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Research Article

Interaction Effects of Differently Processed *Mucuna pruriens* Seed Meal on Growth Performance of Broiler Finisher

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Abstract

The present study aimed to evaluate the influence of differently processed Mucuna pruriens seed meal (boiled, fermented and soaked) at two levels (5 and10%) on growth performance of broilers during the finisher phase. A total of 420, four-week-old broilers (Ross breed) were randomly divided into seven treatment groups. Every treatment was replicated three times with twenty birds per each replicate. The parameters were evaluated in growth performance (final body weight, weight gain, feed intake, feed to gain ratio and mortality). Results of the present study revealed that growth performance, final body weight (3013.33g), weight gain (1783.11g) feed intake (3743.33g) and feed to gain ratio (2.08) were improved with 5 percent Mucuna pruriens seed meal diet supplementation while10 percent Mucuna pruriens seed meal showed lower body weight, weight gain, feed intake and feed to gain ratio. The results of the present study furthered showed that growth performance in terms of final body weight (3008.33g), weight gain (1778.18g) feed intake (3723.33g) and feed to gain ratio (2.10) were improved with fermented Mucuna pruriens seed meal diet supplementation. It can be inferred that a 5% inclusion levels of Mucuna pruriens seed meal supplemented diet of all the processing methods has had a beneficial impact on growth performance of broiler finisher chickens while fermented mucuna pruriens seed meal became the most effective processing out of the three methods employed.

Keywords: Broiler Finisher; Mucuna Pruriens Seed Meal; Growth Performance; Differently Processed

Introduction

Poultry Agriculture, especially broiler farming is the fastest source to provide high-quality meat and nutrients like protein for the human body. Feed cost accounts for 74% of the total cost of feed production [1]. Groundnuts and soybeans have been the major and conventional protein source for poultry have been in short supply and expensive thereby increasing the cost of production [1,3,4]. Most poultry farmers are generally interested in the total cost of production and the final profit after sales, therefore there is the need to intensify research into alternative protein, in order to cut down on the cost of poultry feed. This necessitates a continuous research into the world of alternative non- conventional protein feed source., that are readily available, cheap, nutritionally safe and not in direct demand for consumption by man. Non- conventional feeds offer one of the best alternatives for the production of feed cost hence reducing the cost of chicken, eggs and other animal products [4]. One of such alternative feed ingredients is *Mucuna pruriens* (1,2). It is a widely available leguminous seed that thrives well where others fail due to excellent adaptability to extreme climatic conditions. It yields about two to four tones of seed per hecter. It has crude protein of about 33.4% and carbohydrate content of 47.9% on dry matter basis [9]. Minerals and vitamins in *Mucuna* seed can contribute significantly to the needs of poultry as is typical of many legumes [10].

One of the major problems of legume utilization is the presence of anti-nutritional factors [3,6]. *Mucuna* seed as a source of protein for monogastric animals is limited by the presence of anti-nutritional factors like trypsin inhibitors, haemaglutinins, phytic acid, hydrocyanic acid and tannins [7]. The presence of trypsin and chemotrypsin inhibitors in legumes affects the digestibility of legume protein. Other anti-nutritional factors such as tannins, phytic acid and haemagglutinins impart bitter or unacceptable taste to the legumes, prevent protein digestibility and decrease the absorption of divalent metals ions such as Fe^{2+} and Zn^{2+} in the intestine. Removal of these undesirable components is essential in order to improve the nutritional quality of the seeds and to effectively utilize their full potential as feeds [8]. Differently processing methods, involving soaking, heat and fermentation may be employed to reduce such antinutritional factors. therefore, the present study aimed to evaluate the influence of differently processed *Mucuna pruriens* seed meal (boiled, fermented and soaked) at two levels (5 and10%) on growth performance of broiler finisher.

Materials and Method

This study was carried out at the Poultry Unit of Animal Science Department, Ahmadu Bello University, Samaru-Zaria. Zaria is within the Northern Guinea Savana Zone of Nigeria, Latitude 110 12'N and Longitude 70 33'E, at an altitude of 640m above sea level as reported by (7). *Mucuna* seed meal (MSM) that was boiled for sixty minutes, fermented for 72 hours, and soaked for 72 hours was incorporated into the diets of broiler chickens. The inclusion levels of processed MSM were 5 and 10% for the three-processing method.

