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National Animal Production Research Institute
Ahmadu Bello University
P.M.B 1096, Shika-Zaria,
Kaduna State, Nigeria.
Email:japr@napri.gov.ng Url:journals.napri.gov.ng

GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF FINISHER BROILERS FED FERMENTED *MUCUNA PRURIENS* SEED MEAL

[*1]Akure, C. O., [2]Sekoni, A. A., [2]Abeke, F. O., [3]Vantsawa P. A., [4]Babasanya B., [4]Olukotun, O. and [4]Ayodele. J. T.

[1]Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Zaria
[2]National Animal Production Research Institute, Ahmadu Bello University, Zaria
[3]Department of Biological Sciences, Nigerian Defence Academy, Kaduna
[4] Federal College of Forestry and Mechanization, Afaka, Kaduna
[*]Corresponding Author: akurechristy@yahoo.com

ABSTRACT

A four week feeding trial was conducted to determine the effect of fermented *Mucuna* seed meal (FMSM) on the growth performance and carcass characteristics of broiler finishers. Two hundred and twenty five (225) five-week old Anak broilers were randomly assigned in a completely randomized design (CRD) to pens. There were three replications of the five treatments in which fermented *Mucuna* seed meal was fed at graded levels of 0, 5.0, 10.0, 15.0, and 20.0% for T1, T2, T3, T4 and T5 respectively. Feed and water were given to the birds *ad libitum*. The parameters calculated included weight gain, feed intake, feed to gain ratio and feed cost per kilogram gain. Carcass evaluation was also carried out. The results showed that dietary levels of inclusion of FMSM had significant (P<0.05) effect on weight gain, feed intake, feed to gain ratio and feed cost per kilogram gain. The final weight, the weight gain and feed intake of the birds fed 10.0% FMSM were significantly (P<0.05) higher than all other treatments including the control diet. Cost of feed per birds and feed cost per kilogram gain were lower than the control for all FMSM diets. Dietary treatments had significant (P<0.05) effect on dressing percentage, carcass and cut parts weights. The dressing percentage, carcass, thigh, drumstick, breast, wing and back weights were higher for the birds fed10.0% FMSM based diets. It was concluded that inclusion of FMSM in the diets of broiler finisher chicks has beneficial effects at 10% level of inclusion.

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 chickens (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 (Tuleun and Patrick, 2007) 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 29.37% (Tuleun and Patrick, 2007).

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, toasting and fermentation are frequently used to improve the utilization of the nutrients in legumes by animals (Abeke *et al.*, 2008 and Tuleun *et al.*, 2008). This research aims at evaluating the effect of feeding fermented *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 $11^0$55' and longitude $8^0$36' at an altitude of 460m above sea level with an average annual rainfall of 600-1000mm, mean temperatures of 21.21^{0}C and humidity of 52.81 %. (KNARDA, 2011).

The *Mucuna pruriens* seeds were purchased from villages in Makurdi local government area, Benue State of Nigeria. The raw mucuna seeds were fermented for72 hrs in an air- tight polythene bag. The fermented sample was sun-dried for five 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 fermented *Mucuna* seed meal (FMSM) were 0, 5.0, 10.0, 15.0 and 20.0% 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) five- week old Anak 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 three replications of the five treatments and fifteen (15) birds were used per replicate.

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 before 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 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: Ingredients composition of the diets containing varying levels of FMSM fed to broiler finishers (%)

	Levels of FMSM, %				
Ingredients	**0**	**5.0**	**10.0**	**15.0**	**20.0**
Maize	55.05	53.80	51.95	46.00	42.25
Groundnut cake	25.00	21.25	18.10	19.05	17.80
Mucuna seed meal	0.00	5.00	10.00	15.00	20.0
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)	3005	3010	3112	3015	3020
Crude Protein	20.00	20.00	20.00	20.00	20.00
Crude fibre	4.35	4.78	4.46	6.85	6.95.
Ether Extract	7.85	7.95	7.55	7.40	7.00
Ash	6.45	6.65	6.70	6.62	6.55
Calcium	1.28	1.30	1.36	1.38	1.39
Available Phosphorus	0.79	0.80	0.83	0.84	0.84
Lysine	1.22	1.25	1.28	1.28	1.29
Methionine	0.55	0.56	0.55	0.57	0.58
Methionine + Cystine	0.77	0.7	0.78	0.78	0.79
Cost/kg diet (₦)	72.25	68.92	67.65	63.55	61.50

*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. (Duncan, 1955).

RESULTS AND DISCUSSIONS

Table 2 shows the performance of broiler finisher fed *Mucuna* seed meal fermented for 72 hours at various graded levels of 0, 5.0, 10.0, 15.0 and 20.0% 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 10.0 % fermented *Mucuna* seed meal (FMSM) were similar, higher and better than those on other *Mucuna* treatments including the control treatment. 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 FMSM further increased from 15.0 to 20%. The feed to gain ratio also increased as the levels of fermented *Mucuna* seed meal (FMSM) increased.

The highest feed intake, weight gain and final weight obtained for the birds fed 10.0% FMSM diet could be an indication that chicks were able to efficiently utilize FMSM at 10.0% better than other levels. This result of better feed to gain ratio observed for birds fed 10.0% FMSM could also be due to the fact that there were sufficient digestible nutrients that were better utilized at this level. This is in agreement with Xu *et al.* (2012) who reported no health influences on broiler performance when soya bean was replaced by 10% rapeseed meal fermented with *L. fermentum and B.subtilis.* Another work of Mathivanan *et al.* (2006) suggested that positive influences of fermented feeds seen in gastrointestinal space e.g pathogenic microbial activity, the lowering of pH as well as increasing the production of short chain fatty acid (SCFA) may be attributed to the increased digestibility of feeds, which in turn improves the growth performance of chickens.

