ISSN 1682-8356
ansinet.org/ijps

INTERNATIONAL JOURNAL OF

POULTRY SCIENCE

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorijps@gmail.com

International Journal of Poultry Science 10 (5): 393-396, 2011
ISSN 1682-8356

Inclusion of Some Raw Legume Grains as Broiler Chicks Concentrates

B.M. Dousa[1], Khadiga A. Abdel Ati[2] and S.M. Elawad[2]
[1]Faculty of Agriculture and Natural Resource, University of Gezira, Sudan
[2]Department of Animal Nutrition, Faculty of Animal Production, University of Khartoum,
Postal code 13314, Khartoum North, Sudan

Abstract: A total of 200 broiler chicks were used to evaluate the effect of feeding plant concentrate substitute the imported concentrate on the performance and blood composition of broilers. Four dietary treatments containing 0%, 5%, 10% and 15% plant concentrate were formulated to meet the nutrients requirements as outlined by NRC (1994). The experiment was in a Completely Randomize Design (CRD) comprised broiler chick fed iso caloric and iso nitrogenous diet. Each treatment was replicated five times with 10 birds/replicate. The study lasted for six weeks. Parameters measured was feed intake, body weight gain, Feed Conversion Ratio (FCR), pre-slaughter weight, dressing percentage, protein efficiency, some blood parameters (glucose, cholesterol, triglyceride, total lipid, total protein, calcium and phosphorus) and profitability. Result revealed that increasing dietary level of plant concentrate had significantly ($p<0.05$) decreased feed intake. Whereas, birds fed diet containing 5% plant concentrate significantly ($p<0.05$) observed best performance. There was no significant ($p>0.05$) difference in blood serum glucose, total protein, calcium and phosphorus. However, birds fed on diets containing 5%, 10% and 15% plant concentrate significantly ($p<0.05$) recorded lower serum cholesterol than control group.

Key words: Broilers, concentrate, performance, raw legume

INTRODUCTION

Plant protein sources are good sources of dietary fiber, low fat content, particularly saturated fats and deficient in one or more of the essential amino acids, to achieve a balanced amino acids intake, a variety of plant protein sources need to be complemented with each other in the diet. Legumes content ant nutritional factors in seeds is a major factor limiting the exploitation of alternative grain legumes as protein source for poultry (Udedibie and Nwaiwu, 1987; Ologhobo, 1992; D'Mello, 1994). Ant nutritional factors have negative effects on digestion and performance of fowls (Ologhobo, 1992; D'Mello, 1994; Huiman, 1995; Beric *et al*., 1997). The presence of anti nutritional factors like trypsin inhibitors and hemagglutinins in pigeon pea (*Cajanus cajan*) (Udedibie and Carlini, 2000) impede protein and energy utilization by monogastric animal like poultry, pigeon pea also contains some unavailable carbohydrates that reduce the bioavailability of other nutrients (Kamath and Belavady, 1980).

Substitution of meat meal in the broiler starter diet by small grained cowpea (*Vigna unguiculata*) meal recorded growth rates and feed consumption that were comparable to those of control group, however, at the finishing period the large grained cowpea meal had growth rates comparable to those of control, but the control birds consumed significantly more feed than groups fed legume grain meal (Teguia *et al*., 2003). Impairment of growth in animals fed on diets containing raw faba bean (*Vicia faba*) has been reported in chicken (Santdrian, 1981). However, there were no significant changes in blood glucose, cholesterol, triglycerides and total protein of chicken fed on faba bean while g globulins and plasma zinc levels were reduced and urea excretion was increased (Martinez *et al*., 1986; Rubio and Brenes, 1988). The objective of this study to evaluate the effect of different levels of raw faba bean, cowpea or pigeon pea as plant concentrate in complete substitution of imported concentrate in order to reduce the production cost of broiler chicks.

MATERIALS AND METHODS

Experimental birds and design: Two hundred one day old unsexed broiler chicks (Cobb) were used for this study. The initial weight of the birds ranged from 48.8-50.1 g. The birds were fed control broiler starter diet for three days (adaptation period). The chicks were randomly assigned to the four experimental diets, 50 birds per treatment group in a completely randomized design; each treatment group was further subdivided into five replicates of 10 birds.

