International Journal of
AGRICULTURE AND BIOSCIENCES
www.ijagbio.com P-ISSN: 2305-6622 E-ISSN: 2306-3599 editor@ijagbio.com

RESEARCH ARTICLE

Performance and Nutrient Digestibility of Broiler Fed Graded Levels of Raw Pride of Barbados Seed Meal

Ogunbode AA, Ogungbenro SD, Raji MO and Oyebanji MO

Department of Animal Health and Production Technology, Oyo State College of Agriculture, P.M.B 10, Igboora, Nigeria

ARTICLE INFO

Received: February 12, 2014
Revised: April 13, 2014
Accepted: May 17, 2014

Key words:
Broiler
Digestibility
Performance
Raw pride of barbados Seed

***Corresponding Address:**
Ogunbode AA
ogunbodeadesina@yahoo.com

ABSTRACT

Seventy two day-old Marshal Broiler chicks were used to assess the performances and nutrient digestibility of broiler fed raw pride of barbados seed meal. Four treatment diets that contained 0% (control), 5, 10 and 15% row pride of barbados seed meal were randomly assigned to four groups of eighteen birds each replicate in a completely randomized design. Chemical analysis indicated that raw pride of barbados seed meal contained 23.96% Crude protein, 6.81% Crude fibre, 4.64% ash, 3.96% ether extract, 9.36% moisture and 3.32 ME kcal/kg. The anti nutritional factors in raw pride of barbados reveal the seed to contain 0.05% tannin, 0.28% saponin, 0.09% phytate and 0.06% oxalate. The result of the study showed body weight gain and feed to gain ratio were significantly ($P<0.05$) different across the dietary treatments. The highest weight gain (2353g) was recorded in treatment 4 (15% inclusion level of raw pride of barbados seed meal) while the lowest weight gains (2253 g) were recorded in treatment 1 (0% inclusion level of raw pride of barbados seed meal). The highest feed to gain ratio (2.04) were recorded in diet 2 (5% inclusion level of raw pride of barbados seed meal). While the lowest feed to gain ratio (2.10) was recorded in diet 4 (15% inclusion level of raw pride of barbados seed meal crude protein, crude fibre, ether extract and ash digestibility were significant ($P<0.05$) different across the dietary treatments. The highest crude protein digestibility (61.98%) was recorded in diet 1 (0% inclusion level of raw pride of barbados seed meal, while the lowest crude protein digestibility (56.68%) was recorded in diet 4 (15% inclusion level f pride of barbados seed meal. The amount of phytate, oxalate, tannins and saponin in the feed ingredient are very low and below the ranges that would adversely affect their nutritional values or cause any toxic effects associated with these anti-nutritional factors. It can be concluded that 15% inclusion level of raw pride of barbados seed meal could effectively be used without adverse effect on performance and nutrient digestibility of broilers.

Cite This Article as: Ogunbode AA, SD Ogungbenro, MO Raji and MO Oyebanji, 2014. Performance and nutrient digestibility of broiler fed graded levels of raw pride of barbados seed meal. Inter J Agri Biosci, 3(3): 123-126. www.ijagbio.com

INTRODUCTION

The growing demand for animal protein resulting from rapid growth of the world population calls for increase supply of food of animal origin. Poultry which would have been a panacea to this inadequate protein of animal origin has suffered from the rising costs of both the imported feed ingredients and locally produced protein feed sources especially Soya bean and groundnut cake. To meet the plant protein demand of livestock, nutritionists are seeking plant protein alternatives in order to ameliorate the high cost of feeding (kudu *et al.*, 2008) this will invariably reduce the cost of poultry production directly through availability at reduced cost and indirectly by reducing the cost of soya bean and groundnut cake since the competition for soya bean and groundnut cake would be reduced. One of such alternative feed ingredient is pride of barbados seed *Caesalpina pulcherrima* which belongs to the family leguminosae and second largest family among the dicotyledonous plants (Prohp *et al.*, 2006). The immature seeds of pride of barbados are edible while the mature seeds are toxic. The toxicity is due to the presence of anti nutrients factors which when ingested cause symptoms such as nausea, vomiting and diarrohea

(Russel *et al.,* `1997). The objective of this study therefore is to investigate the nutritional effect of inclusion of graded level of raw pride of barbados seed on the performance and nutrient digestibility of broilers.

MATERIALS AND METHODS

Experimental location

The experiment was carried out at the poultry unit of the Teaching and Research Farm of the Oyo State College of Agriculture, Igboora, Nigeria. The experimental area lies in savannah forest zone on latitude 7^{l} 43^{0}N and longitude 3^{l} 28^{0}E with an elevation of 140m above sea level. The average minimum temperature is about 21.5^{0}C and maximum average temperature of about 32.5^{0}C. The average humidity in the study area is 58%. The double maximum rainfall is about 214.3mm in June and 165.2mm in September.