The reduced weight gain observed as the dietary level of inclusion increased from 15 to 20% FMSM also could be attributed to the reduced feed intake and poor efficiency of feed utilization which limited the availability of digestible nutrients. These findings are in consonance with the report of Dada *et al.* (2000) who observed that weight gain in broiler 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 FMSM increased. The feed cost per bird and per kilogram gain were significantly ($P<0.05$) better for all the FMSM 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. This shows that lower cost of feed can be achieved when an unconventional legume seeds like *Mucuna pruriens* is used in feed formulation.

Table 2: Effects of feeding diets containing FMSM on performance of Broiler finishers (5-8weeks)

Parameters	0%	5.0%	Levels of BMSM 10.0%	15.0%	20.0%	SEM
Initial weight (g/b)	1190.67	1190.00	1190.00	1190.00	1190.00	0.00
Final weight (g/bird)	2680.00^{b}	2700.00^{b}	2828.03^{a}	2550.73^{c}	2454.93^{d}	8.02
Weight gain (g/bird)	1489.33^{b}	1510.00^{b}	1638.00^{a}	1360.73^{c}	1264.93^{d}	15.46
Feed intake (g/bird)	1599.36^{b}	1600.91^{b}	1700.35^{a}	1508.88^{c}	1408.77^{d}	50.18
Feed to Gain Ratio	1.07^{b}	1.07^{b}	1.04^{a}	1.11^{c}	1.12^{d}	0.02
Feed cost/kg weight gain (₦)	165.57^{e}	150.22^{d}	142.57^{c}	143.41^{b}	135.23^{a}	1.04
Feed cost/bird (₦)	490.44^{d}	477.58^{c}	475.24^{bc}	472.48^{b}	466.32^{a}	0.47

Table 3 shows the result of the carcass characteristics of broiler finisher birds fed FMSM 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 10.0% FMSM diet gave the best result for the carcass weight and dressing percentage when compared with other treatments. Birds on 10.0% FMSM diets also gave the best result for the cut parts such as thigh, drumstick, breast, wing, and back weights.

The results of the carcass weight, dressing percentage and cut parts such as thigh, breast, wing, and back weights of the control and 10.0% FMSM 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. This led to better carcass development and meat yield on this diet. The reduction in carcass weight from 15 to 20% levels of fermented *Mucuna* seed meal inclusion could be due to low feed intake and utilization. Fetuga *et al*. (1975) and Adejinmi *et al.* (2011) indicated that carcass quality were closely related to the intake level of nutrients especially protein and energy. There was no significant ($P>0.05$) decrease among treatment means for the various organs like liver, gizzard and kidney.

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

			Levels of FMSM,%			
Parameters	**0.0**	**5.0**	**10.0**	**15.0**	**20.0**	**SEM**
Live wt. (g)	2703.67^{b}	2700.60^{b}	2803.00^{a}	2550.00^{c}	2500.00^{d}	2.10
Bled wt.(g)	2590.00^{b}	2589.00^{b}	2690.00^{a}	2489.00^{c}	2390.00^{d}	0.79
Plucked wt.(g)	2403.33^{b}	2400^{b}	2603.33^{a}	2410.00^{c}	2283.00^{d}	0.81
Dressed wt (g)	2057.00^{b}	2060.00^{b}	2160.00^{a}	1889.67^{c}	1830.00^{d}	4.63
Dressing %	76.08^{a}	76.29^{a}	77.00^{a}	74.10^{c}	73.20^{d}	0.05
	Cut parts		**Expressed as**	**%**	**dressed**	**Weight**
Thigh	13.07^{b}	13.40^{b}	14.07^{a}	12.27^{c}	11.35^{d}	0.06
Drumstick	15.15^{b}	15.25^{b}	16.15^{a}	13.25^{c}	12.28^{d}	0.04
Breast	19.90^{b}	19.88^{b}	20.90^{a}	18.96^{c}	18.26^{d}	0.05
Back	17.22^{a}	17.32^{a}	18.62^{a}	16.97^{b}	16.12^{c}	0.06
Wing	8.20^{a}	8.15^{a}	9.30^{a}	7.72^{c}	7.06^{d}	0.03
Neck	5.00	5.01	5.00	5.00	5.00	0.02
	Organs		**Expressed as**	**%**	**Live**	**Weight**
Heart	0.48	0.48	0.49	0.49	0.48	0.05
Liver	1.76	1.76	1.77	1.76	1.76	0.05
Gizzard	1.88	1.87	1.88	1.89	1.89	0.06
Spleen	0.12	0.12	0.12	0.12	0.12	0.01
	Visceral		**expressed as**	**%**	**Live**	**Weight**
A/fat	2.11	2.11	2.11	2.20	2.20	0.04
Intestinal 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

CONCLUSION

The results obtained in this study indicated that inclusion of fermented *Mucuna* seeds meals in the diet of finisher chickens is beneficial. Broiler finisher chickens fed 10.0 % FMSM had the best among all the treatments including the control diet. This shows that birds on the 10.0% FMSM diets were able to produce 1 kg of meat at a reduced cost when compared to birds on the control diet. It is therefore recommended that FMSM can be included in broilers diet as a source of protein up to 10% level of inclusion.

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