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Performance of Growing Cockerel Chickens Fed Diets Containing Graded Levels of Processed Horse Eye Bean Meal (*Mucuna urens*)

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Abstract: The study was designed to determine the optimum replacement level of processed horse eye bean meal (HEBM) for soybean meal (SBM) in the diet of growing cockerel chicks. The raw horse eye beans were cracked, soaked in water for 48 hours, cooked for 90 minutes, rinsed in fresh clean water, sundried, toasted on open fire at 100°C, milled and used for feed formulation. Six experimental (grower mash) diets were formulated, with diet 1 as control, while HEBM was used to replace SBM in the control diet at 15, 30, 45, 60 and 75% for diets 2, 3, 4, 5 and 6, respectively. One hundred and eighty (180) spotted cockerel chicks at 56 days old were used for the experiment which lasted for 84 days (12 weeks). The chicks were weighed into six (6) of thirty (30) chicks with two replicates of fifteen (15) chicks. Each group was randomly assigned to one of the six experimental diets in a completely randomised design. The result showed that average daily weight gain, average daily feed intake, cost of feed consumed and kg of feed per kg weight gain were statistically ($P<0.05$) influenced with elevated level of HEBM in the diet. Feed conversion ration and cost/kg of feed were not significantly affected. It was concluded that the cost of production can be reduce by reducing up to 30% of SBM with HEBM in the cockerel's diet.

Key words: Horse eye bean · Soaking · Cooking · Toasting cockerels

INTRODUCTION

Poultry production remains one of the veritable ways of achieving sustainable and rapid production of high quality protein to meet the increasing demand of the Nigerian teeming populace [1].

In Nigeria, there is inadequate supply of grains by-products, oil-seed cakes and other agro-industrial wastes to sustain small to medium scale poultry production [2]. A high demand for these feed ingredients has resulted in an increase in their prices and consequently, cost of poultry feed and its products [3].

It is imperative therefore, to look inward for alternatives and cheaper sources of feed ingredients. One of them is the horse eye bean (*Mucuna urens*) [4,5]. It is a widely available leguminous seeds that thrives well, even under extreme climatic conditions. It has a crude protein of about 27% and carbohydrate content of 56% on dry matter basis [5]. Horse eye bean has been reported to contain anti-nutritional factors. Combining, soaking, cooking and toasting at 100°C for 48 hours, 90 minutes and 60 minutes, respectively have been effectively utilized in eliminating anti-nutrients in the horse eye bean [6].

The study was therefore designed to assess the performance of growing cockerel chicks fed diets containing graded levels of processed horse bean meal.

MATERIALS AND METHODS

Processing of the Experimental Material: The horse eye beans used for this study were cracked using stone, soaked in plain water for 48 hours at room temperature (37°C), peeled, rinsed in fresh water, cooked for 90 minutes on open fire at 100°C (Timing started from the point of boiling), rinsed in clean water and sun-dried. The dried beans were toasted in frying pot, on open fire until they turned brown. The processed beans were milled on 4mm screened hammer mill and used for feed formulation.

Experimental Diets: Six (6) diets (grower mash) were formulated to supply 15 per cent crude protein and about 2,700 Kcal/kg of metabolizable energy.

Diet 1 was the control, while diets 2 to 6 constituted test diets, with processed HEBM replacing SBM at 15, 30, 45, 60 and 75 per cent, respectively.

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Experimental Birds and Design: One hundred and eighty (180) spotted cockerel chicks at 56 days old were used for this experiment. The birds were weighed and divided into six (6) groups of thirty (30) chicks each on weight equalization basis. Each group was further divided into two (2) replicates of fifteen (15) birds and randomly assigned to one of six (6) diets in a completely randomized design (CRD).

Feed and water were offered *ad libitum* and feed intake (pen basis) was measured daily. The weight of the birds were taken weekly on replicate basis.

Data for the feed intake and the weight gain were used to compute the feed conversion ratio.

Data generated from the experiment were statistically analyzed, using analysis of variance procedures. Significant means were separated by the Duncan's new multiple range test outlined by Obi [7].

RESULTS AND DISCUSSION

Data for the growth performance of cockerel chickens fed diet containing graded levels of processed horse eye bean meal (HEBM) are presented in table 2.

