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PERFORMANCE AND CARCASS CHARACTERISTICS OF FINISHER BROILERS FED GRADED LEVELS OF *MUCUNA PRURIENS* SEED MEAL

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ABSTRACT

A four week feeding trial was conducted to determine the effect of boiled *Mucuna* seed meal (BMSM) on the growth performance and carcass characteristics of broiler finishers. Two hundred and twenty five (225) five-week old Marshall Strain of broilers were randomly assigned in a completely randomized design (CRD) to pens. There were three replications of the five treatments in which boiled *Mucuna* seed meal was fed at graded levels of 0, 7.5, 15.0, 22.5, and 30.0. Feed and water were given to the birds *ad libitum*. The parameters measured included weight gain, feed intake, feed to gain ratio and feed cost per kilogram gain. Carcass analysis was also carried out. The results showed that dietary levels of inclusion of BMSM had significant ($P<0.05$) effect on these parameters. The final weight, the weight gain and feed intake of the birds fed 0.0 and 7.5%BMSM were similar and significantly ($P<0.05$) higher than those of other treatments. Cost of feed per birds and feed cost per kilogram gain were lower for all BMSM diets than the control. Highest mortality rate was recorded for birds fed 30% BMSM. The carcass showed significant ($P<0.05$) differences among the treatments for dressing percentage, carcass and cut parts weights. The dressing percentage, carcass, thigh, drumstick, breast, wing and back weights were higher for the birds fed 0 and 7.5% BMSM based diets. It was concluded that inclusion of BMSM in the diets of broiler finisher chicks has beneficial effects and 7.5% level of inclusion is recommended

Keywords: Boiling, Performance, *Mucuna pruriens*, Broiler finishers, graded levels, carcass

INTRODUCTION

Poultry production, especially broiler chickens remains one of the veritable ways of attaining sustainable and rapid production of high quality protein to meet the increasing demand of the Nigeria teeming populace (Apata and Ojo, 2002), due to short generation interval of broiler chicken (Akinmutimi and Onwukwe, 2002). One of the main challenges in poultry enterprise is high cost of feed which is estimated to be about 70% of the total cost of production (Ogundipe *et al.*, 2003). This high cost has been attributed to the over-dependence on the expensive conventional feed stuffs such as soybean and groundnut cake which is mainly used in poultry feed formulation (Emenalon and Udedibie, 1998). A high demand for these feed ingredients has resulted in an increase in their prices and consequently, cost of poultry feeds and its products (Akinmutimi and Okwu, 2006). This necessitates research into non-conventional feedstuffs (NCF) that are readily available, cheap and nutritionally safe. One of these NCF is *Mucuna pruriens* seeds (Iyayi and Egharevba, 1998; Anele, 2002) which is a widely available leguminous seed that thrive well where others fail due to its excellent adaptability to extreme climatic conditions. It yields about three to four tones of seed per hectare. It is a potential source of protein because it is very high in crude protein. It has a crude protein of 33.4% (Anele 2002).

One of the major problems of legume utilization is the presence of anti-nutritional factors (Oke *et al.,* 2003). Removal of these anti-nutritive components is essential in order to improve the nutritional quality of the seeds and to effectively utilize their full potential as feeds (Akinmutimi and Okwu, 2006). Heat treatment such as boiling is frequently used to improve the utilization of the nutrients in legumes by animals (Tuleun *et al.,* 2008). This research aims at evaluating the effect of feeding graded dietary boiled *Mucuna* seed meals on the growth performance and carcass characteristics of broiler finishers.

MATERIALS AND METHODS

The experiment was conducted at the poultry section, Department of Livestock, Ministry of Agriculture, Mariri, in Kumbotso Local Government Area of Kano State. The area lies between latitude 11^{o} 55' and longitude 8^{o} 36' at an altitude of 460m above sea level with an average annual rainfall of 600-1000mm, mean temperatures of 21.21^{o}C and humidity of 52.81 %. (KNARDA, 2011).

