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RESEARCH ARTICLE

PERFORMANCE OF BROILER CHICKENS FED GRADED LEVELS OF DEHULLED *Mucuna sloanei M*EAL IN PLACE OF SOY BEAN MEAL

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ABSTRACT

The use of dehulled velvet bean (*Mucuna sloanei*) in place of soy bean meal in the diets of broiler chickens was investigated. The proximate, gross energy and the anti - nutritional factors in dehulled *Mucuna sloanei* were chemically analyzed. Also the dietary level of inclusion of dehulled *Mucuna sloane*i that will give good performance was investigated using 120 one Week old broiler birds. They were randomly allotted into 4 dietary treatments having 3 replicates and 10 birds per replicate in a completely randomized design experiment. The diets were iso-caloric and iso –nitrogenous. Diet 1 was soybean based while diets 2, 3 and 4 contained 5, 7.5 and 10% dehulled *Mucuna sloanei* respectively. The experiment lasted for 49 days. The proximate composition particularly the crude protein (27.42%) and gross energy value (3.189Kcal/g) respectively showed that dehulled *Mucuna sloanei* is a potential feed ingredient .The presence of anti -nutritional factors such as L- Dopa, tannin, hydro- cyanide (HCN) and trypsin inhibitors were also confirmed. There were significant differences (($P<0.05$)) for all the parameters measured except % mortality. It favoured the control diet in all parameters considered (final live weight, daily weight gain, % mortality, feed conversion ratio, % dressed weight, organ weight, and feed cost of the diets) as opposed to diets containing the test feed stuff. (Dehulled *Mucuna sloanei*) From the above results, soybean could not be replaced by dehulled *Mucuna sloanei* even at 5 %dietary level of inclusion.

INTRODUCTION

Expansion of the poultry industry depends to a large extent on the availability of good quantity of feed at a price that producers can afford. This is particularly true of the intensive poultry enterprises whose performance depends almost entirely on the use of balanced concentrate rations. The scarcity of conventional sources of protein and energy is largely responsible for the present high price of finished feed. (Babatunde and Hamzat,

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2005). In other to reduce the price of feed and there by making animal products affordable among Nigerians, the need to source for cheap and available alternative feed ingredients. One that has such potential is *Mucuna sloanei (Edet, 2008, Ogu, 2008).* 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 (Ukachukwu and obioha, 1997). The seeds are highly resistant to disease and pest and exhibit good nutritional qualities (jannardhanan and Vadivel, 1994). It yields about 0.8-2 tonnes of seeds / ha with crude protein content of about 28% (Adaku, 1993; Ijeh *et al.*, 2004). *Like other grain legumes, Mucuna* seeds are known to contain anti- nutritional factors such as L-Dopa, tannins, trypsin inhibitors etc (Ukachukwu and Obioha, 1997; Akinmutimi and Okwu, 2006).The need then for processing to completely remove the anti- nutrients or reduce them to tolerable level. Dehulling is a common and acceptable processing method among Nigerians. This calls for its usage in this study. The objective of this study is to evaluate the performance of broiler chickens fed graded levels of dehulled *Mucuna sloanei* meal as substitute for soy bean meal

MATERIAL AND METHODS

Experimental Location

The experiment was conducted at the poultry unit of the Teaching and Research Farm of Michael Okpara University of Agriculture, Umudike. Umudike is located at latitude 05^0 29 North and longitude $07^0$33 East. It has daily temperature range of 27-35^{0}C and relative humidity of 57-91%. It is therefore a humid tropical environment; the temperature and relative humidity are significant in agricultural production..

Experimental birds and their management

150 day old Anak broiler birds were procured from a hatchery at Uyo in Akwa Ibom State. The birds were brooded during which commercial broiler starter feed was given for one week.120 birds out of them were weighed and randomly assigned to 4 dietary treatments. Diet 1 was soyabean based serving as control diet while the test ingredient replaced soyabean meal at varying levels of 0, 5, 7.5 and 10% as shown in Table 1. Each treatment had 3 replicates of 10 birds per replicate in a completely randomized design experiment. The initial live weight of birds at the beginning of the experiment were taken, subsequent weighing was done on weekly basis. Weight gains were obtained by subtracting initial weight from the final weight. Data on feed intake was also determined using the difference between the quantity offered and quantity left. Feed conversion ratio (feed / gain) was determined by dividing the feed intake by the weight gain. Weighing was done using sensitive scale and mortality was recorded. Routine vaccinations and medications were strictly adhered to.