The highest average daily weight gain of 22.78g was recorded on birds fed the control diet, while the lowest value of 14.46g was observed among birds fed 60 per cent

Table 1: Composition of experimental diet

	Replacement levels of HEBM for SBM (%)					
Ingredients	0	15	30	45	60	75
Maize	59.8	59.1	58.2	57.25	56.05	54.20
Fish meal	3.0	3.0	3.0	3.0	3.0	3.0
Soy bean meal	9.2	8.4	7.6	6.46	5.18	3.7
Mucuna bean meal	-	1.5	3.2	5.29	7.77	11.1
Palm kernel cake	6.0	6.0	6.0	6.0	6.0	6.0
Wheat offal	18.0	18.0	18.0	18.0	18.0	18.0
•Vitamin/mineral premix	0.5	0.5	0.5	0.5	0.5	0.5
Salt	0.5	0.5	0.5	0.5	0.5	0.5
Bone meal	3.0	3.0	3.0	3.0	3.0	3.0
Total	100	100	100	100	100	100
Calculated analysis						
Crude protein (%)	15.00	15.00	15.00	15.00	15.00	15.00
ME (Kcal/kg)	2,700	2,702	2,705	2,707	2,709	2,712
Determined analysis						
% Crude protein	15.04	15.01	14.99	14.97	14.96	14.97
ME(Kcal/kg)	2696	2699	2702	2705	2710	2714

•Grower mineral premix containing the following per kg. Vitamin A 8,000000IU; Vitamin D3 1,600000IU; Vitamin E 5,000IU; Vitamin K 2,000mg; Thiamine 1,500mg; Riboflavin B2 4,000mg; Pyridoxine B6 1,500mg; Anti oxidant 125g; Niacin 1,500mg; Vitamin B12 10mg; Panthotenic acids 5,000mg; Folic acid 500mg; Biotin 20mg; Choline chloride 200g, manganese 80g; Zinc 50g; iron 20g; 1ron 20g; copper 5g; Iodine 1.2g; Selenium 200mg; Cobalt 200mg.

Table 2: Performance of cockerels fed diet containing graded levels of processed horse eye bean during rearing phase

	Replacement levels of HEBM for SBM (%)						
Parameters	0	15	30	45	60	75	SEM
Initial Weight/Bird (g)	347.50	337.50	335.00	342.50	340.00	347.72	± 1.94
Final Weight/Bird (g)	2,261.35^{a}	2,201.23^{a}	1,755.93^{b}	1,804.75^{b}	1,596.81^{b}	1,671.85^{b}	± 6.53
Weight gain/bird (g)	1,913.85^{a}	1,863.73^{a}	1,420.93^{b}	1,462.25^{b}	1,256.81^{b}	1,324.14^{b}	± 6.52
Average daily weight gain/bird (g)	22.78^{a}	22.19^{a}	16.92^{b}	17.41^{b}	14.96^{b}	15.76^{b}	± 1.88
Average daily feed intake/bird (g)	62.14^{ab}	57.45^{ab}	45.26^{b}	63.47^{a}	50.92^{ab}	61.16^{ab}	± 2.77
Feed conversion ratio	2.73	2.59	2.68	3.65	3.40	3.88	± 0.12
Cost/kg of feed	65.85	65.37	64.90	64.20	63.42	62.57	± 7.20
Cost of feed consumed	343.79^{a}	315.73^{a}	247.27^{b}	340.90^{a}	263.49^{b}	320.00^{a}	±13.96
Kg feed/kg weight gain	179.99^{ab}	169.74^{b}	174.13^{b}	223.49^{a}	209.12^{a}	242.42^{a}	±20.52

Means with different superscripts on the same row are significantly different ($P < 0.05$)

SEM-Standard Error of Mean

Table 3: Carcass and internal organs characteristics of cockerel chickens fed diets containing graded levels of processed HEBM during rearing phase (live weight)

	Replacement levels of HEBM for SBM (%)						
Parameters	0	15	30	45	60	75	SEM
Live Weight (g)	1,652.50	1,753.68	1,270	1,450.0	1,365.6	1,422.80	±5.07
Dressing percentage	79.58^{a}	80.69^{a}	69.28^{b}	75.85^{ab}	71.44^{b}	72.41^{b}	±0.84
Carcass weight (% live weight)							
Thigh	23.82	25.97	21.63	23.01	20.24	21.39	±0.56
Breast	18.72	17.36	17.55	16.34	14.69	21.72	± 0.60
Wing	9.34	8.63	8.40	8.76	8.66	9.57	± 0.81
Back	14.0	15.77	9.95	14.69	13.43	13.83	± 0.55
Shank	4.22	4.18	3.54	4.09	4.07	4.12	±0.20
Neck	7.54	7.11	4.93	6.75	7.46	6.29	±0.50
Head	3.54^{b}	4.61^{a}	3.14^{b}	4.49^{a}	3.38^{b}	2.98^{bc}	±0.32
Internal organs weight (% live weight)							
Liver	1.69^{b}	1.23^{c}	1.60^{b}	2.02^{a}	1.54^{b}	2.08^{a}	±0.22
Heart	0.53^{b}	0.78^{a}	0.41^{c}	0.53^{b}	0.41^{c}	0.53^{b}	± 0.14
Proventriculus	0.29^{c}	0.26^{dc}	0.40^{b}	0.45^{b}	0.34^{bc}	0.57^{a}	±0.13
Gizzard	4.36^{b}	3.46^{d}	3.55^{d}	3.97^{c}	4.72^{a}	4.78^{a}	±0.29
Lungs	0.68^{ab}	0.65^{bc}	0.66^{bc}	0.76^{a}	0.74^{a}	0.81^{a}	±0.01
Length of intestine (cm)	158.0	167.02	186.01	157.0	163.0	155.0	± 1.32