The *Mucuna pruriens* seeds were purchased from villages in Markudi local government area, Benue State of Nigeria. Raw *Mucuna* seeds were cleaned and poured into two litres of boiling water at a temperature of 100^{o}C in a four litre aluminum cooking pot and boiled for 60 minutes. The boiled *Mucuna* seeds were drained and spread out thinly on a neat concrete floor with occasional turning to dry. The seeds were sun dried for three days and thereafter ground in a hammer mill and then incorporated into the experimental diets. Diets were formulated to meet standard requirements (NRC, 1994). Five experimental diets were formulated, and the inclusion levels of boiled *Mucuna* seed meal (BMSM) were 0, 7.5, 15.0, 22.5 and 30.0% for T1, T2, T3, T4 and T5 respectively. Birds were fed 20% crude protein finisher diet, and Tables 1 represents the feed composition for the finisher chicks.

A total of two hundred and twenty five (225) four- week old Marshall Breed broiler chicks (mixed sexes) were used for this study. The birds were weighed at the beginning of the experiment and allotted into pens in a completely randomized design (CRD).

There were five treatments; each treatment was replicated three times with 15 birds per pen. The birds were reared on deep litter, in an open sided wire mesh screened poultry house. Routine vaccinations against New Castle and Gumboro diseases were given and drugs were given as at when due. A one week adjustment period was allowed at the 3rd weekbefore the feeding trial began. Birds were supplied with experimental diets and fresh water *ad libitum* throughout the trial period. The birds were weighed at the beginning of the experiment (4th week) and then weekly for the period of 4 weeks. Performance characteristics in terms of weight gain, feed intake, and feed to gain ratio were recorded weekly throughout the experimental period.

At the end of the feeding trial, one bird per pen (3 per treatment) was randomly selected and slaughtered for carcass evaluation. Hot carcass weight was taken and expressed as dressing percentage. Also, the weights of cut parts such as thigh, breast, wing and back were taken; the weights of liver, gizzard, intestines, shank and head were also taken and expressed as percentages of dressed weight. The length of the intestine was also measured after cleaning.

Table 1: Gross composition of Broiler finisher diets (%)

Ingredients	Levels of BMSM, %				
	0	7.5	15	22.5	30
Maize	55.05	53.80	51.95	46.00	42.25
Groundnut cake	25.00	18.75	13.10	11.55	7.80
Mucuna seed meal	0.00	7.50	15.00	22.50	30.0
Soybean meal	8.00	8.00	8.00	8.00	8.00
Maize offal	5.00	5.00	5.00	5.00	5.00
Fish meal	2.00	2.00	2.00	2.00	2.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Limestone	1.00	1.00	1.00	1.00	1.00
Common salt	0.30	0.30	0.30	0.30	0.30
Methionine	0.30	0.30	0.30	0.30	0.30
Lysine	0.10	0.10	0.10	0.10	0.10
*Vitamin/trace min.premix	0.25	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**	**100**
Calculated Analysis (%)					
ME (Kcal/kg)	3001	3000	3112	3020	3025
Crude Protein	20.00	20.00	20.00	20.00	20.00
Crude fibre	4.35	4.78	6.46	7.85	7.95
Ether Extract	7.80	7.92	7.45	7.00	6.95
Ash	6.40	6.45	6.40	6.42	6.35
Calcium	1.25	1.29	1.27	1.28	1.29
Available Phosphorus	0.78	0.79	0.70	0.74	0.74
Lysine	1.20	1.22	1.24	1.20	1.22
Methionine	0.57	0.59	0.51	0.57	0.58
Methionine + Cystine	0.75	0.72	0.70	0.72	0.70
Cost/kg diet (₦)	71.15	68.22	67.45	63.75	60.50

*Biomix Premix supplied per kg of diet: Vit. A, 10000 I.U; Vit.D_3, 2000 I.U; Vit.E, 23mg; Vit.K, 2mg; Vit.B1 (Thiamine), 1.8mg; Vit.B2 (Riboflavin), 5.5mg; Vit. B6 (Pyridoxine), 3.0mg; Vit B12, 0.015mg; Pantothenic acid, 7.5mg; Folic acid, 0.75mg; Niacin, 27.5mg; Biotin, 0.06mg; Choline chloride, 300mg; Cobalt, 0.2mg; Copper, 3mg; Iodine, 1mg; Iron, 20mg; Manganese, 40mg; Selenium, 0.2mg ; Zinc, 30mg; Antioxidant, 1.25mg; I.U; International unit; M.E., Metabolisable Energy.
*Computed in the year 2011

Data obtained from the performance and the carcass evaluation were subjected to analysis of variance (ANOVA) using procedure of SAS (2002), significant levels of differences among treatment means were determined using the Duncan's multiple range test.

