cheap and could be available, but the potential of *Mucuna sloanei* as plant protein source in livestock feed is yet to be fully known and exploited in broiler nutrition. Evaluation and characterization of its nutritive potential in broiler feeds is not yet established.

The objective of this study therefore is to determine the growth performance and economics benefits of broilers fed raw and variously processed *Mucuna sloanei* seed meal based diet

Materials and Methods

The experiment was carried out at the Poultry Unit of the Teaching and Research Farm of Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria.A total of 150 broilers were purchased from a reputable farm. The birds were allowed to stabilize for 10 days, after which they were assigned to five treatment diets replicated into three in a completely Randomized Design (CRD) with 10 birds per replicate. The feed and water were given *ad-libitum* throughout the period. The birds were given a measured quantity of feed every day and on each day the left over were removed and measured to determine the quantity consumed by the birds. The birds were subjected to standard broiler management with necessary drugs and vaccines given as at when due. Other management practices were observed throughout the period. The experiment lasted for seven weeks (49days).

A total of five diets were formulated having crude protein range of 22.10-22.39% and energy level of 2933.60.5 – 3003.60kcal/kg. Diet one served as control containing soyabean. Diet two contains 10% raw *Mucuna sloanei*. Diet three contains 10% raw *Mucuna sloanei* with enzyme. Diet four contains 10% boiled *Mucuna sloanei* with enzyme. Diet five contains 10% toasted *Mucuna sloanei* with enzyme. The Mucuna seeds were processed in the following ways: Raw: seeds were crushed and ground to pass through 2 millimeters sieve and then bagged for use. Boiling: the seed were added to the water at boiling point and allowed to boil for 30minutes, water decanted and then dried, milled and bagged. Toasting: the seed were toasted to brownness, milled and bagged. The experimental design used was completely randomized design (CRD).

Data collected were subjected to analysis of variance (ANOVA) as was described by Steel and Torrie (1980), and significant means were separated using Duncan Multiple Range Test (Duncan, 1955).

Table 1: Percentage composition of experimental diets containing raw and variously processed *Mucuna Slonei* meal fed to brioler chicken.

Ingredients	Control	Raw	Raw mix with enzyme	Boiled mix with enzyme	Toasted mix with enzyme
Maize	60.00	57.50	57.50	57.50	57.50
Soybeal meal	30.00	27.5	27.5	27.5	27.5
Mucuna sloanei	---	10.00	10.00	10.00	10.00
Palm kernel meal	3.40	3.40	3.40	3.40	3.40
Fish meal	3.00	3.00	3.00	3.00	3.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Vitamin Premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
methionine	0.10	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00	100.00
Calculated composition					
Crude protein	22.10	22.24	22.24	22.24	22.24
Methabolizable Energy	3003.60	2968.60	2968.60	2968.60	2968.60

Each 2.5kg of premix contains vitamin A (8,500000 iμ) vitamin D, (1,50000000 iμ) Vit E, (10,000000mg), vitamin K3 (1,500,00mg) vitamin B1 (1,600000mg,) vitamin B2 (4.00000n). Niacin (2O00000mg). pentathenic acid (5,000,00mg), vit B6 (1,50000mg), vit B12 (lO,000mg) folic acid (500,00mg) Biotin (750,00mg) chlorine chloride (175.000.00mg) cobalt (200.00mg). copper (3000,00mg) iodine (1000.00mg). zinc (30.000,00mg), selenium (200,00mg), manganese (40.000.00 mg). iron (20,000,00ing).

Results and Discussion

The crude protein and energy content of the various diets met the standards for straight line diets for broiler production as reported by Akinmutimi (2011) as shown in Table 1. The performance of broilers fed diet containing graded levels of *Mucuna sloanei* is presented in Table 2. There were significant ($p<0.05$) difference in all parameters considered for growth performance except initial weight. Control was significantly ($p<0.05$) higher (1842.97g) than the processed for final life weight. Among the processed, T_2 (raw) had the lowest (1069.17g) weight gain while T_3 T_4 (1218.07g), (1311.40g) had weight gains that were statistically ($p>0.05$) similar. Weight gain, Average daily weight gain, Total feed intake and Average daily feed intake followed the same trend with the final weight gain. Control had the lowest feed to gain ratio (2.54) that was significantly ($p<0.05$) different from the processed. T_2 (raw), T_3 (R.E), T_4 (B.E) and T_5 (T.E) had feed to gain ratio values of 3.48, 3.35, 3.38 and 3.15 respectively, that did not statistically ($p>0.05$) differ from each other.