Processing of experimental diet

Ripened pods of pride of barbados seeds were collected within Igboora metropolis. Over 100kg seeds were collected and ground into pride of barbados seed meal using hammer mill. The meals produced were used to formulate four isocaloric and isonitrogenous experimental diets. Four experimental diets were formulated for the starter (0-4weeks) and finishers (5-8weeks) phases. Experimental diets were introduced at day old and fed to the birds for the duration of the experiment, with inclusion level of pride of barbados seed meal at 0, 5, 10 and 15% levels respectively.

Birds and management

A total of seventy two day old Marshal broiler chicks were obtained from Obasanjo Farms, Igboora, Nigeria, Prior to the arrival of the birds, the brooding pen was fumigated with potassium permanganate and formalin. The brooding pen had been previously washed and cleaned thoroughly with disinfectant. The birds were divided into four brooding unit, each brooding unit has three replicates with six birds per replicates in a complete randomized design. The birds were weighed and their average weights per unit were determined. Each brooding unit contains one chick feeder and one chick drinker and the birds were maintained with a twenty-four hours constant light schedule during brooding. Wood shavings were used as litter materials and warmth was provided using coal pot.

Diet formulation

Two diets were formulated comprising raw pride of Barbados seed meal at varying levels (5, 10 and 15%) respectively and a control diet that contain no pride of barbados seed (Tables 1 and 2).

Digestibility trial

Digestibility trial was conducted at the seventh week of the finisher phase to determine the apparent nutrient digestibility. Two birds were selected from two of the replicates in each treatment (one bird per replicate) and place in metabolic cage known weight of feed which matched their daily feed intake were fed to the birds in the metabolic cages daily for seven days. The birds were first acclimatized to the metabolic cage for first two days. On the third day, the birds were starved for twenty-four hours. Daily excreta voided per bird for the remaining four days were collected and dried to a constant weight at 70^{0}c.Dried excreta sample were used to determine the respective proximate composition (AOAC, 1995).

Table 1: Gross composition of raw experimental diet (Starter Phase)

Ingredient	0% T1	5% T2	10% T3	15% T4
Maize	48.00	48.00	48.00	48.00
Soya bean meal	33.00	31.35	29.70	28.05
Raw PBSM	0.00	1.65	3.30	4.95
Fishmeal	3.00	3.00	3.00	3.00
Wheat Offal	11.30	11.30	11.30	11.30
Bone meal	2.00	2.00	2.00	2.00
Limestone	2.00	2.00	2.00	2.00
Broiler Premix	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10
TOTAL	100.00	100.00	100.00	100.00
Determined Analysis				
Dry matter	90.78	90.66	90.83	90.81
Crude protein (%)	22.88	23.15	22.97	23.28
Crude fibre (%)	3.78	3.81	3.92	3.87
Ether extract (%)	3.61	3.69	3.65	3.73
Ash (%)	7.13	6.94	7.21	7.33
Moisture (%)	9.22	9.34	9.17	9.19
Energy (MEKcal/kg)	2.93	2.92	2.93	2.91

Table 2: Gross composition of raw experimental diet (Finisher Phase)

Percentage Ingredients	0% T1	5% T2	10% T3	15% T4
Maize	50.00	50.00	50.00	50.00
Soya bean meal	27.00	25.65	24.30	24.30
Raw PBSM	0.00	1.35	2.70	2.70
Fishmeal	2.50	2.50	2.50	2.50
Wheat Offal	15.80	15.80	15.80	15.80
Bone meal	2.00	2.00	2.00	2.00
Limestone	2.00	2.00	2.00	2.00
Broiler Premix	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10
TOTAL	100.00	100.00	100.00	100.00
Determined Analysis				
Dry matter	90.84	90.87	90.75	90.72
Crude protein (%)	22.97	23.28	23.15	23.37
Crude fibre (%)	3.76	3.79	3.88	3.83
Ether extract (%)	3.58	3.65	3.62	3.71
Ash (%)	6.86	6.91	6.89	6.95
Moisture (%)	9.16	9.13	9.25	9.28
Energy (MEKcal/kg)	2.93	2.92	2.93	2.92

The anti nutritional

The raw pride of barbados seed meal were determined for tannin using modified vanillin assay (Price *et al.,* 1978*)*, Oxalate by Day and Underwood (1986) procedure, Phytate by Reddy and Love (1999) method and Saponin by Hudson and El-Difrawi (1979) method.

Proximate analysis

Proximate composition of the raw pride of barbados seed meal was carried out according to the procedure of AOAC (1990).

