Online Journal of Animal and Feed Research

Volume 4, Issue 1: 01-05 (2014) ISSN 2228-7701

EFFECT OF DIETARY LEVELS OF COWPEA (*Vigna unguiculata*) SEEDS ON BROILER PERFORMANCE AND SOME SERUM BIOCHEMICAL FACTORS

N. GUMAA BALAIEL

Department of Animal Production, Faculty of Agriculture, Sinnar University, P.O. Box: 11174 Postal Code 313314, Sudan

*Email: nhamad_nu@yahoo.com

ABSTRACT: *Effect of inclusion of different levels of untreated cowpea (Vigna unguiculata) seeds (0, 5, 10 and 15%) in broiler diet on performance and some serum biochemical factors was studied. The research was conducted on basis of a completely Randomized Design (CRD). Feed intake, body weight gain, feed conversion ratio, protein intake and protein efficiency ratio were significantly ($P\leq0.05$) reduced with the inclusion of 15% untreated cowpea seeds. Plasma cholesterol, glucose, albumin, total protein, Ca and K contents were significantly ($P\leq0.05$) decreased with increasing level of cowpea seeds in diets. Uric acid concentration observed to be higher in birds fed 15% cowpea seed. It is concluded that good performance of broiler chicken is satisfactory maintained with 5 to 10% inclusion of cowpea seeds in balanced diet for broiler.*

ORIGINAL ARTICLE

Received 23 Sep. 2012

Accepted 11 Jan. 2014

Key words: *Cowpea, Untreated, Broiler, Production, Plasma*

INTRODUCTION

There is needed to look for locally available and cheap sources of feed ingredients particularly those that do not attract competition between humans and livestock. Robinson and Singh (2001) reported that there has always been interest in legume grains as protein source in poultry diets. Productive parameters and serum biochemistry assay of livestock suggest the physiological disposition of the animals to their nutrition (Madubuke and Ekendem, 2006). Esonu et al. (2001) had stated that haematological constituents reflect the physiological responsiveness of the animal to its internal and external environments which include feed and feeding. Scientists have found the effects of various feeds on the haematology and serum biochemistry of livestock and concluded that feed ingredients including unconventional sources affect animal physiology. Teguia et al. (2003) observed that inclusion of some legumes in starter broiler chicken such as black bean, bambara groundnut, and/or cowpea seeds induced deteriorating effects on growth rate. Only the birds fed on diet with cowpea meal recorded growth rates and feed intake that were comparable to the control, they also reported that only 6% of either cowpea or bambara groundnut was included in the broiler diets, higher inclusion levels would limit the utilization of legume grains due to the presence of anti-nutritional factors. Emenalom and Udedibie (1998) suggested that up to 10% levels of raw mucuna could be tolerated by broiler. Raw mucuna seeds contain high level of anti-trypsin activity, phytate, cyanide and tannins (Esonu et al., 2001) which limit its use in animal feeding. This statement is supported by previous reports showing that legume seeds may contain variable amounts of the protease inhibitors, trypsin, chymotrypsin and phyto-haemagglutinins (D'Mello, 1995; Wiseman, 1995). The presence of protease inhibitors could be responsible for the depression in growth reported by Teguia et al. (2003) as they interfere with the digestion of proteins. Feeding untreated legume seeds to boiler chickens resulted in poor feed consumption, deteriorating growth rate also affect blood biochemistry. Therefore, the objective of this experiment was to assess the effect of the various dietary levels of cowpea seeds on productive parameters and serum responses of broilers as a guide to optimum production of healthy and safe poultry products.

MATERIAL AND METHODS

Seeds analysis and diets formulation: Samples of cowpea (*Vigna unguiculata*) seeds were analyzed for proximate composition according to the methods outlined in the AOAC methods of analysis (1990). See Table 1. Eight isocaloric and isonitrogenous starter and finisher diets (Table 2) were formulated according to nutrient specifications of the standards recommended by National Research Council (NRC, 1994). Diet (A) was the control with 0% of cowpea seeds, diet (B) 5%, diet (C) 10% and diet (D) 15% untreated cowpea seeds.