Table 3: Effect of various processing methods of *Mucna sloanei* diet on growth performance of broilers

Parameters	T_1(Control)	T_2 (Raw)	T_3(R.E)	T_4(B.E)	T_5(T.E)	S.E.M
Initial weight	149.33	149.33	149.67	149.67	149.33	0.13
Final weight	1842.97^{a}	1069.17^{c}	1218.07^{b}	1230.00^{b}	1311.40^{b}	72.46
Weight gained	1693.30^{a}	919.83^{c}	1068.40^{b}	1080.33^{b}	1162.07^{b}	72.46
A.D.W.G	34.56^{a}	18.78^{c}	21.80^{b}	22.05^{b}	23.72^{b}	1.48
T.F.I.	4295.33^{a}	3190.00^{c}	3571.33^{bc}	3650.67^{b}	3651.17^{b}	108.03
A.D.F.I.	87.66^{a}	65.10^{c}	72.88^{bc}	74.50^{b}	74.51^{b}	2.21
F.G.R.	2.54^{b}	3.48^{a}	3.35^{a}	3.38^{a}	3.15^{a}	0.11

^{abc} means across rows with different superscripts differ significantly at p<0.05; S.E.M: standard error of means; ADWG: Average daily weight gained; TFI: Total feed intake; ADFI: Average daily feed intake; FCR: Feed conversion ratio. R.E. = Raw mix with enzyme, B.E. = Boiled mix with enzyme, T.E. = Toasted mix with enzyme.

There were significant (p<0.05) differences for all the parameters considered for economic benefits except for cost/kg feed. T_1 (control) had a higher significant (p<0.05) cost of feed consumed (N533.85) compared to the processed. The higher cost/kg weight gain of the processed over the control showed that the birds ate more to gain less. This can be attributed to the negative effect of the anti-nutritional factors that limits the availability of the nutrients to the birds in the test diets. The control had the highest return (Revenue) (N=1658.67) closely followed by T_3, T_4, and T_5 (N1096.26, N1107.00 and N1180.26 respectively) and the lowest was T_2 (N962.25).The significantly (p<0.05) lower values of the test diets from that of control could be attributed to the lower final body weight and lower total weight gain of birds placed on these test diets. They consumed less and even the little they consumed could not be efficiently utilized by the body for growth due to the presence of anti-nutritional factors in the diets. These resulted to very low gross margin of the test diets (D_2= N569.76, D_3= N656.86, D_4 = N654.19 and D_5 = N727.38) as compared to that of the control (N1124.82).

Table 4: Economics benefits of broiler chicken fed various processed *Mucuna sloanei* seed meal diets.

Parameters	T_1(Control)	T_2 raw)	T_3 (R.E)	T_4 (B.E)	T_5 (T.E)	S.E.M
Cost/kg of feed	124.29	123.04	123.04	124.04	124.04	0.14
Cost of feed consumed(₦)	533.85^{a}	392.49^{c}	439.40^{bc}	452.81^{b}	452.87^{b}	13.74
Cost/kg WG(₦)	315.71^{b}	427.93^{a}	412.06^{a}	418.92^{a}	390.54^{a}	12.90
Cost of production(₦)	533.85^{a}	392.49^{c}	439.40^{bc}	452.81^{b}	452.88^{b}	13.74
Revenue (₦)	1658.67^{a}	962.25^{c}	1096.26^{b}	1107.00^{b}	1180.26^{b}	65.22
Gross margin	1124.82^{a}	569.76^{c}	656.86^{bc}	654.19^{bc}	727.38^{b}	53.86

^{abc} means across rows with different superscripts differ significantly at P<0.05; S.E.M: standard error of means. R.E. = Raw mix with enzyme, B.E. = Boiled mix with enzyme, T.E. = Toasted mix with enzyme.

This result was in line with the findings of Emenalom and Udedibie (1998), Carew *et al*. (2003), Tuleun and Igba (2007) who reported that broiler chicks on 10% raw *Mucuna pruriens* balanced ration had depressed growth rate as a result of the presence of anti-nutritional factors in their ration. This same observation was also reported by Ekwe (2012) that the poor weight gain of birds on *Mucuna* based ration would have been due to poor nutrient utilization resulting from the effect of anti-nutritional factors such as cyanogenic glucoside, trypsin inhibitor, tannin, phytin, saponin that are present in the raw *Mucuna* seed. It has been observed that cyanogenic glucoside on hydrolysis releases hydrogen cyanide HCN) which has the ability to cause a marked weight reduction (Aletor, 1993). Akinmutimi (2004) reported that methionine deficiency in *Mucuna* seeds result in poor growth of birds raised on *Mucuna* based ration. The fact that the control diet had the lowest cost/kg weight and attracted highest revenue and gross margins shows that incorporating 10% *Mucuna* (with or without enzyme supplementation) in the diets of broiler chicken even at 10% is not economically advantageous.

Conclusion

Therefore considering the poor performance of birds fed *Mucuna* based diets (with or without enzyme) in relation to the growth performance and economics returns. *Mucuna* seed meal cannot replace soybean diets at 10% level of inclusion without affecting the performance of the birds. From the result of this research, I recommend the following: That the level of inclusion of *Mucuna sloanei* seed meal in broiler diets should not be up to 10% (with or without enzyme).That higher dosage of enzyme supplementation (normal dosage being 100g/1 ton of feed) should be tested on *Mucuna sloanei* seed meal based broiler diets to see if higher levels

(from 10% and above) could be reached. That the same 10% level of inclusion (with or without enzyme) of *Mucuna sloanei* should be tested on other strains of poultry like layers, ducks, turkey to see their performance.

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