RESULTS AND DISCUSSION

Performance of broiler fed raw pride of barbados seed meal

The value obtained were significantly (P<0.05) different across the dietary treatments. The highest final weight (2400 g) and weight gain (2353 g) were obtained in diet 4 (15% inclusion of pride of barbados seed meal), while diet 2 (10% Inclusion level of raw pride of barbados seed meal) recorded the lowest value (2260 and 2213 g) for final weight and weight gain respectively. The highest feed intake (4950 g) was recorded in diet 4 (15% inclusion level of raw pride of barbados seed meal while the lowest feed intake (4650 g) was recorded in diet 1 (0% inclusion level of raw pride of barbados seed meal). The best feed conversion ratio (2.04) was obtained in diet 2 (5% inclusion level of raw pride of barbados seed meal). The final total weight, average weight gain, average feed intake and feed conversion ratio and mortality percentage of birds fed control diet were significantly (P<0.05) different across the dietary treatment. These results negates the finding of Zdunezy *et al.* (1997) who reported that the decrease in body weight and weight gain with increase (5%) and (7.5%) in weight of raw *Daniella oliveri* seed meal could be attributed to low feed consumption and poor feed utilization by the birds. Zduney *et al.,* (1997) reported that aparts from tannins other phytochemical compounds such as saponin, oxalate and phytate could have played a role in depressing growth rate of birds. The best feed conversion ratio (2.04) was recorded in diet 2, this result is in agreement with the findings of Obun *et al.* (2012) who reported that the best feed conversion was obtained in diet 2. The highest mortality percentage (31.58%) recorded in diet 3 is in consonance with the findings of Osagie (1998) who reported that the high mortality was due to prolonged effect of consumption of anti-nutritional factors.

The nutrient digestibility of broiler fed the experimental diet is presented in Table 4. There is significant (P<0.05) difference in all the parameters measured. The highest dry matter digestibility (97.23) was recorded in diet 4 (15% inclusion level of raw of pride of barbados seed meal) while the lowest (96.90) was recorded in the control diet. The highest crude protein, crude fibre, ether extract and ash digestibility was recorded in the control diet while the lowest crude protein, crude fibre and ash digestibility was recorded in diet 4 (15% inclusion level of raw pride of barbados seed meal).Crude protein digestibility decrease across the dietary treatment. Earlier reports indicate that tannin complexes formed initially in the grain or in the digestive tract of the animal reduces the digestibility of dietary components mainly protein (Apata, 1990; Hu *et al.,* 1997). Inhibition of enzymatic digestion of dietary proteins in the digestive tract could also result in poor total tract and ileal digestibility, digestive disturbances and reduced animal performance (Butler *et al.,* 1984). This result is in agreement with Ehekeronye *et al.* (1988) who reported that some of these active principles interfere with digestibility processes thereby preventing efficient utilization of the legume protein. Ether extract digestibility was low this suggested the probable effects of tannins on activities of lipase, amylase and digestion of lipids (Longstaff and McNab, 1991) Crude fibre digestibility was significantly reduced as the level of inclusion of raw pride of barbados seed meal increased, the digestibility of crude fibre decreases. The structure and amount of tannins likely present in the raw pride of barbados seed meal probably determined their nutritional effects (Makkar, 1995). These effects include reduction of voluntary intake, reduced apparent digestibility of dry matter, crude protein and crude fibre (Muhammed *et al.,* 1994).

Table 3: Performance of Broiler fed Experimental Diets

Parameters	0% T1	5% T2	10% T3	15% T4	SEM
Initial weight (g)	47	47	47	47	
Final weight (g)	2300^{c}	2350^{b}	2260^{d}	2400^{a}	26.31
Total weight gain (g)	2253^{c}	2303^{b}	2213^{d}	2353^{a}	26.31
Total feed intake (g)	4650^{d}	4700^{c}	4900^{a}	4950^{a}	63.74
Daily weight gain (g)	40.23^{c}	41.13^{b}	39.52^{d}	42.02^{a}	0.47
Daily feed intake (g /bird/day)	83.04	83.93	87.50	88.39	1.14
Feed conversion ratio					
Protein intake (%)	2.06^{a}	2.04^{a}	2.21^{b}	2.10^{c}	0.03
Protein efficiency	993.71	994.99	1027.53	1028.12	8.38
Ratio (%)	4.68^{c}	4.72^{b}	4.77^{b}	4.81^{a}	0.02
Mortality (%)	21.05^{c}	21.05^{c}	31.58^{a}	26.32^{b}	2.18

a, b, c, d means on the same row with different superscript differ significantly (P<0.05)