To cite this paper: Gumaa Balaiel. N. 2014. Effect of dietary levels of cowpea (*Vigna unguiculata*) seeds on broiler performance and some serum biochemical factors. *Online J. Anim. Feed Res.*, 4 (1): 01-05.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Table 1 - Chemical composition of cowpea (*Vigna unguculata*) seed

Item	Analysis
Crude protein	29.18
Crude fat	2.30
Crude fiber	6.22
Ash	4.60
NFE	51.32

Table 2 - Composition of experimental broiler diets containing dietary levels of cowpea seeds

	Dietary levels of cowpea seeds (%)							
	Starter				Finisher			
	0(A)	5(B)	10(C)	15(D)	0(A)	5(B)	10(C)	15(D)
Sorghum	64.90	64.90	60.66	60.86	64.9	64.9	60.66	60.80
Groundnut meal	15.2	13.48	13.24	15.9	15.2	13.48	13.24	14.9
Sesame meal	13	10	8	-	12.0	9.00	7.00	-
Wheat bran	0.30	-	-	-	1.3	1.00	1.06	1.54
Br. super concentrate*1	5	5	5	5	5	5	5	5
Dicalcium	1.10	1.0	0.80	1.10	1.1	1.01	1.5	1.06
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	-	0.25	0.25	0.25	0.25
V. oil	0	0.12	1.76	1.75	-	0.11	1.00	1.19
Methionine	-	-	0.04	0.14	-	-	0.04	0.14
Calculated analysis								
ME (Mj/kg)	11.74	12.92	12.54	12.21	12.55	12.60	13.83	12.57
Crude protein	23.71	23.05	23.60	24.58	20.01	19.42	19.25	20.01
Crude fat	4.28	3.40	3.50	3.10	4.28	3.07	4.12	4.66
Crude fiber	4.28	4.37	4.24	4.22	4.60	4.17	3.98	4.09
Calcium	1.01	1.1	1.0	1.07	1.00	1.09	1.1	1.06
Av. Phosphorus	0.51	0.49	0.44	0.47	0.48	0.48	0.46	0.46
Methionine	0.57	0.51	0.46	0.48	0.58	0.56	0.57	0.44
Lysine	1.05	1.90	1.14	1.07	1.05	1.8	1.15	1.14
Determined analysis								
Crude protein	23.45	25.85	25.77	24.69	19.89	19.68	20.44	18.38
Ether extract	7.0	6.40	6.70	5.50	6.8	7.4	6.11	5.89
Crude fiber	6.67	7.01	6.67	6.27	6.51	7.02	6.42	6.55
Nitrogen free extract	52.47	50.77	50.43	51.65	56.96	55.84	56.33	59.37
ME*2 (Mj/kg)	12.76	12.81	12.75	12.76	12.92	12.77	11.81	12.88
Ash	5.74	5.82	6.24	7.34	6.24	5.88	5.93	7.17

*1Super concentrate contains the following: CP 40%, ME 2000 kcal/kg, C. fiber 3%, EE 3% Ash 34%, Ca, 8% Av. P 1.38% Lysine 12%, Methionine 3%, Methionine + cysteine 3.5%, Vitamin A 250000 IU/kg, Vitamin D_3 50000 IU/kg, Vitamin E 500 Mg/kg, Vitamin K_3 6 Mg/kg, Vitamin B_1/thiamin 20 Mg/kg, Vitamin B_2/riboflavin 100 Mg/kg, Lysine 12%, Methionine 3%, Copper 120 Mg/kg, Zinc 1000 Mg/kg, Iodine 6 Mg/kg, Vitamin C 4000 Mg/kg, Folic acid 30 Mg/kg, Iron 800 Mg/kg, Manganese 1400 Mg/kg, Cobalt 12 Mg/kg, Niacin vitamin pp. 600 Mg/kg, Pantothenic acid/vitamin B_3 160 Mg/kg, Vitamin B_6/pyridoxine 40 Mg/kg, Vitamin B_{12} 300 Mcg/kg, Biotin/vitamin H 2000 Mcg/kg, Choline 10000 Mg/kg, Copper 120 Mg/kg, Zinc 1000 Mg/kg, Iodine 6 Mg/kg, Selenium 3 Mg/kg. *2Metabolizable energy is calculated according to the equation of Iodhi et al. (1976).