RESULTS AND DISCUSSION

Tables 2 shows the performance of broiler finisher fed *Mucuna* seed meal boiled for 60 minutes at various graded levels of 0, 7.5, 15.0, 22.5 and 30.0% respectively. There were significant ($P< 0.05$) differences between treatment means for final weight, weight gain, feed intake and feed to gain ratio. The final weight, weight gain, feed intake and feed to gain ratio, of birds fed 0 and 7.5% boiled *Mucuma* seed meal (BMSM) were similar, higher and better than those on other treatments. It was also observed that the final body weight (g/bird)), weight gain ((g/bird)) and feed intake ((g/bird)) decreased significantly ($P<0.05$) as dietary levels of inclusion of BMSM

Table 2: Effects of feeding diets containing boiled *Mucuna* seed meal on performance of Broiler finishers (5-8weeks)

Measurements	Levels of BMSM					SEM
	0%	7.5%	15%	22.5%	30%	
Initial weight (g/b)	1195	1195	1195	1195	1195	0.00
Final weight (g/bird)	2828[a]	2800[a]	2690[b]	2554[c]	2505[c]	8.01
Weight gain (g/bird)	1633[a]	1605[a]	1495[b]	1359[c]	1311[c]	15.46
Feed intake (g/bird)	3370[a]	3320[a]	3189[b]	3176[b]	3157[b]	50.38
Feed to Gain Ratio	2.06[a]	2.07[a]	2.13[b]	2.34[c]	2.41[d]	0.02
Feed cost/kg weight gain (₦)	162[e]	150[d]	144[c]	143[b]	135[a]	1.04
Feed cost/bird (₦)	490[d]	477[c]	475[bc]	472[b]	466[a]	0.47
Mortality %	2.22[b]	0.00[b]	11.09[a]	2.22[b]	13.30[a]	0.77

[abcd]*Means within the same row with different superscripts differ significantly (P<0.05) SEM = standard error of mean*

Table 3. Carcass characteristics of broiler finisher chickens fed boiled *Mucuna* seed meal based diets

Parameters	Levels of BMSM,%					SEM
	0.0	7.5	15.0	22.5	30.0	
Live wt. (g)	2803.67[a]	2800.60[a]	2679.33[b]	2520.00[c]	2500.67[d]	2.11
Bled wt.(g)	2690.00[a]	2689.00[a]	2606.67[b]	2470.00[c]	2400.00[d]	0.89
Plucked wt.(g)	2603.33[a]	2600[a]	2472.00[b]	2410.00[c]	2283.00[d]	0.83
Dressed wt (g)	2157.00[a]	2150.00[a]	1992.33[b]	1883.67[c]	1880.00[d]	4.74
Dressing %	76.89[a]	76.78[a]	74.41[b]	73.81[c]	72.63[d]	0.05
Cut parts Expressed as % dressed weight						
Thigh	14.07[a]	14.40[a]	13.25[b]	12.27[c]	11.35[d]	0.05
Drumstick	16.15[a]	16.25[a]	15.00[b]	13.25[c]	12.28[d]	0.04
Breast	20.90[a]	20.88[a]	19.40[b]	18.96[c]	18.26[d]	0.06
Back	18.62[a]	18.52[a]	17.72[b]	17.47[b]	17.12[c]	0.06
Wing	9.30[a]	9.30[a]	8.76[b]	8.62[c]	7.96[d]	0.02
Neck	5.00	5.01	5.00	5.00	5.00	0.03
Organs Expressed as % live weight						
Heart	0.46	0.46	0.47	0.47	0.47	0.05
Liver	1.66[a]	1.66[a]	1.69[a]	1.70[a]	1.90[b]	0.03
Gizzard	1.89	1.89	1.89	1.90	1.90	0.06
Spleen	0.11	0.11	0.11	0.12	0.12	0.01
Visceral expressed as % live weight						
A/fat	2.12	2.12	2.12	2.27	2.27	0.04
Intestinal wt.	4.25[a]	4.28[a]	4.50[a]	5.13[b]	5.13[b]	0.12
Intestin.length (cm)	230.00	230.45	230.00	230.00	230.00	0.03