The chicks were divided into seven treatments of three replicates each in a completely randomized experimental design and each replicate has twenty (20) birds. A known weight of feed was given daily while water was given *ad libitum.* The management of the broiler chicken were carried out according to the standard procedures for cleaning, brooding vaccination and medication. The feeds and the birds were weighed weekly. The performance of the birds in terms of the final body weight, weight gain, feed intake and feed to gain ratio were measured and recorded. The mortality of bird was also recorded and calculated. The experiment lasted for eight weeks. All data were recorded and analyzed using analysis of variance (ANOVA) (9). Means were separated by Duncan Multiple Range Test (10). The composition of experimental diet is shown in table 1.

Ingredients	T1	T2	T3	T4	T5	T6	T7
Maize	55.00	55.00	56.00	57.00	54.00	58.00	55.00
Mucuna	0.00	5.00	10.00	5.00	10.00	5.00	10.00
Ground nut cake	25.00	20.00	14.00	18.00	16.00	17.00	15.00
Soya bean meal	8.00	8.00	8.00	8.00	8.00	8.00	8.00
Fishmeal	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Limestone	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Bone meal	3.00	3.00	3.00	3.00	3.00	3.00	3.00
M/offal	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Common Salt	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Vit/premixs	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Lysine	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Methionine	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Calculated analysis							
ME: (Kcal/kg)	3017	3038	3100	3028	3030	3015	3000
Crude protein (%)	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Crude fiber (%)	3.45	3.71	4,03	3.69	3.99	3.67	3.96
Ether Extract %	6.21	6.15	6.12	6.20	6.23	6.15	6.12
Ash (%)	0.64	0.64	0.64	0.64	0.63	0.63	0.63
Calcium (%)	1.36	1.37	1.38	1.38	1.39	1.38	1.40
Av. Phosphorus (%)	0.59	0.60	0.61	0.60	0.62	0.61	0.62

Lysine (%)	2. 30	2.29	2.28	2.28	2.26	2.28	2.25
Methionine (%)	0.27	0.27	0.27	0.27	0.26	0.26	0.25
Methio. + Cyst. (%)	0.75	0.74	0.74	0.74	0.74	0.73	0.73

Table 1: Composition of finisher diet containing variously processed *Mucuna* seed meal.

*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, 1.25mgMSM; Mucuna Seed Meal, GNC; Groundnut Cake, SBM; Soya bean meal cake; i. U; international unit; M.E.; Metabolizable Energy.

Results and Discussion

Table 2 shows that there was a significant ($P < 0.05$) difference between processing methods and *Mucuna* levels on final weight, weight gain and feed to gain ratio (FGR). Processing methods enhanced ($P < 0.05$) weight gain at 5% levels of MSM inclusion. Birds on treatment 1(0% MSM) had significantly ($P < 0.05$) highest final weight, weight gain and feed to gain ratio which is comparable to those of birds on treatments 2, 4 and 6 (5% boiled MSM, 5% fermented MSM and 5% soaked MSM) but significantly ($P < 0.05$) higher than the final weights of birds on treatments 3 and 5 (10% boiled and 10% fermented. Birds on treatment 7 had the least for all these parameters mentioned.

The result of this work where FGR increased significantly ($p < 0.05$) at 10% soaked MSM agrees with the findings of [13] who reported reduced efficiency of feed conversion in broiler finisher fed soaked sesame seed meal in their diets. This may be due to reduced acceptability of feed by the birds which is caused by poor palatability of the feed as compared to boiled and fermented MSM diet.

Parameters	Treatments								
	T1	T2	T3	T4	T5	T6	T7	SEM	LOS
Initial weight (g/b)	1230.00	1230.00	1230.00	1230.00	1230.00	1230.00	1230.00	4.752	NS
Final weight (g/b)	3021.67^{a}	3022.00^{a}	2988.73^{b}	3023.33^{a}	2993.33^{b}	3016.67^{a}	2758.33^{c}	6.276	*
Weight gain (g/b)	1791.63^{a}	1791.72^{a}	1748.65^{d}	1793.28^{a}	1763.25^{c}	1786.33^{a}	1528.25^{e}	7.263	*
Feed intake (g/b)	3710^{c}	3720.00^{b}	3735.00^{a}	3733.33^{ab}	3753.33^{a}	3716.67^{b}	3676.67^{d}	1.692	*
Feed/ gain ratio	2.07^{a}	2.08^{a}	2.15^{b}	2.06^{a}	2.13^{b}	2.08^{a}	2.41^{c}	0.012	*
Feed cost/bird (₦)	279.59^{f}	274.72^{e}	263.13^{b}	272.01^{d}	265.45^{c}	263.36^{b}	256.88^{a}	0.566	*
Feed cost /kg gain (₦)	156.05^{c}	155.22^{b}	150.78^{b}	151.68^{b}	150.55^{b}	147.41^{a}	169.06^{d}	0.445	*
Mortality	2.22^{ab}	0.00^{b}	0.00^{b}	0.00^{b}	2.22^{ab}	0.00^{b}	6.67^{a}	1.876	*

Table 2: Effect of processing methods and *Mucuna* levels on the performance of broiler finisher.

^{abc}Means within the same row with different superscripts differ significantly ($P < 0.05$)

SEM: Standard Error of Mean; *: Significant Difference; NS: Not Significant

There was a significant ($P < 0.05$) interaction between processing methods and *Mucuna* levels on final weight and weight gain and feed to gain ratio as shown in table 3, figure 1-4. Processing methods enhanced ($P < 0.05$) final weight and weight gain and feed to gain ratio at 5% levels of MSM inclusion, there was a slight decline at 10% boiled soaked and fermented. The least final weight and weight gain and feed to gain ratio were recorded for the birds on 10% soaked MSM.

At the interaction level the result of low weight gain and final weight obtained for birds at every 10% level of Processed MSM inclusion could be due to the fact that there was a reduced feed intake which brings about the reduction, this agrees with the findings of [13] who reported that the decreased in final weight and weight gain was attributed to reduced feed intake.

	5% BMSM	10% BMSM	5% SFMSM	10% SFMSM	5% SMSM	10% SMSM	SEM	LOS
Initial weight (g/b)	1230	1230	1230	1230	1230	1230	0.04	*
Final weight (g/b)	3016.67^{a}	2758.33^{c}	3000.00^{a}	2988.73^{b}	3023.33^{a}	2993.33^{b}	0.02	*
Weight gain (g/b)	1786.67^{a}	1528.33^{c}	1770.00^{b}	1758.73^{a}	1793.33^{a}	1763.33^{b}	0.23	*
Feed intake (g/b)	3786.33^{a}	3528.25^{c}	3720.00^{a}	3735.00^{a}	3733.33^{a}	3753.33^{a}	0.15	*
Feed gain ratio	2..12^{a}	2,31^{c}	2.10^{a}	2.12^{b}	2.08^{a}	2.13^{b}	0.63	*
Feed cost/kg	147.41^{a}	169.06^{c}	155.22^{b}	150.78^{a}	151.68^{a}	150.55^{a}	0.33	*
Mortality	0.09^{a}	6.67^{c}	0.0^{a}	0.0^{a}	0.0^{a}	0.0^{a}	0.01	*

Table 3: Interaction effect of processing methods and inclusion levels of MSM on the performance of broiler finisher (5-8 weeks).

^{abc} Means within the same row with different superscripts differ significantly (P < 0.05).

SEM: Standard Error of Mean *: Significant Difference at 5% Level; NS: Not Significant

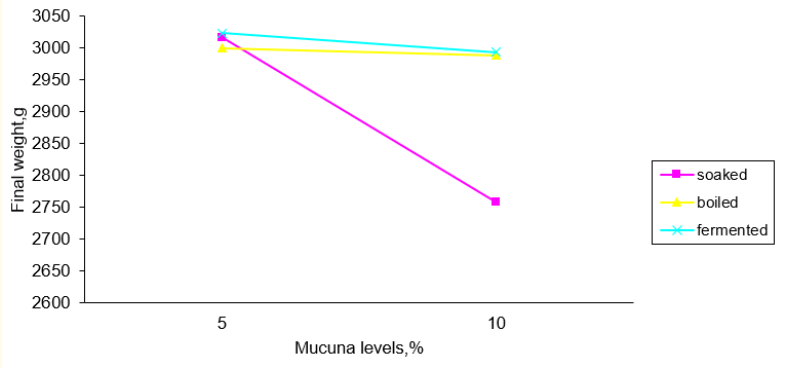

Figure 1: Interaction of processing methods and Mucuna levels on final weight at finisher phase.