Table 1. Composition of experimental diets using dehulled *Mucuna sloanei*

	T1	T5	T6	T7
Maize	47.00	47.00	47.00	47.00
Soy bean meal	28.50	22.50	19.00	15.50
Dehulled Mucuna sloanei	-	5	7.50	10.00
Palm kernel cake	14.50	14.50	14.50	14.50
Fish meal	5	5	5	5
Blood meal	1.5	2.5	3.5	4.5
Born meal	3	3	3	3
Salt	0.25	0.25	0.25	0.25
Premise	0.25	0.25	0.25	0.25
	100	100	100	100
C.P %	22.58	22.23	22.25	22.26
ME(Kcal/kg)	2880.86	2897.75	2905.69	2913.64

Vitamin premix = Vitamin A, D3, E, K, B1, B2, B6, B12, Niacin, Pantothenic Acid, Folic Acid, Biotin, Choline chloride, Manganese, Zinc, Iron, Copper, Iodine, Selenium, Cobalt and Antioxidants

Chemical analysis

Proximate composition and gross energy determination

The dehulled *Mucuna sloanei* meal and the experimental diets were analyzed for proximate composition using the procedure of (AOAC, 1990). The gross energy was determined using Gallenkamp Ballistic Bomb Calorimeter.

Anti-nutritional Factors Determination

The following anti-nutritional factors- hydrocyanic acid, tannin, trypsin inhibitors and L-Dopa were determined as described by Knowles and

Montgomery (1980), Maga (1982), Kakade *et al.,* (1969) and AOAC (1990) respectively.

Carcass / organ weights Evaluation

Carcass evaluation was carried out at the end of the experiment as reported by Ojewola and Longe (1999). At the end of the experiment a bird per replicate was randomly selected, fasted overnight and thereafter bled by severing the jugular vein. Each carcass was defeathered and eviscerated. Carcass weights, cut parts and organ weights were determined. They were expressed as percentage of dressed weight.

Feed Cost Analysis

Feed cost analysis was carried out at the end of the experiment to assess the economic viability of the diets. This was carried out as described by Shonaiya *et al.* (1986).

Statistical analysis

Data collected were subjected to analysis of variance (Steel and Torrie, 1980) and significant means were separated using Duncan (Duncan, 1955).

RESULTS AND DISCUSSION

Table 2 reveals the proximate composition of experimental diets containing dehulled *Mucuna sloanei.* The crude protein content of experimental diets of 20.49 – 21.56 is acceptable for broiler for a straight diet (Edet 2008). Table 3 shows the proximate composition and gross energy of dehulled *Mucuna sloanei*. With crude protein and gross energy values of 27.42% and 3.189 (kcal/Kg) respectively, it shows that *Mucuna sloanei* is a potential feed ingredient. The Table 4 shows some anti-nutritional factors present in dehulled *Mucuna Sloanei.* They are L-Dopa, tannin, hydrogen cyanide and trypsin inhibitor. It implies that dehulling does not completely remove the anti - nutritional factors in *Mucuna sloanei* and hence the possibility of residual effects of these anti-nutritional factors. Table 5 revealed the growth performance of broiler birds fed dehulled *Mucuna sloanei* meal. There were significant ($P<0.05$) differences for all parameters considered except percent mortality. The final live weight ranges between 1.533 (control diet) and 0.48kg (10% dietary level of inclusion). The control diet was significantly ($P<0.05$) higher than all the diets containing the test feedstuff, also birds placed on the test feedstuff even at 5% level of inclusion could not attain the standard market weight at 8 weeks (Obioha, 1992). The daily weight gain decreases as the quantity of the test feedstuff increases in the diet. The birds placed on the control diet were significantly ($P<0.05$) higher than any of the birds placed on the diets containing the test feedstuff. The downward trend is attributed to residual anti- nutritional factors in the test feedstuff such as L – Dopa,. L-Dopa for example has been reported to cause growth depression in broiler chickens (Anele, 2002; Edet, 2008) by causing low feed intake and negative involvement in the digestive tract (Szabo and Tebbet, 2002). Also cyanogenic glycosides has been reported to cause marked reduction in weight in broilers. Hydrolysis of cyanogenic glycosides result in the release of hydrogen cyanide, a substance reported to have the ability to cause marked weight reduction (Aletor, 1993). Cyanide detoxification route in man and anmals is through cyanide thiocyanate sulphur transferase (Rhodenase path way), which generally requires organic sulphur donors in form of methionine and cysteine, thereby precipitating methionine deficiency in an otherwise balanced diet (Aletor and Fasuyi, 1997). It is this methionine deficiency that results in poor growth.