[abc]Means within the same row with different superscripts differ significantly (P<0.05)
SEM = standard error of means, A/Fat = Abdominal fat

further increased from 15 to 30%. The feed to gain ratio also increased as the levels of boiled *Mucuna* seed meal (BMSM) increased.

The similar high feed intake, weight gain and final weight obtained for the birds fed 7.5% BMSM and those on the control diet could be an indication that chicks were able to efficiently utilize BMSM at 7.5% better than other levels.This result of better feed to gain ratio observed for birds fed 7.5% MSM could also be due to the fact that there were sufficient digestible nutrients that were better utilized at this level of lower anti-nutritional factors.

The reduced weight gain observed as the dietary level of inclusion increased from 15 to 30% BMSM also could be attributed to the reduced feed intake and poor efficiency of feed utilization which limited the availability of digestible nutrients. This could also be attributed to the effect of residual anti-nutritional factors which became pronounced as the dietary levels of test feed ingredient increased. These findings are in consonance with the report of Dada *et al.* (2000) who observed that weight gain in broilers was directly related to feed intake, quality of feed as well as efficiency of feed utilization.

There was significant ($P<0.05$) decrease among treatment means for feed cost per bird and per kilogram gain, which decreased as the dietary levels of BMSM increased. The feed cost per bird and per kilogram gain were significantly ($P<0.05$) better for all the BMSM diets compared to the control diet. This was because *Mucuna* seeds were cheaper and readily available without much competition from humans as they are not cherished as human food.It could also be because of the reduction of groundnut cake and maize in the BMSM diets.Bawa (2003), also reported a significant ($p<0.05$) reduction in feed cost and total cost per animal when unconventional legume (*Lablab purpurens)* were utilized in pig diets. The feed cost/kg gain were significantly ($P<0.05$) better for all the BMSM compared to the control diet. This shows that lower cost of feed can be achieved when an unconventional legume seeds like *Mucuna pruriens* is used in feed formulation.

Table 3 shows the result of the carcass characteristics of broiler finisher birds fed BMSM based diets. There were significant ($P<0.05$) differences between the treatment means for all measurements except relative weights of neck, heart, spleen and abdominal fat. The results of the control and 7.5% BMSM diets were similar and gave the best result for the carcass weight and dressing percentage when compared with other treatments. Birds on the control and 7.5% BMSM diets also gave the best result for the cut parts such as thigh, drumstick, breast, wing, and back weights. The weights of liver were similar for birds fed the control, 7.5 15.0 and 22.5 BMSM diets, this result could infer that boiling *Mucuna* seeds reduced anti-nutritional factors thereby was not deleterious to the birds.

The results of the carcass weight, dressing percentage and cut parts such as thigh, breast, wing, and back weights of the control and 7.5% BMSM diets being higher when compared with other treatments could be an indication that there was an efficient utilization of feed by the birds on these diets, due to lower concentration of anti-nutritional factors. This led to better carcass development and meat yield on these two diets. The reduction in carcass weight from 15 to 30% levels of boiled *Mucuna* seed meal inclusion could be due to low feed intake and utilization. Fetuga, (1975) indicated that carcass quality were closely related to the intake level of nutrients especially protein and energy.

The enlargement of liver for the 30% BMSM inclusion in this study could be due to increased metabolic activities of the liver in trying to detoxify the high residual anti-nutritional factors at this inclusion level since liver serves as the detoxification centre.

CONCLUSION

The results obtained in this study indicated that inclusion of boiled *Mucuna* seed meal in the diet of finisher broilers is beneficial. Birds on 7.5% BMSM showed the same performance with birds on the control diet and were able to produce 1kg of meat at a reduced cost when compared to birds on the control diet. It is therefore recommended that BMSM can be included in broilers diet as a source of protein.

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