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Response Of Broilers To Treated Dietary *Moringa oleifera* Seed Cake

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ABSTRACT

A 56- day feeding trial was conducted to investigate the effects of dietary raw and Ammonium hydroxide treated Moringa oleifera seed cake (AHMOSC) on performance, serum and haematological characteristics, and nutrient retention of broiler chickens. One hundred and fifty day- old Arbor acre chickens were used in this experiment. They were fed five different diets as follows; Diet 1-the control devoid of Moringa oleifera seed cake (MOSC), diet 2-raw MOSC, diets 3, 4, and 5 –MOSC soaked in 10, 20, and 30% Ammonium hydroxide solution. Broilers fed graded level of AHMOSC had similar ($p<0.05$) DWG, FI and FCR with the control (61.73 to 61.99 vs. 59.99; 103.75 to 104.74 vs. 102.51 g/bird/day and 1.67 to 1.69 vs. 1.71, respectively, and were significantly ($p>0.05$) better than value for raw MOSC. The haematological indices and serum chemistry of chickens fed treated MOSC were poorer than the control but significantly ($p<0.05$) better than those of raw MOSC. In conclusion, treatment of MOSC with Ammonium hydroxide was effective in reducing its anti-nutritional contents and can be used as protein supplement in poultry diet. This study recommends the use of 20% ammonium hydroxide in treatment of MOSC for improvement of its nutritive value.

Key words: Moringa seed cake, broiler chickens, performance, biochemical and haematological indices

INTRODUCTION

Feeding in livestock production is majorly a source of nutrient to the livestock and the importance of the feed can be seen from the point of view that feed accounts for 55-75% of cost of producing chickens, 45-65% of the cost of producing dairy cattle, 40-60 % of the cost of producing sheep and goats and about 70% of the cost of raising rabbits (Atteh, 2002). The biggest constraint to poultry production in Nigeria is cost of feed, which accounts for about 60 to 80% of the recurrent expenditure in intensive poultry production (Oluyemi and Roberts, 2000).This is because feedstuffs used in formulating and compounding diets for poultry are also in high demand for human consumption and industrial uses (Anike and Okeke, 2003) thus, alternative feeding stuff must be sourced to prevent competition between man and animal. Plant proteins are cheaper and therefore their use in large quantity ensures less expenditure as compared to animal Proteins. Some nutrients chemicals however, possess well known toxic properties if consumed in excessive amounts or without adequate preparation. The toxic chemicals in feeds when consumed by animals can cause a variety

of actions in the body or can react in some adverse ways between the nutrients and toxins in vivo. For instance, some feed chemical toxins exert their action by interfering with nutrients retention, availability and some are known to adversely affect the utilization of nutrients while others have been reported to influence negatively the metabolism of nutrients, all these chemicals which influence the metabolism negatively are called anti-nutritional factors, the anti-nutritional factors present in these feeds include trypsin, chymotrypsin and amylase inhibitors, aflatoxins and polyphenolic compounds which tend to inhibit and obstruct the activity of digestive enzymes thereby causing digestive losses (Singh, 1988). To find ways of reducing feed cost there have been numerous efforts by researchers, nutritionists and producers to find alternatives by considering novel feedstuffs which are safer, cheaper, locally available and nutritionally adequate and majorly that contain lesser toxin in which case their method of detoxification will be cheaper as feed ingredients. Overwhelmed by the numerous economic benefits of *Moringa oleifera* tree in the tropical world where the plant is considered a miracle tree due to its industrial, medicinal and nutritional attributes, the area of its anti-nutritional or toxic factors remains to be fully dealt with. However, there is no information on the use of ammonium hydroxide for the processing of *Moringa oleifera* seedcake in nutrition of poultry. The constrain in the use of this present novel feed resources attributed to the ANFs present in MOSC could be ameliorated using aqueous ammonium hydroxide for the removal of condensed tannin (Griffiths,1991).