Tannin also have been reported to cause poor growth by forming complexes with dietary protein there by inhibiting the activities of proteolytic enzymes (Akinmutimi, 2004), leading to loss of amino acids. Trypsin inhibitors one of the residual anti– nutritional factors in dehulled seeds (Table 4) has been reported to inhibits proteolytic enzymes there by preventing proteolysis , resulting in unavailability of amino acids and poor growth (Akinmutimi and Ukpabi, 2008). The total weight gain followed similar pattern as the daily weight gain probably due to similar reasons. The daily feed intake for the birds placed on the control diet was significantly ($P<0.05$) higher than the birds placed on die containing the test feed stuff. There was downward decrease of the quantity of feed intake as the quantity of the test feedstuff increased. This trend could be attributed to the effect of anti nutrients such as L-Dopa and tannin. L Dopa has been reported to cause poor feed intake by stimulating the formation of neuro teansmitter dopamine in the brain leading to anorexia (Szabo and Tebbet, 2002; Edet, 2008). Tannin also has been reported to reduce feed intake by causing poor palatability of the feed containing them (Olomu, 1995). The total feed intrake follows similar feed pattern probably due to the above reasons. Birds placed on control diet had lower FCR that was significantly (P<0.05) different from the values obtained for the birds on the diets containing the test feedstuff, birds placed on diet 4 had the highest value for feed conversion ratio. It implies that the control diet is superior to other diets since the lower the FCR, the more superior the diet is (Akinmutimi, 2004).

Table 2. Proximate composition of experimental diets containing dehulled *Mucuna sloanei*.

Diet	*%CP*	*%EE*	*%CF*	*%Ash*	*%DMM*	*GE(Kcal/Kg)*
1	20.49	3.65	5.54	8.35	90.17	3.069
2	20.79	3.73	5.85	7.89	90.27	3.104
3	20.57	3.85	5.94	8.13	90.09	3.087
4	21.56	3.71	5.72	8.35	90.23	3.061

Table 3. Proximate composition and gross energy of dehulled *Mucuna sloanei*

%CP	*%EE*	*%CF*	*%Ash*	*%NFE*	*%DMM*	*GE(Kcal/ kg)*
27.42	4.26	6.85	2.75	48.63	89.91	3.189

Table 4. Anti-Nutritional factors in dehulled *Mucuna sloanei*

%L-Dopa	*%Tannin*	*%HCN*	*TIU/mg*
5.58	0.26	14.34	16.39

Table 5. Growth performance of broiler birds fed dehulled *Mucuna sloanei*

	T_1 control	*T_5*	*T_6*	*T_7*	SEM
Initial weight(kg)	0.1333	0.1333	0.1367	0.1367	0
Final weight (kg)	1.5133^a	0.8833^b	0.6200^c	0.4900^d	0.0183
Total weight gain(kg)	1.3800^a	0.7500^b	0.4833^c	0.4200^c	0.0447
Total feed intake(g)	4075.4900^a	3130.6100^b	2304.7967^c	2011.9400^d	55.1364
Daily feed intake(g)	83.1767^a	63.8900^b	47.0367^c	41.0833^d	1.1252
Feed conversion ratio	2.9733^c	4.1533^b	4.8067^b	5.7033^a	0.2058
Percent mortality	0.0000	3.3333	1.1100	4.4433	2.4841