Birds and treatments

A total of 240 one-day old unsexed broiler chicks (Ross 308) were used in 42-day feeding trial after being vaccinated against Mareks' disease. The chicks were divided into four treatment groups of sixty birds each and randomly allocated to the dietary treatments. Each group was further divided into six replicates of ten birds each. The chicks were reared from one –day-old to six weeks of age in 24 pens (20201) with wood shavings litter. For the first 3 weeks, the chicks were fed starter diets and then they were placed on finisher experimental diets. Feeding and water supply to the bids were ad libitum while other standard management practices were adopted. Feed intake and body weight were determined weekly by weighing the feed and birds. Body weight gain was determined then feed conversion ratio was calculated. Protein intake and protein efficiency ratio were also weekly determined.

Plasma chemical constituents' analysis

At the end of 6th week of age, 3 birds were randomly selected from each replicate making a total of 18 /treatment. Sampled birds were fasted for 8 hours then slaughtered. Blood sample were taken from jugular vein and received in 10 ml test tube. Hemoglobin concentration (Hb) was determined using Haemoglobin –Drabkin kit. Plasma total protein was determined as shown by (King and Wooton, 1965). Plasma albumin, globulin, Na and plasma k were determined by calorimetric method of (Bartholomew and Delaney, 1966). Plasma Ca was determined by calorimetric method described by (Trinder, 1967). Inorganic phosphorus was determined by the method described by (Gomeri, 1942). Plasma glucose and plasma cholesterol were determined by enzymatic calirometric methods using kit GOD-PAP (Radox Labrotary Ltd. Lodon). Plasma uric acid was measured by an enzymatic method using akit (Plasmatic Laboratory Products Ltd., U.K).

To cite this paper: Gumaa Balaiel. N. 2014. Effect of dietary levels of cowpea (*Vigna unguiculata*) seeds on broiler performance and some serum biochemical factors. *Online J. Anim. Feed Res.*, 4 (1): 01-05.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Statistical analysis

The research was conducted on basis of a completely Randomized Design (CRD). Data were subjected to analysis of variance and treatment means compared using the Duncans, Multiple range tests.

RESULTS AND DISCUSSION

Overall performance of broiler chicks as affected by inclusion of different dietary levels of cowpea seeds are shown in Table 3. Feed intake was significantly (P≤0.05) influenced by dietary treatments. Feed intake of birds fed 15% cowpea seeds were significantly (P≤0.05) depressed compared to the control. The depression in feed intake is in line with the findings of Lji et al. (2004) and Mahmoud (1997), who reported that feed intake depressed with the increased level of cowpea seeds. This reduction in feed intake may be due to tannin which were complex glycol-proteins with some of the saliva, such complex causes a sensation astringent in the oral cavity, which greatly reduced palatability and hence consumption (Laurena,1984). On the other hand reduction in consumption associated with a lower digestibility (Silivlo, 2007). Body weight gain was significantly (P≤0.05) depressed at 15% cowpea seeds, these results are in agreement with the finding of Teguia and Beynen (2005) who attributed this to the presence of anti-nutritional factors, this statement was supported by previous reports showing that legume seeds contain variable amount of the protease inhibitors, trypsin, chemotrypsin and phytohaemaggulatinins (D"Mello, 1995; Wiseman, 1995). These findings coincided with that reported by Teguia et al. (2003) who attributed the depression in growth to the presence of protease inhibitors as they interfere with the digestion of protein. Tannin presence reduced utilization of more essential amino acids and reduced the activity of digestive enzyme. Therefore, growth deteriorated. FCR was not significantly (P≥0.05) influenced by dietary treatments. Protein intake was significantly (P≤0.05) affected by dietary treatments. It was decreased when the level of cowpea seeds increased. This statement is supported by previous reports showing that legume seeds may contain variable amount of protease inhibitors, trypsin, chemotrypsin (D'Mello, 1995; Wiseman, 1995). This is coincided with the finding of Teguia et al. (2003) who attributed the reduction in protein intake to the presence of protease inhibitors as they interfere with the digestion of protein. PER observed to be the poorest for birds fed on 15% cowpea seeds. This coincided with Tshovhote et al. (2003) finding. He attributed the reduction in PER to the quality of protein which enhanced as a result of the combination of more than one source of protein.