Experimental diets: The experimental diets were calculated to meet the nutrient requirement of broiler chicks according to the National Research Council (1994). Four iso energetic and iso nitrogenous diets

Corresponding Author: B.M. Dousa, Faculty of Agriculture and Natural Resource, University of Gezira, Sudan

Table 1: Percentage composition and calculated analysis of plant concentrate

Items	Percentage
Faba bean	42.00
Cowpea	30.00
Pigeon pea	21.50
Lysine	03.00
Methionine	02.00
Calcium	01.00
Premix	00.50
Calculated analysis	
Crude protein (%)	29.30
Crude fiber (%)	08.00
Calcium (%)	03.40
Phosphorus (%)	02.00
Lysine (%)	06.00
Methionine (%)	02.00
ME (kcal/kg)	1880.00

Table 2: Percentage composition and calculated chemical analysis of the rations

	Treatments			
Feed staffs (%)	Control	T1	T2	T3
Sorghum	63.21	60.30	58.35	55.32
Groundnut meal	17.50	18.40	16.70	17.10
Sesame meal	12.80	13.10	12.00	09.00
Imported concentrate*	05.00	00.00	00.00	00.00
Plant concentrate	00.00	05.00	10.00	15.00
Di-calcium phosphate	00.10	00.55	00.25	00.10
Limestone	00.89	01.08	00.90	00.80
Salt	00.20	00.20	00.20	00.20
Premix**	00.20	00.20	00.20	00.20
Lysine	00.10	00.32	00.05	00.00
Methionine	00.00	00.07	00.00	00.00
Vegetable oil	00.00	00.78	01.35	02.28
Calculated analysis				
ME kcal/kg diet	3102.20	3102.80	3102.90	3102.20
Crude protein (%)	22.91	22.91	22.91	22.90
Crude fiber (%)	04.42	04.76	04.85	04.97
Calcium (%)	01.11	01.10	01.11	01.15
Total phosphorus (%)	00.68	00.61	00.63	00.67
Lysine (%)	01.13	01.11	01.10	01.33
Methionine (%)	00.51	00.50	00.51	00.57

Imported concentrate* contains (%): CP 32, CF 2, Ca 7, P 5, Lysine 11, Methionine 3.7 and ME 1900 kcal/kg.

Premix** provided per kg of diets vitamin A 8000 IU, vitamin D3 1400 IU, vitamin E 2IU, vitamin K3 2 mg, vitamin B2 4 mg, vitamin B1 2 mg, Ca-d-pantothenate 5 mg, Nicotin amide 15 mg, Choline choride 100 mg, Folic acid 0.5 mg, vitamin B12 5 mcg, Iron 22 mg, Manganese 33 mg, Copper 2.2 mg, Cobalt 0.5 mg, Zinc 25 mg, Iodine 1.1 mg

were formulated with graded levels of plant concentrate 0, 5, 10 and 15%. The control diet contained 5% imported concentrate. The compositions and the proximate constituents of experimental diets are shown in Table 2.

Management and data collection: The chicks were reared in deep litter with feed and water supplied *ad-libitum*. Each pen was provided with bulb lamb (60 watts) for continuous lightening throughout experimental period, artificial light was provided by lambs 12 h in the evening and 12 h natural day-light. The birds were vaccinated against Newcastle disease at 7 day-old (IB) and at the 28 day (lasota). Gumboro disease vaccine was given at the 21 day. Vitamins offered as supportive dose before and after vaccination. They were also given antibiotics. Measurements taken were feed intake, weight gain and feed conversion ratio. At the end of the experimental period 2 birds from each replicate of each dietary treatment were randomly selected and weighted individually then slaughtered and allowed to bleed. Samples of blood were collected into clean dry test tubes and allowed to clot and serum was separated and collected for frozen and later analyzed. Hot carcasses weight was recorded and the dressing percentage was determined by expressing hot carcass weight to the live weight. Protein Efficiency Ratio (PER) calculated as weight gain divided by protein intake.

Statistical analysis: The data collected were subjected to analysis of variance and the means were separated using Duncan's Multiple Range Test as described by Steel and Torrie (1980).