Table 6. Cut parts (Expressed as percent dressed weight)of broiler birds fed dehulled *Mucuna sloanei*

	T_1 control	*T_5*	*T_6*	*T_7*	SEM
Percent dressed weight	68.4733^a	58.6967^b	59.5067^b	56.0900^b	1.9767
Thigh (%)	15.1467	16.5300	16.5600	16.3100	0.6460
Drumstick (%)	14.2800^c	15.8967^b	14.8200^c	17.4900^a	0.2309
Breast cut (%)	25.6900^a	23.3000^b	22.3367^b	24.7600^a	0.4465
Back cut (%)	22.2100^b	24.6867^a	20.4667^c	22.1467^b	0.2714
Wing (%)	12.2300^c	15.5733^a	13.8667^b	14.8867^{ab}	0.4879

Table 7. Organ weights (Expressed as percent dressed weight) of broiler birds fed dehulled *Mucuna sloanei*

	Treatments				
Parameters	T_1	T_5	T_6	T_7	SEM
Liver (%)	2.6800^{bc}	3.5700^a	2.2100^c	3.0700^b	0.1483
Gizzard (%)	4.2600	4.0900	4.1667	3.6100	0.2477
Kidney (%)	0.4200	0.5167	0.3967	0.3867	0.0365
Heart (%)	0.7600	0.8300	0.7900	0.7867	0.0483

This may be due to efficient utilization of nutrients in terms of digestion, absorption and assimilation (Bamgbose, 1998). Cut parts of broilers fed dehulled velvet bean *Mucuna sloanei* is as shown in Table 6 There was significant (P<0.05) difference for all the parameters measured except the thigh. The percent dressed weight for birds placed on the control diet was significantly (P<0.05) higher than that of birds placed on the diet containing the test feedstuff. This implies higher edible portion than the offals (Oluyemi and Roberts, 2000). The drumstick, breast cut, back cut and wing did not actually follow any specific pattern that could be attributed to the effect of the diets. The values of organ weights of broiler birds fed dehulled velvet bean *Mucuna sloanei* is as shown in Table 7 There was no significant (P>0.05) difference for all the parameters measured except the liver. The liver values did not follow any trend that could be attributed to the effect of the diet. The feed cost of using dehulled velvet bean *Mucuna sloanei in the* diets of broiler chickens is as shown in Table 8 There were significant(P<0.05) differences for all the parameters measured. The cost/kg of feed was highest in the control diet and the least in diet 2. The values obtained for the diets containing the test feed stuff was significantly(P<0.05) lower than the control diet, this could be attributed to the effect of lower price of the test feedstuff as opposed to that of soybean meal (Akinmutimi *et al*. 2008). The cost of feed consumed for control diet was also significantly (P<0.05) higher than the diets containing the test feedstuff. There was a decline in the cost of the feed consumed as the quantity of the test feedstuff increased in the diets. This probably could be partly attributed to the cost/kg of feed and partly due to the poor feed intake of the birds placed on the test feedstuff (Akinmutimi, 2008). For cost/kg weight gain, diets 3 and 4 had values that were statistically similar and differ significantly (P<0.05) from diets 1 and 2, also diets 1 and 2 differ significantly (P<0.05) from one another; this makes diet 4 having the highest value and diet 1 the lowest value. This shows the superiority of diet 1 among others. This probably could be due to good weight gain at moderate cost of feed consumed (Ekwu, 2008.)

For feed cost of production, the control diet had the highest value that was significantly (P<0.05) different from that of the diets containing the test feedstuff. The least value occurred in diet 4. The lower values of diets containing the test feedstuff when compared to the control diet could be attributed to the poor weight gain by the birds placed on the test diets (Nebechukwu, 2008). Since the cost/kg of broiler meat was the same for all the treatment. Gross margin, the value obtained for the control diet was significantly (P<0.05) higher than the diets containing the test feed stuff.. The gross margin favoured diet 1 among others, this could be attributed to good revenue and moderate feed cost of production (Akinmutimi, 2004).

Conclusion

Judging from the above points, dehulled *Mucuna sloanei meal* could not replace soybean meal even at 5% dietary level of inclusion without deleterious effects.

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