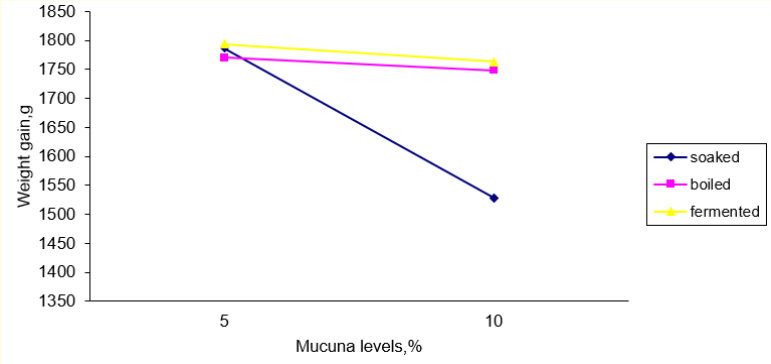

Figure 2: Interaction of processing methods and Mucuna levels on weight gain at finisher phase.

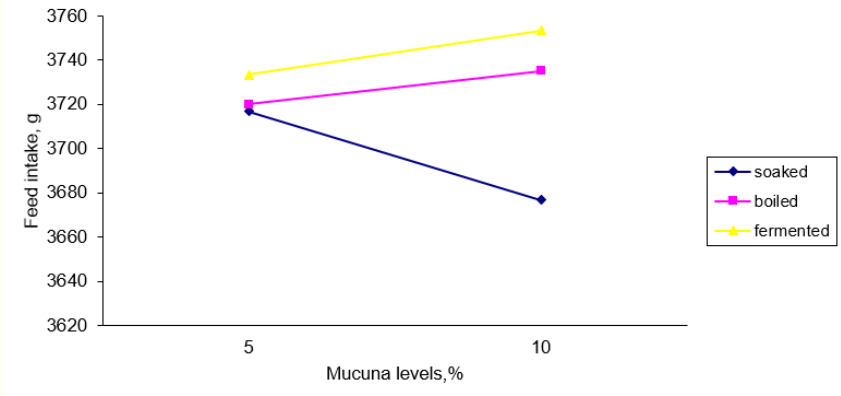

Figure 3: Interaction of processing methods and Mucuna levels on feed intake at finisher phase.

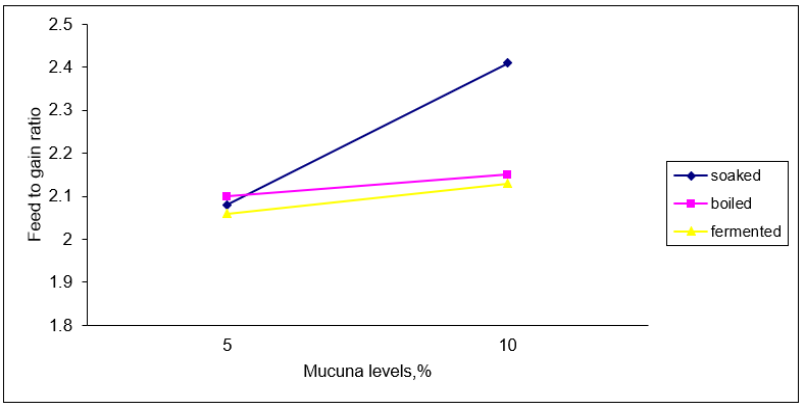

Figure 4: Interaction of processing methods and Mucuna levels on feed to gain ratio at finisher phase.

Conclusion and Recommendations

Based on the results obtained in this study, it can be concluded that

- TMSM has significant effect on the growth performance of broiler chickens.
- TMSM based diets significantly influence the digestibility of dry matter, crude protein, crude fiber, ether extract, ash and nitrogen free extract which were better for birds on 10% TMSM diet.
- TMSM can be included into diet of broiler finisher up to 10% thus having significant effect on performance. The general performance of TMSM based diets was comparable to the control. The replacement levels were also found to yield higher economic value as their inclusion reduced cost/kg of feed.

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