RESULTS AND DISCUSSION

The effects of treatment on feed intake, weight gain, final body weight, Feed Conversion Ratio (FCR), dressing carcass percentage and Protein Efficiency Ratio (PER) are showed in Table 3. The broiler chicks fed diets contained plant concentrates significantly ($p<0.05$) reduced feed intake, this result may attributed to the palatability of those diets may affected by tannins in legume grains on broiler diets. Weight gain and final body weight at point of slaughter significantly decreased ($p<0.05$) by increasing level of plant concentrate, this result may related to the lower feed consumption thus leading to a deficiency in essential amino acids, in addition to imbalances of these amino acids in plant protein compared with amino acids in control group which contributed by animal protein, this feature could also be attributed to the influence of a high concentration of anti nutritional factors as phytic acid inhibits the absorption of calcium and phosphorus through the small intestine (Flaih *et al*., 1998; Al-Nouri, 1979).

During the grower period the feed conversion ratio FCR was poor ($p<0.05$) for diets contained plant concentrate in comparison to the control group. The protein efficiency ratio PER was significantly ($p<0.05$) decreased by increasing the level of plant concentrate, this result may be due to imbalance of essential amino acids that affected the protein synthesis. Moreover, the presence of anti nutritional factors in experimental diets may reduce protein digestibility (Ene-Obong, 1995). In current study the broiler chicks fed raw legume grains performed poor in parameters evaluated compared to control group, this may attributed to a high level of inhibitors in raw legume

Table 3: Effect of feeding plant concentrate on overall performance of broiler chicks

	Plant concentrate levels				
Items	0%	5%	10%	15%	±SE
Total feed intake g/bird	3042.64^{a}	2600.39^{b}	2500.62^{b}	2630.05^{b}	72.16
Total weight gain g/bird	1487.08^{a}	1021.97^{b}	782.11^{d}	868.88^{c}	24.97
Final weight g/bird	1523.48^{a}	1167.17^{b}	836.77^{d}	923.08^{c}	25.84
Feed conversion ratio	2.05^{c}	2.55^{b}	3.22^{a}	3.04^{a}	0.10
Dressing percentage	68.84^{a}	68.03^{a}	65.88^{b}	67.10^{ab}	0.71
Protein efficiency ratio	2.20^{a}	1.73^{b}	1.39^{c}	1.48^{c}	0.05

Table 4: Effect of feeding plant concentrate on serum composition of broiler chicks

	Plant concentrate levels				
Items	0%	5%	10%	15%	±SE
Glucose	161.97	176.19	185.72	190.47	9.93
Cholesterol	134.00^{a}	121.65^{b}	122.52^{b}	123.07^{b}	3.47
Triglyceride	141.05^{a}	115.99^{ab}	71.58^{b}	92.63^{ab}	16.97
Total proteins	3.09	3.40	3.45	3.35	0.34
Total lipids	275.05^{a}	237.64^{ab}	194.10^{b}	216.63^{b}	18.07
Calcium	7.15	6.91	6.54	6.47	0.27
Phosphorus	5.91	5.90	5.69	5.62	0.46

Table 5: The feeding economics of experimental diets

	Plant concentrate levels				
Items	0%	5%	10%	15%	±SE
Feed cost per bird (SDG)	3.59	3.09	3.22	3.77	0.29
Feed cost per bird ($)	1.20	1.03	1.07	1.26	0.10
Average weight of bird (kg)	1.52^{a}	1.17^{b}	0.84^{c}	0.92^{c}	0.26
Total returns (SDG)	16.75^{a}	12.84^{b}	9.21^{c}	10.15^{c}	0.33
Total returns ($)	5.50^{a}	4.28^{b}	3.07^{c}	3.38^{c}	0.11
Total cost per bird (SDG)	7.64	7.14	7.27	7.82	0.31
Total cost per bird ($)	2.55	2.38	2.42	2.61	0.10
Net profit per bird (SDG)	9.11^{a}	5.70^{b}	1.94^{c}	2.33^{c}	0.35
Net profit per bird ($)	3.04^{a}	1.90^{b}	0.65^{c}	0.78^{c}	0.12

SDG: Sudanese pounds

grains resulting in poor utilization of available nutrients. Similar finding were reported by Esonu *et al.* (2001); Amaefule and Obioha (2001).

Serum chemical values are presented in Table 4. There was a significant difference ($p<0.05$) on serum cholesterol, the lowest level was observed in birds fed 5% plant concentrate while the highest level was obtained in birds fed on control diets. However, the dietary treatments showed significant reduction ($p<0.05$) in serum triglyceride and total lipids that result may be related to a presence of high proportion of saturated fatty acids in imported concentrate than oils (Gheeke-Peter, 2005). No statistical significance was observed for the blood serum glucose, total protein, calcium and phosphorus.

The results of feed economics of experimental diets were shown in Table 5. The lowest feed cost at the point of slaughter was observed on birds fed 5% plant concentrate when compared to control group, resulted from low feed consumption whereas a higher feed cost was observed on birds fed 15% plant concentrate which could be increased the cost of production. In the current study the diet contain 5% plant concentrate and control group are more benefit to feeding broiler chicks. It is recommended to use diet contain 5% plant concentrate to replace the imported concentrate to reduce production cost.

REFERENCES

Al-Nouri, F., 1979. Chemical and nutritional evaluation of broad bean (Vicia faba) and its products development. Ph.D. Thesis. Collage of Agriculture, University of Baghdad, Iraq.

Amaefule, K.U. and F.C. Obioha, 2001. Performance and nutrient utilization of broiler starter fed diets containing raw, boiled or dehlied pigeon pea seeds. Nig. J. Anim. Prod., 28: 31-39.

Beric, Z., T. Ceny, J. Posavac and Z. Janjecic, 1997. Grain legumes in feeding monogastric livestock. Krmiva, 39: 181-190.

D'Mello, J.P.F., 1994. Non-protein amino acids in plants toxicity and implications. Proceedings 9th European Poultry Conference Glasgow. UK., 7-12 August 1994, 2: 141-144.

Ene-Obong, H.N., 1995. Effect of various processing on pigeon pea. Plant Food Human Nutr., 48: 225-233.

Esonu, B.O., O.O. Emenalom, A.B.I. Udedibie, U. Herbert, C.F. Ekpor, I.C. Okoli and F.C. Iheuukwumere, 2001. Performance and blood chemistry of weaner pigs fed raw Mucuna meal. Trop. Anim. Prod. Invest., 4: 49-54.

Flaih, A., A. A-Hussain and B.M. N-Ebrahim, 1998. The effect of different levels of local faba bean on broiler performance. In: Iraq. J. Agric. Sci., Vol. 29.

Gheeke-Peter, R., 2005. Introduction to nutrients digestive physiology and feed analysis. Applied Anim. Nutr., pp: 5.

Huiman, J., 1995. Aspects of anti nutritional factors in relation to nutrition and pollution. Poult. Adv., 28: 57-66.

Kamath, M.V. and B. Belavady, 1980. Unavailable carbohydrates of commonly consumed Indian foods. J. Sci. Food Agric., 31: 194-202.

Martinez, J.A., Y. Barcina and J. Larralde, 1986. Zinc bioavailability from a faba bean diet to rats Rev. Esp. Fisiol., 42: 123-124.

NRC, 1994. (National Research Council). Nutrients requirements of poultry, 8th Edn., Nath. Acad. Washington DC.

Ologhobo, A.D., 1992. Nutritive value of some tropical (West African) legumes for poultry. J. Appl. Anim. Res., 2: 93-104.

Rubio, L.A. and A. Brenes, 1988. Plasma mineral concentration in growing chicks fed diet containing raw and autoclaved faba bean. Nutr. Rep. Int., 38: 609-619.

Santdrian, S., 1981. Intestinal absorption of galactose, glucose and leacine in male growing rats fed field bean. J. Anim. Sci., 53: 414-419.

Steel, R.G.D. and J.H. Torrie, 1980. Principles and Procedures of Statistics, 2nd Edn., McGraw-Hill Book Company Inc. New York; 481 pp +XV1.

Teguia, A., I.B. Japou and E.C. Kamsu, 2003. Response of broiler chicken to *Vigna unguiculata* (L) Walp (cowpea), as feed ingredients in replacement of meat meals. Submitted for publication to Journal of Animal and Feed Sciences.

Udedibie, A.B.I. and C.R. Carlini, 2000. Relative effects of dry and most heat treatment on hemagglutinating and antitryptic activities of selected legume grains. Nig. Poult. Sci. J., 1: 81-87.

Udedibie, A.B.I. and J. Nwaiwu, 1987. The potential of jack bean as animal feed. Nig. Agric. J., 23: 130-143.