Table 3 - Overall performance of broiler chicks as affected by inclusion of dietary levels of cowpea seeds

Parameters	Dietary levels of cowpea seeds%				± SEM
	0(A)	5(B)	10(C)	15 (D)	
Feed intake (g/bird)	3277.4^{a}	3140.1^{ab}	3015.5^{b}	2635.6^{c}	39.2
Body weight gain (g/bird)	1709.5^{a}	1578.3^{b}	1530.1^{b}	1268.8^{c}	23.13
FCR (g/BWG)	2.00	2.10	1.92	1.98	0.08
Protein intake (g/bird)	794.04^{a}	774.08^{b}	733.87^{b}	649.32^{c}	15.42
PER (BWG/ PI)	2.34^{a}	2.13^{bc}	2.27^{b}	2.14^{bc}	0.06

Values are means of 18 birds/ treatments (3 birds / replicate); Means with different superscripts in the same row were significantly different (P<0.05)

Table 4 - Plasma constituents as affected by inclusion of dietary levels of cowpea-seeds

Parameters	Dietary levels of cowpea seeds%				
	0(A)	5(B)	10(C)	15(D)	±SEM
Haemoglobin%	70.06^{a}	68.53^{b}	69.2^{ab}	66.53^{c}	0.36
Camg/dl	9.88^{b}	10.02^{b}	10.9^{ab}	7.29^{c}	0.29
NamEq/L	179.18^{b}	189.3^{a}	180.0^{b}	173.06^{c}	3.11
KmEq/L	5.07^{a}	4.79^{b}	4.7^{b}	3.49^{c}	1.31
Total protein(g/dl)	7.14^{a}	6.75^{a}	5.10^{b}	3.08^{c}	0.22
Albumin(g/dl)	4.79^{a}	4.23^{ab}	4.18^{c}	2.05^{c}	0.20
Globumin(g/dl)	3.07^{a}	2.89^{b}	1.98^{b}	1.92^{c}	0.05
Cholesterol(mg/dl)	216.85^{a}	208.06^{a}	189.6^{b}	168.4^{c}	4.87
Uric acid(mg/dl)	2.91^{b}	2.82^{cb}	2.9^{b}	3.55^{a}	1.20
Glucose(mg/dl)	195.18^{a}	193.42^{a}	180.2^{b}	184.20^{b}	4.32
Total lipids(mg/g)	352.75	349.82	368.02	371.37	14.57
Pi mg/dl	6.06	5.54	5.98	5.72	0.23

Values are means of 18 birds/ treatments (3 birds / replicate); Means with different superscripts in the same row were significantly different (P< 0.05).