MATERIALS AND METHODS

20kg of *Moringa oleifera* seed cake used for this work was obtained from Moringa processing plant at Afe Babalola University, Ado-Ekiti, Nigeria. Raw (unprocessed) *Moringa oleifera* seed cake was divided into four equal portions of 3Kg each. A portion was left untreated, while each of the other three portions was treated by soaking in 5Litres of 10, 20 and 30% ammonium hydroxide solution respectively for 24hours. The seed cake was later removed from solution and properly dried in the sun to a constant weight and milled for replacing soyabean in the diets

Five experimental diets were formulated to meet NRC (1994) requirement for day old broiler chicks. A corn-soybean reference diet (diet 1) is devoid of *Moringa oleifera* seed cake (MOSC), diet 2 contained raw MOSC, while the other three diets contained processed *Moringa oleifera* seed cake using ammonium hydroxide before inclusion in the diet at the same 5% level of inclusion corresponding to diets 1, 2, 3, 4 and 5 respectively. One hundred and fifty day-old Arbor acre breed of broiler birds used for this experiment were obtained from Novic Farms , Ibadan, Oyo State Nigeria. The experiment was designed as a complete randomized design. The dietary treatments contained three replicates with 10 chicks per replicate. All the birds were raised under similar management practices throughout the eight week experimental period. The birds were given feed and water *ad-libitum* and weighed weekly.. The composition of the experimental diets for the broilers on as fed basis is presented on Table 1.

Table 1: Composition of the experimental diets on as fed basis (%)

	Inclusion doses of treated MOSC (%)				
Ingredients (%)	**0 (control)**	**0 (Raw)**	**10**	**30**	**50**
Maize	52.00	52.00	52.00	52.00	52.00
AHMOSC	0.00	3.10	3.10	3.10	3.10
Wheat offal	10.00	10.00	10.00	10.00	10.00
Soya bean meal	31.00	27.90	27.90	27.90	27.90
Palm oil	1.50	1.50	1.50	1.50	1.50
Lysine	0.10	0.10	0.10	0.10	0.10
Methionine	0.25	0.25	0.25	0.25	0.25
Bone meal	1.15	1.15	1.15	1.15	1.15
Oystershell	1.50	1.50	1.50	1.50	1.50
Salt	0.25	0.25	0.25	0.25	0.25
Fish meal	2.00	2.00	2.00	2.00	2.00
*Vit/Min premix	0.25	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**	**100**

The proximate composition of the treated *Moringa oleifera* seed cake diet is presented on Table 2

Table 2: Analysed nutrient content of Ammonium hydroxide MOSC diets for broilers

	Inclusion levels of MOSC (%)				
Parameters	**0(control)**	**0(untreated)**	**10**	**30**	**50**
Dry matter	86.69	92.71	93.25	94.31	93.58
Crude protein	22.20	22.60	21.70	20.65	24.12
Ether extract	3.64	3.84	3.43	3.98	2.89
Crude fibre	8.73	8.71	8.68	8.50	8.74
Ash	7.44	7.47	7.50	7.54	7.48

At the end of the experiment, one broiler per replicate in all the treatments was taken at random and blood collected by decapitation. Blood for biochemical indices was collected in bottles without EDTA for the analysis of the biochemical parameters of total protein albumin, globulin, urea, transaminase activities- AST, ALT ALP etc. The blood samples for haematological parameters were pretreated with ethylene diamine tetra-acetic acid (EDTA). Haematological indices examined include WBC, RBC, PCV, and Hb. MCV, MCH and MCHC were calculated from the values of the RBC, PCV and Hb respectively .

Statistical Analysis

Data collected on the response criteria were subjected to analysis of variance

according to the completely randomized design model and differences between treatment means were separated using the Duncan's multiple range test (Steel and Torrie, 1980).

RESULTS

Table 3 presents data on performance characteristic of broilers fed ammonium hydroxide treated *Moringa oleifera* seed cake (MOSC) diet. Except for birds on raw diet (treatment 2), the average daily weight gains, the feed intake values and the feed conversion ratio of the birds were not significantly ($p>0.05$) affected. Table 4 presents the biochemical indices of the broiler chickens given dietary ammonium hydroxide treated MOSC diet. There was a significant ($p<0.05$) increase in the total protein levels with the inclusion of ammonium hydroxide treated *Moringa oleifera* seed cake (MOSC) in the diet of the birds. The albumin levels revealed a decrease in the trend with the inclusion of ammonium hydroxide treated *Moringa oleifera* seed cake (MOSC) in the diet of the birds. ALT and ALP levels of the birds significantly ($p<0.05$) decreased linearly except treatment 2 with the inclusion of ammonium hydroxide treated *Moringa oleifera* seed cake (MOSC) in the diet of the birds. The hematology indices of the birds fed with graded level of ammonium hydroxide treated *Moringa oleifera* seed cake diet is presented on Table 5. RBC, PCV, MCH and MCHC were significantly ($p<0.05$) affected with an irregular pattern in the values with the inclusion of graded level of ammonium hydroxide treated MOSC in the diet of the birds. The mean cell volume, haemoglobin and white blood cell of the birds were not statistically ($p\geq0.05$) different by the inclusion of the graded level of ammonium hydroxide treated *Moringa oleifera* seed cake in the diet of the birds. Table 6 presents the nutrient retention of broilers fed with graded level of ammonium hydroxide treated MOSC diet. The nutrient retention of crude protein, fat and fibre of birds on control diet and the ammonium hydroxide treated groups were not significantly ($p>0.05$) different with the inclusion of graded level of ammonium hydroxide treated MOSC in the diet of the birds. The trend in the crude protein, fat and fibre retention revealed that the birds on 30% ammonium hydroxide treatment (diet 5) had the best nutrient retention compared with its counterparts, the raw and the control diet.

Table 3: Performance characteristics of broiler birds fed ammonium hydroxide treated *Moringa oleifera* seed cake diet

Parameters	0(control)	0(Raw)	10	20	30	SEM
Daily weight gains (g/bird/day)	59.993^{a}	42.340^{b}	61.763^{a}	61.873^{a}	61.993^{a}	1.366
Feed intake (g/bird/day)	102.507^{a}	92.307^{b}	104.477^{a}	103.747^{a}	104.737^{a}	3.972
Feed conversion ratio	1.707^{b}	2.180^{a}	1.693^{b}	1.677^{b}	1.687^{b}	0.045

SEM= Standard error of mean*=P<0.05Means with different superscript along the same rows are significantly (P<0.05), MOSC=*Moringa oleifera* seed cake

Table 4: Serum biochemical indices of broiler birds fed ammonium hydroxide treated *Moringa oleifera* seed cake diet

Parameters	Inclusion doses of treated MOSC (%)					
	0(control)	0(Raw)	10	30	50	SEM
Urea (mmol/l)	4.657^{b}	8.070^{a}	4.707^{b}	4.520^{b}	4.657^{b}	0.127
Total protein (g/l)	13.927^{c}	24.230^{a}	5.817^{b}	15.620^{b}	14.060^{c}	0.230
Albumin (g/l)	2.727^{b}	6.163^{a}	2.307^{bc}	2.020^{c}	2.157^{c}	0.261
Aspartate Amino transaminase(U/L)	70.000^{b}	90.030^{a}	64.210^{bc}	54.737^{c}	61.053^{bc}	6.894
Alanine Amino transaminase(U/L)	19.480^{c}	30.443^{a}	20.827^{c}	24.480^{b}	10.830^{d}	1.136
Alkaline phosphatase (U/L)	35.680^{a}	36.287^{a}	25.020^{b}	23.580^{b}	22.960^{b}	3.948

SEM= Standard error of mean*=P<0.05Means with different superscript along the same rows are significantly (P<0.05);NS=Non Significant (P>0.05);.MOSC=Moringa oleifera seed cake.

Table 5: Blood composition of broiler birds fed ammonium hydroxide treated *Moringa oleifera* seed cake diet.

Parameters	Inclusion doses of treated MOSC (%)					
	1 0(control)	2 0(Raw)	3 10	4 20	5 30	SEM
Red Blood Cell (x 10^{12}/l)	2.360^{ab}	2.520^{a}	2.215^{b}	2.355^{ab}	2.180^{b}	0.148
Haemoglobin (g/dl)	8.750^{a}	9.300^{a}	9.000^{a}	8.950^{a}	8.650^{a}	0.397
Packed Cell Volume (%)	31.200^{a}	32.600^{a}	30.250^{ab}	31.400^{ab}	29.800^{b}	1.412
Mean Cell Volume (fl)	132.250^{a}	129.600^{b}	136.550^{a}	133.350^{a}	137.500^{a}	4.048
Mean Cell Haemoglobin (pg)	37.150^{c}	36.950^{c}	40.600^{a}	38.050^{bc}	39.950^{ab}	1.264
Mean Cell Hae. Conc (g/dl)	28.050^{c}	28.550^{bc}	29.750^{a}	28.500^{bc}	29.050^{ab}	0.4147
White Blood Cell (x 10^{9}/l)	231.000^{a}	233.850^{a}	234.750^{a}	238.900^{a}	232.500^{a}	4.482

SEM= Standard error of mean=P<0.05; Means with different superscript along the same rows are significantly (P<0.05); Mean Cell Hae. Conc= Mean Cell Haemoglobin Concentration, .MOSC=Moringa oleifera seed cake.

Table 6: Nutrient retention of broiler birds fed ammonium hydroxide treated *Moringa oleifera* seed cake diet

	Inclusion doses of treated MOSC (%)					
Parameters(%)	**1** **0(control)**	**2** **0(Raw)**	**3** **10**	**4** **20**	**5** **30**	**SEM**
Crude protein	76.870[a]	55.300[b]	76.107[a]	75.440[a]	76.007[a]	1.432
Crude fibre	68.993[a]	48.690[b]	71.023[a]	71.153[a]	71.293[a]	1.571
Fats	65.997[a]	46.570[b]	67.937[a]	68.057[a]	68.197[a]	1.503

SEM= Standard error of mean;p<.05;[a,b,c] Means with different superscript along the same rows are significant (P<0.05), .MOSC=Moringa oleifera seed cake.

DISCUSSION

Growth performance characteristics: The observed improved growth performance of birds with the inclusion of graded level of ammonium hydroxide in the diets of the birds indicate the efficiency of the processing method to reduce the various anti-nutrients inherent in MOSC thereby enhancing its better utilization by the birds. This present study agrees with the findings of Barlett (1998) that found reduction in toxicity in mustard meal after alkali heating in broilers.

The significant increase in the feed intake of the animals fed ammonium hydroxide treated MOSC diet compared to those on the raw MOSC may be an indication of reduction in the level of tannins in the treated feed sample. Tannins are known to cause reduction in feed intake (probably by irritating the gut) due to their astringency or bitter taste, thereby reducing the palatability of the feed (Reed, 1995). Ferreira et al., (2008) reported that higher levels of 7.5 and 100 g/kg moringa seed meal supplementation depressed intake, growth rate and live weights of the chickens. Also, the significant improvement observed in the feed conversion ratio of the birds placed on ammonium hydroxide treated MOSC based diet, when compared with those on the raw MOSC diet, is indicative of a better utilization of the feed.. It showed that the animals, reared on the feed, gained more weight with little amount of the feed consumed. There was an indication that birds fed the control diet and the treated groups had better feed conversion ratios. The best FCR observed in birds on the control diet and the treated groups was due to the absence of anti-nutritional factors (ANFs) in the control diet and subsequent reduction in the ANFs present in MOSC by the adopted processed method.

This result confirms earlier findings of Emiola et al., (2003) that reduced ANFs as a result of improved processing techniques enhanced birds' performance. Absence of mortality in this study is an indication that most of the anti- nutrients in the treated MOSC diets have been eliminated or significantly reduced. Some of these anti-nutrients are known to cause death in animaals. The observed non-significant ($p>0.05$) difference in serum urea between the control and the treated groups is in agreement with the findings of Eggum (1970); Esonu *et al*; (2001); Iyayi and Taiwo (2003) who reported that serum urea and total protein contents depend on both the quantity and quality of the protein supplied in the diet. The significant ($p<0.05$) increase in serum urea observed in raw diet (treatment 2) is an indication that, the more the test feed was included in the diet of broilers, the more the birds survive at the expense of their body response. The observed significant ($p<0.05$) increase in total protein, and albumin with the inclusion of graded level of ammonium hydroxide in the diets of the birds attest to the nutritional adequacy of treated MOSC in meeting the protein needs of the birds. Onifade and Tewe (1993) had earlier reported that serum protein, albumins and globulins are generally influenced by total protein intake. ALP, AST and ALT decreased with the inclusion of graded level of ammonium hydroxide in the diets of the birds. The increase in ALT values in birds in treatments 2, compared with the control and treated group suggest that there may be

a likelihood of liver damage by the raw MOSC. Haematological parameters such as Packed Cell Volume (PCV), Haemoglobin (Hb) and Total Protein (TP) were observed to be better for the control diet than for the MOSC diets.

CONCLUSION

From this study, broilers fed treated MOSC diet performed better than those fed raw MOSC diet while those fed the control diet performed significantly better than those fed raw and treated MOSC diet respectively. The adopted treatment method in this study was not sufficient to totally detoxify the anti-nutrients present in MOSC. The best result obtained from replacing soyabean with treated *Moringa oleifera* seed cake diet was 30% Ammonium hydroxide treatment at 5% inclusion level.

In this study, the nutrient retention of the birds fed the treated MOSC was better than those fed with raw MOSC diet and the better nutrient retention of the birds fed with the graded level of ammonium hydroxide treated MOSC implies the effectiveness of the processing of raw MOSC for broilers.

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