Means are values of three birds

Means with different superscripts within the same row are significantly ($p<0.05$) different

SEM-Standard error of mean

HEBM. Average daily weight gains were significantly ($P<0.05$) different among treatment groups. However, weight gain by birds fed the control diet and those on diet containing 15 per cent HEBM were not statistically different from each other. Also, birds fed diets containing 30, 45, 60 and 75 per cent levels of HEBM recorded average daily weight gain which were statistically similar. The result of this experiment was however, similar to values reported by some researchers. For instance, Adeleye *et al.* [8] reported an average daily weight gain range of 18.56g-20.19g, while Kperegbeyi and Onwumere [2] gave 20.36-25.15g as the average daily weight gain of cockerels fed groundnut cake based diets. Yisa *et al.* [9] reported an average daily weight gain range of 17.01-18.46g for growing cockerel fed graded levels of pigeon pea diets. Values reported by these authors were similar to the result of this experiment.

The average daily feed intake was significantly ($P<0.05$) different, with the highest intake of 63.47g recorded in birds fed 45 per cent processed HEBM, while the least intake of 45.26g was observed in birds fed 30 per cent processed HEBM diet.

Values for the feed conversion ratio were not significantly different among the treatment groups. Low FCR values recorded among birds fed diets containing 45, 60 and 75 per cent HEBM may be attributed to the presence of residual anti-nutritional factors (ANFs), which became pronounced with increasing level of the HEBM in the diet. Siddhuraju and Becker [10] observed that the presence of phytate and protease inhibitors could have inhibitory action on the protein digestibility of the seed samples. Kossori *et al.* [11] also stated that the presence of non-starch polysaccharide constituent could result in decreased digestibility of seed proteins through the interaction with the enzymes or proteins. Etuk *et al.* [12] and Yisa *et al.* [9] reported an increase in FCR values with increasing level of toasted pigeon pea inclusion in broilers and cockerels diets, respectively.

Cost of kilogram of feed did not differ significantly among the treatment groups. Slight decrease in the cost of feed was however, observed with increase in the level of the processed HEBM from 15 to 75 per cent in the diet. Cost of feed consumed was significantly ($p<0.05$) lower (N 247.27) for birds fed 30 per cent processed HEBM than those on treatments containing 0, 15, 45 and 75 per cent HEBM. Values for birds on 30 and 60 per cent HEBM diets were not significantly different. Increase in the cost of feed consumed for control and treatment groups with 15, 45 and 75 per cent HEBM is attributed to the high feed intake of birds eating this diets. Cost of feed per kg weight was significantly ($p<0.05$) lower among birds on 15 per cent HEBM diet compared to those on 45, 60 and 75 per cent HEBM diets. Cost of feed per kg weight for birds fed control and 30 per cent HEBM diet compared favourably to the group fed 15 per cent HEBM diet. The significant reduction in the cost of feed per kg weight at 0, 15 and 30 per cent levels of the HEBM may be attributed to the outstanding growth performance of birds.

Internal organs and carcass characteristics of cockerel chickens fed diets containing graded levels of processed horse eye bean meal during rearing phase (% live weight) are shown in table 3.

Dressing percentage was significantly ($p<0.05$) different among treatment groups. The values ranged from 80.69% in birds fed diet containing 15 per cent processed HEBM to 69.28% in birds fed 30 per cent processed HEBM. The dressing percentage of 79.58% recorded in the control diet was comparable to the value obtained on birds fed 15 per cent HEBM diet. Also values obtained for birds on diets containing 30, 60 and 75 per cent processed HEBM were not significantly different from each other.

The mean weight of cut parts as a percentage of live weight were not significantly different among the treatment groups. Values for the head was significantly ($p<0.05$) different and ranged from 4.61% in bird fed 15 per cent HEBM to 2.98% in diet containing 75 per cent HEBM.

Variation in the mean weight of internal organs as percentage of live weight was significant ($P<0.05$) with increasing level of processed HEBM in the diet. Birds fed diet containing 75 per cent HEBM had the highest percentage weights of liver (2.08%) gizzard (4.78%) lungs (0.81%) and proventriculus (0.57%) whereas birds on 15 per cent HEBM diet had the least values for liver, gizzard and lungs, corresponding to 1.23, 3.46 and 0.65%, respectively. Percentage weight of heart was highest (0.78%) in birds on 15 per cent HEBM diet and least in bird fed 30 and 60 per cent HEBM diets. Birds on 30 per cent HEBM had the highest length of small intestine; while birds fed diet containing 75 per cent HEBM had the shortest intestinal length (155cm). The increase in gizzard and proventricular weight may represent greater work of digestion and metabolism by the organs in processing of the horse eye bean. The HEBM contains higher fibre than soy bean meal and may make the musculature of the gizzard work harder [13,14]. Decrease in liver size has been attributed to an attempt to detoxify the toxic components of the diets, while enlargement of the heart may represent the extra work load imposed by stress or diseases [14]. Increase in the length of intestine may be attributed to the high fibre content.

In conclusion, The present result showed that the cost of production can be reduced by replacing up to 30 per cent of the soybean meal with processed HEBM in the diet of growing cockerels' diet.

REFERENCES

1. Akpata, D.F. and Y. Ojo, 2000. Efficacy of the *Trichoderma viride* enzyme complex in broiler starter fed cowpea testa based diets. *In the Proceedings* of the 2000 Annual Conference of Nigerian Society for Animal Production, pp: 132-134.
2. Kperegbeyi, J.I. and O.S. Onwumere, 2007. Effects of raw and toasted bambara groundnut (*Vigna subterranean (L.) verdcourt)* on performance of growing cockerels. *In the Proceedings* of the 2007 Annual Conference of the Nigerian Society for Animal Production, pp: 188-191.
3. Akinmutimi, A.H., S.F. Abasiekong and R.O. Izundu, 2002. Effect of processing on metabolisability of energy and protein content of sword bean (*Canavalia gladiata*) using muscovry duck (*Carina muschata*). Trop. J. Anim. Sci., 5: 51-56.
4. Osaniyi, C.B. and O.U. Eka, 1978. Studies on chemical composition and nutritive value of horse eye bean (*Mucuna urens*). West African J. Biol. Appl. Chem., 32: 228-229.
5. Umoren, U.E., O.O. Effiong and I.A. Akpan, 2007. Nutritional evaluation of horse eye bean (*Mucuna urens*): Effect of processing on the chemical composition. Journal of Food, Agric. Environ., 3(2): 128-131.
6. Effiong, O.O., 2010. Improving the nutritional value of horse eye bean (*Mucuna urens*) through multi-processing techniques for poultry feeding. Ph.D Thesis, University of Calabar, Nigeria.
7. Obi, I.U., 1990. Statistical methods of detecting differences between treatment means. 2nd edition. Snaap press, Enugu, Nigeria.
8. Adeleye, O.O., A.O. Fanimo, M.O. Sogunle, D. Eruvbetine, Egbeyale and K.O. Yusuf, 2009. Effect of house-type and strain on performance of two strains of cockerels in early rainy season. In the *Proceedings* of the 2009 Annual Conference of the Nigerian Society for Animal Production, pp: 303-304.
9. Yisa, A.G., J.A. Edache, O.D. Olaiya, S.N. Atam and M.N. Samuel, 2010. Effect of graded levels of pigeon pea (*Cajanus cajan (L.) Millsp*) 0n the growth performance of growing cockerels. In the Proceedings of the 2010 Conference of the Nigerian Society for Animal Production, pp: 321-323.

10. Siddhuraju, P. and P. Becker, 2005. Nutritional and anti-nutritional composition, *in vitro* amino acid availability, starch digestibility and predicted glycemic index of differently processed mucuna beans (*Mucuna pruriens var. utilis*): underutilized legumes. Food Chemistry, 91: 275-286.
11. Kossori, R.L., C.E. Sandchez, E.S. Boustani, N. Maucourt, Y. Sauvaire, L. Mejean and C. Villaume, 2000. Comparison of effects of prickly pear (*Opuntia ficus indica* vitro amino acid availability, starch digestibility and predicted glycemic index of differentially processed mucuna beans (*Mucuna pruriens var. utilis*): underutilized legumes. Food chemistry, 91: 275-286.
12. Etuk, E.B., B.O. Esonu and A.B.I. Udedibie, 2003. Evaluation of toasted pigeon pea (*Cajanus cajan*) seed meal as replacement for soybean meal and maize broiler finisher diets. In the *Proceedings* of the 2003 Annual Conference of Animal Science Association of Nigeria, pp: 16-19.
13. Carmen, D.J., A.C. Gernat, R. Myhrman and L.B. Carew, 1999. Evaluation of raw and heated Velvet beans (*Mucuna pruriens*) as feed ingredients for broilers. Poultry Science, 78: 866-872.
14. Carew, L.B., D. Hardy, J. Weis, F. Alster, S.A. Mischler, A. Gernat and E.I. Zakrzewska, 2003. Heating raw velvet beans (*Mucuna pruriens*) reverse some anti-nutritional effects on organs histology in growing chickens. Tropical and subtropical agrosystems, 1: 267-275.