Results of the effect of the inclusion of different levels of cowpea seeds on plasma constituents are shown in Table 4. Plasma total protein, albumin, globulin, glucose, cholesterol, plasma K, Ca, and Na were significantly (P≤0.05) depressed as the level of cowpea seeds increased. Reduction in plasma protein was observed when the level of cowpea seeds increased. This is in agreement with Kauramoto et al. (1996) who explained this in part to the direct consequence of the effect of condensed tannins reducing the digestibility of the protein diet. Plasma albumin and globulin decreased as cowpea seeds inclusion increased. This was coincided with the findings of Al-Homidan et al. (2006). Their findings indicate significant reduction in the concentration of plasma albumin as direct

To cite this paper: Gumaa Balaiel. N. 2014. Effect of dietary levels of cowpea (*Vigna unguiculata*) seeds on broiler performance and some serum biochemical factors. *Online J. Anim. Feed Res.*, 4 (1): 01-05.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

results of anti-nutritional factors present in diet containing 2% above cowpea seeds. Plasma cholesterol and glucose reduced as the level of cowpea seeds increased. This finding was supported by Meluzzi (1977) who attributed this reduction to the liver disorders. Reduction in plasma electrolytes (Ca, Na, K) was explained by Oberleas et al. (1981) who reported that the absorption of Ca, K, Na and Zn may be unavailable in feed containing high level of phytate. Uric acid concentration increased when level of cowpea seeds increased, these results coincided with Akinola and Abiola (1990) findings. They attributed this increment of serum uric acid to poor dietary protein utilization. Phosphorus and total lipids were not significantly ($P \geq 0.05$) influenced.

From the economic analysis, the profit was calculated as relative percentage from the control diet. The results revealed that 5% level was the most profitable level

ACKNOWLEDGEMENT

I would like to express my deep gratitude to the ministry of higher education for supporting this work. We also thank management and staff of Sinnar Agricultural Research Station for the supply of cow pea seeds used in this experiment.

REFERENCES

Akinola SO and Abiola, SS (1990). Blood biochemistry and carcass yield of cockerels fed melon based diet. Trop. J. Anim. Sci. 3: 39 –44.

Al- homidan A, al-Qarawi AA, Al-Wally SA and Adam SEI (2006). Response of broilers chick to dietary (*Hazya strieta)* and (*Nigella sativa*), Brit. Poul. Sci. 43: 291-296.

AOAC, "Association of Official Analytical Chemist", (1990). Official Methods of Analysis 12th ed. Washington, DC.

Awosanya B, Joseph JK and Sowumi SO (1999). Performance of rabbits on graded dietary levels of roasted *Leucaena leucocephala* seed meal. J. Appl. Amin. Res., 9: 235-239.

Baratholmew RJ and Delaney AM (1966). Determination of serum albumin, Proc. Aust. Assoc. Clin. Biochem. 1: 24.

D'Mello JPE (1995). Anti-nutritional substances in legumes grain seeds. In J PF D/Mello and C. Decendra, eds. Tropical legumes in animal nutrition. Wallingford, U.K., CAB International p. 135-172

Emenalom OO and Udedibie ABI (1998). Effect of feeding dietary raw, cooked, and roasted mucuna pruriens seeds (Velvet bean) on the performance of finisher broilers chicks. Nig. J. Anim. Prod. 25: 115-119.

Esonu BO, Ibeukwumere FC, Emenalom OO, Udedibie ABL, Herbert U, Ekpor CE, Okolie IC and FC (2001). Performance and blood chemistry of weaner pigs fed raw mucuna (Velvet bean). Tropical animal Production Investigations, 4: 49-54.

Gomori G (1942). A modification of the colorimetric phosphorus determination for use with the photoelectric colorimeter. J. Lab. Clin. Med., 27: 955-960.

Kawamoto H, Nakatsubo EF and Murakami K (1996).Stoichiometric studies of tannin – protien co-precipitation. Phytochem.41:1427-1431.

King ES and Wooton JGP (1965). Determination of total protein in plasma or serum. In: Med. Biochem. Churchill, London, pp. 138-140.