Table 4: Nutrient Digestibility of Broiler Fed Experimental Diets

Parameters	0% T1	5% T2	10% T3	15% T4	SEM
Dry matter (%)	96.90^{b}	96.97^{b}	97.04^{a}	97.23^{a}	0.06
Crude Protein (%)	61.98^{a}	57.88^{b}	57.53^{b}	56.68^{c}	1.02
Crude fibre (%)	35.16^{a}	34.45^{a}	34.18^{b}	34.10^{b}	0.21
Ether extract (%)	45.96^{a}	42.98^{c}	45.10^{b}	42.08^{d}	0.78
Ash (%)	20.70^{a}	20.55^{b}	20.61^{a}	20.29^{b}	0.08

a, b, c, d means on the same row with different superscript differ significantly (P<0.05)

Table 5: Anti-nutritional factors in raw pride of barbados seed meal

Anti-nutrients	Value (%)
Saponin	0.28
Phytate	0.09
Tannin	0.05
Oxalate	0.06

The result of the anti nutritional factors in raw pride of barbados seed meal revealed (0.05%) tannin, (0.28%) saponin, (0.09%) phytate and 0.06% oxalate. The major anti nutritional factors commonly found in plants materials are phytate and oxalates have long been known to inhibit the absorption and utilization of minerals by animals. Tannins decrease protein quality by reducing digestibility and palatability. The amount of phytates, oxalates, tannins and saponin in the materials are very low and below the ranges of values that would adversely affect their nutritional values or cause any toxic effects associated with these anti nutritional factors.

Statistical analysis

Data were subjected to analysis of variance (ANOVA) using statistical package systems software (1999) and means separated by Duncan's Multiple Range Test at 5% probability level (Duncan, 1955).

Conclusion

The result of this study shows that raw pride of barbados is a good feed sources for broiler and could be

included in diet up to 15% for good performance and nutrient digestibility.

REFERENCES

Akinmutimi AH, 2002. Effect of cooking with various concentrated potash on nutrient composition of and mineral. Adv Exp Med Biol, 459: 99-106.

AOAC, 1990. Official Methods of Analysis, 15th edition. Association of Official Analytical Chemists.

AOAC, 1995. Official Methods of Analysis, 15th edition. Association of Official Analytical Chemists.

Apata DF, 1990. Biochemical, nutritional and toxicological assessment of some tropical legume seeds. PhD Thesis, University of Ibadan.

Butler L, OJ Riedl, DG Lebruk and HJ Blyth, 1984. Interactions of proteins with sorghum tannins. Mechanism, Specificity and significance. J Assoc Chem Sci, 61: 916-920.

Day RA and AL Underwood, 1986. 5th Ed Prentice Hall publication. 701

Duncan DB, 1955. Multiple Range and F-test, Biom, 11: 1-42.

Hu M, T Huang, RYY Chiou, ML Hu and TT Haug, 1997. Agronomic characteristics of various cultivars of common bean (*Phaseolus vulgaris* L) and analysis of their seed compositions. J Chin Agric Chem Soc, 35: 9-17.

Kudu YS, JO Alabi, SS Egene and MA Umaru, 2008. Effect of four different commercial feeds on lima beans. J Agric Biotechnol Environ, 1-13.

Longstaff MA and JM McNab, 1991b. The effect of concentration of tannin rich bean hulls (Vicia faba L) on activities of lipase (E.C.3.1.1.3) and amylase (E.C.3.2.1.1) in digesta and pancreas and on the digestion of lipid and starch in young chicks. Brit J Nutr, 66: 139-147.

Makkar HPS, 1995. (Ed). Quantification of Tannins: International Centre for Agricultural Research in the dry areas. Aleppo, Syria, pp: 1-24.

Mohammed S, CS Stewart and T Acamovic, 1994. Effects of tannic acid on cellulose degradation, adhesion and enzymatic activity of rumen microorganisms. Proceedings of society of Nutrition Physiology, 3: 174.

Obun CO and OA Adeyemi, 2012. Effect of raw and toasted *Daniella oliveri* seed meal on broiler chicken performance. Nigeria Journal of Animal production, 39: 218-227.

Proph TP, IG Ihimire, AO Madusha, HO Okpala, JO Eicbor and CA Oyinbo, 2006. Some anti-nutritional and mineral contents of extra cotyledonous deposits of pride of barbados *Caesalpina pulcherrima*. Pak J Nutr, 5: 114-116.

Reddy MB and M Love, 1999. Adv Exp Med Bio, 459: 99-106.

Russel BA, JN Hardin, L Grand and A Traser, 1997. Poisonous Plants of North Carolina Caesalpina spp (pride of barbados). Department of Horticultural Science North Carolina State University (online) http://www.nesy.edu/depths (10/11/2006)

Zdunezy Z, J Juskiewicz, S Frejnages and K Gule Wicz, 1997. Influence of alkaloids and oligosaccharides from white lupin seeds on utilization of diets by rats and absorption of nutrients in the small intestine, 10 Tuwima, Olsztyn, 10-718.