Laurena AC, Garcia VV and Mendoze EMT (1984). Effects of condensed tannin on the *in vitro* protein digestibility of cowpea (*Vigna unguiculata*). J. Agric. Food chem. 32:1045-1048.

Lji AP, Kumalo K, Slippers S and Gous RM (2004). Intestinal function and body growth of broiler chickens on maize –based diets supplemented with mimosa tannins and microbial enzymes.J. Sci. Food Agri.84; 1451-1458

Lodhi GN, Singh D and Ichponani JS (1976). Variation in Nutrient Content of Feedstuffs Rich in Protein and Reassessment of the Chemical Methods for Metabolizable Energy Estimation for Poultry. J. Agric. Sci. Camb.,86: 293-303.

Madubuike FN and Ekenyem BU (2006). Haematology and serum biochemistry characteristics of broiler chicks fed varying dietary levels of Ipomoea asarifolia leaf meal. International Journal of Poultry Science 5 (1): 9-12.

Mahmood S, Smithard R and Sarwar M (1997). Effects of salseed tannins, restricted feed intake and age on relative pancreas weight and activity of digestive enzymes in male broilers. Anim. Feed Sci.Technol. 65: 215-230.

Medubuike EN and Ekenyem BU (2001). Non-ruminant live tock production in the tropics. Gust- chuks Graphic Centre, Owerri, Nigeria, pp. 196.

Meluzzi A, Primicer G, Giorandi R and Fabris G (1992). Determination of blood constituents reference values in broilers. Poul. Sci. 71:337-345.

NRC (1994). Nutrients requirements of poultry. Ninth Revised Edition. National Academy Press. Washington, D.C. pp. 19-26.

Oberleas D and Harland BF (1981). Phytate content of foods: Effect on dietary Zinc bioavailability. J. Amer. Dietet. Associ. 79: (4), 433-436.

Opara CC (1996). Studies on the use of Alchornig Cordifolia leaf meal as feed ingredients in poultry diets. M.Sc.Thesis,Federal University of Technology, Owerri, Nigeria.

Robinson D and Singh DW (2001). Alternative protein sources for laying hens. Report for the Rural Industries Research and Development Corporation. Queens land Poultry Research and Development Center, March 2001, Publication NO. DAQ - 241 A.

Silivo Miranda, L, Rafaela M, Tiolla, Ana Maria and Hermaogenes (2007). Blood chemistry and production parameters in chickens for fattening using (*Vigna unguiculata)* seeds. Science Magazine Print ISSW, 0798-2259.

Teguia A and Beynen A (2005). Alternative feed stuffs for broilers in Cameroon. Livestock Research for Rural Development, 17: (3), 2005.

Teguia A, Japou IB and Kamsu EC (2003). Response of broiler chickens to *Vigna unguiculata* (L.) walp (cowpea) *Phaseolus vulgaris* (black bean) and *Voanzeia subterranean* (Bambara groundnut) as feed ingredients in replacement of meat meals. Submitted for Publication to Journal of Animal and Feed Sciences.

Trinder P (1967). Calorimetric micro-determination of serum calcium. In: Microanalysis in Med. Biochem., (Eds.) Wooton, J.D.P. Churchill Ltd., London, p. 76-77.

Tshorhote N, Nesmruni AE, Raphulu T and Gous RM (2003). The chemical composition, energy and amino acid digestibility of cowpea used in poultry nutrition. S.Afric.J.Anim. Sc. 33:65-69.

Wiseman J (1995). Assigning metabolisable energy values to high fat ingredients. Technical Bulletin, University of Nottingham, Faculty of Agriculture and Food Sciences.

To cite this paper: Gumaa Balaiel. N. 2014. Effect of dietary levels of cowpea (*Vigna unguiculata*) seeds on broiler performance and some serum biochemical factors. *Online J. Anim. Feed Res.*, 4 (1): 01-05.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir