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EFFECT OF DIETARY COWPEA (*VIGNA UNGUICULATA*) SEEDS ON THE PERFORMANCE OF BROILER CHICKS

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This experiment was conducted to study the effect of dietary levels of cowpea (*Vigna unguiculata*) on broiler chick's performance. A total of one hunedred and twenty-eight unsexed, one day old broiler chicks (Hubbard) were used. The birds were randomly divided into four equal groups (32 birds each) in four replicates (8 birds/ replicate) in a completely randomized design. Four isocaloric and isonitrogenous diets: A, B, C and D, Diet A contained 0% (control), diet B 5%, diet C 10% and diet D 15% cowpea. Data were collected on weekly feed intake, body weight gain and feed conversion ratio (FCR). At The end of the experimental period (7weeks), 4birds/replicate was randomly selected weighted and slaughtered. The carcass weight and dressing percentage were calculated. The results showed that inclusion levels of cowpea had no significant ($p>0.05$) effect on weight gain, feed intake and FCR of broiler chicks. The result showed that the profit return was similar in control and the diet contained 5%cowpea.

Keywords: Hubbard, liver, protein efficiency, income

Legumes are plants belonging to the family Leguminosae. Most of these plants are commonly grown in warm climatic regions. Legumes are very important sources of protein and lipid as well as minerals and vitamins required for the proper growth of chicks **(Balogun and Fetuga, 1986).** The rapid increase in the world population and acute protein shortage particularly in developing countries has necessitated the urgent need for a means of increasing food production especially cheap and good source of protein. Rich sources of quality protein for the body are mainly animal sources such as poultry (Oloyede *et al*., 2007). Intensive poultry production now a day is based on rations that contain high cereal grains and conventional protein sources is the most common. Many researches were conducted to investigate the potentiality of local protein sources as to reduce the impact of imported concentrates on poultry producers (Algam *et al*., 2012). Grain legumes are characterized by protein that contains high level of lysine and low level of methionine (Akanji, 2002). Many Local sources of protein and energy as grain legumes, has contributed in the maintenance of poultry industry in Africa (Akanji *et al*., 2012). Soybean is the most prominent grain (44-48% crude protein) and is the major source of plant protein to animal feed. Increased prize of the latter grain (Robinson and Singh, 2001), suggested the search of good substitutes from local feed stuffs (Akanji *et al*., 2012). Cowpea grains (*Vigna unguiculata*) can serve as alternative to soybean meal as they have similar amino acid profile (Wiryawan and Dingle, 1999). The cheapness of the most legumes seeds as plant protein sources compared to animals ones can encourage their utilization in feeding animals and poultry especially in under developing tropical countries, in which the climatic condition are suitable for their growth and occurrence. So *Vigna unguiculata* common name cowpea and

locally (Alhinitir) is the one of these legume seeds which constitutes one of the richest and cheapest plant protein. Cowpea *(vigna unguiculata)* is grown for mature and immature fruits and leaves (which are used as vegetable) haulms are also fed to livestock (Abdelgani 2012). Cowpea was biochemically analyzed by Farinu and Ingrao (1991). It was reported that the mean content (g kg^{-1}) of crude protein, ether extract, ash, total dietary fiber and carbohydrates were 245, 18.6, 38.8, 121.8 and 573.4, respectively. On the other hand, Farinu and Ingrao (1991) found that the proximate composition of six varieties of cow peas (*Vigna unguiculata*) were as follows: moisture (6.20-8.92%), protein (20.5-31.7%), fat (1.14-3.03%), fiber (1.7-4.5%) and carbohydrates (56.0-65.7%). Recently in Sudan there is work in legumes as animal diets especially in poultry because it became an industry which is excellent sources animal protein for human (Abdelgani 2012). The objective of the current study was to assess the effect of adding varying levels of cowpea Alhinitir in broiler diet on the performance and to evaluate the economical value

MATERIAL AND METHODS

The experiment was carried out in premises of the Faculty of Animal Production, University of Khartoum (Shambat). The experiment lasted for seven weeks during which the highest and lowest temperature were 25-40°**C, respectively.**

3.1 Experimental Housing:

The experiment was carried out in an open house located east-west from cemented brick walls, iron posted with netted. The house was partitioned into sixteen pens. Each of them was one meter dimension. After burning and cleaning up every pen was covered with clean wood –shaving as bedding, each pen was provided with one round fountain drinker and one tabular feed trough.

3.2 Experimental birds:

One hundred and twenty eight, one-day old commercial unsexed broiler chicks (Hubbard), were bought from commercial company for poultry production. Some sugar was added to the drinking water at the first day. The chicks were selected on the basis of approximately same weight and were assigned randomly for each dietary treatment with four replicates. They were reared eight birds per pen. Each pen represent a replicate, the initial body weight for birds 40.0g was recorded.

3.3 Experimental diets:

Cowpea seeds sample (Table 3.1) was analyzed for proximate Composition according to (AOA 1990). Four experimental diets were used the diets were formulated to meet nutrient requirements as outlined by NRC 1984), and were approximately isocaloric and isonitrogenus.
Diet A control with 0% cowpea, diet B contained 5% cowpea, diet C 10% cowpea and diet D 15% cowpea. The dry ingredients of each treatment were mixed in the mixture. The composition of experimental diets, determined and calculated chemical composition were presented in Table (3.2).

Table (1): Proximate analysis (%) of cowpea (*vigna unguiculata*)

Ingredient	Cowpea%
DM	94.4
CP	23.6
EE	1.6
CF	10.4
Ash	3.8
NFE	54.9
ME(Kcal/kg)	2501.14

ME was calculated according to the equation to **(Lodhi *et al* (1970)**

ME(P) = 1.549+0.0102CP+0.0275NFE-0.0034CF.

3.4 Management and data collection:

One hundred and twenty eight chicks were allotted to equally randomized groups to the experimental diets. Natural and artificial light was available and maintained throughout the experimental period. Vaccination against new castle disease was carried out at day 7 and 21 in drinking water and also gumboro vaccine at day 12 in drinking water. Parameters recorded weekly were body weight, feed intake and weigh gain, protein efficiency ratio and feed conversion ratio (FCR) were also calculated

Table (2): Composition (%) of the experimental diets (As fed):

Ingredients	Cowpea levels%			
	0	5	10	15
Sorghum	62	61	59	56
Groundnut cake	15	14	14	12
Sesame cake	15	13	10	10
Cowpea	0	5	10	15
Super concentrate	5	5	5	5
Di Calcium	1.46	1.46	1.46	1.46
Nacl	0.25	0.25	0.25	0.25
Lysin	0.04	0.04	0.04	0.04
Permix	0.25	0.25	0.25	0.25
Filler	1	0	0	0
Total	100	100	100	100

Table (3): Calculated and Determined chemical analysis (%) of the experimental diets (As fed):

Ingredient	Cowpea level%			
	0	5	10	15
ME(kcal/kg)	3063	3076	3055	3027
CP	22.98	22.76	22.43	22.34
CF	3.096	3.49	3.96	4.22
EE	4.85	4.57	4.22	4.10
Ash	6.172	5.971	5.703	5.644
Calcium	1.097	1.05	0.989	0.975
Lysine	1.102	1.069	1.037	1.005
Methionin	0.494	0.463	0.424	0.41
A*.phosporuurs	0.598	0.59	0.579	0.573
Meth+Cys	0.758	0.707	0.643	0.616
Determined				
CP	21.8	22.83	22.55	22.41
CF	4.01	4.2	4.5	4.8
Ash	6.07	6.11	6.16	6.7

A*: Available

for individual replicates of each dietary treatment.

Mortality was recorded when it occurred. The experiment lasted for 7 weeks and at the end of experimental period, 16 chicks were randomly selected from each dietary treatment (4 birds /replicate) and were tagged legs. These birds were weighted individually and slaughtered, the hot carcass weight was recorded and dressing out percentage was determined by expressing hot carcass weight to live weight.

3.5 Experimental design and statistical analysis:

The experiment was conducted following the completely randomized design. The data were subjected to analysis of variance according to Steel and Torrie (1980) using SPSS computer programmer. The significance between treatment means analyzed by using Duncan multiple range test.

RESULTS AND DISCUSSION

Table 4 shows that incorporation of different levels of cowpea had no significant ($P \leq 0.05$) effects on feed intake. This is in agreement

with Scott et al (1982) who reported that birds were expected to consume similar feed when fed on diets contained approximately equal energy and protein. Reported feed intake in this study is lower than that reported by Nworgu et al (2007) and Belal et al (2011).

Table 5 depicts the effect of different levels of Cowpea on weekly weight gain. No significant (P≤0.05) differences were found for treatment effects on weight gain traits. These results were generally lower than the estimates reported by Ahmed et al (2012).

Total feed consumption in this study is 2345.23 -2524.68 g (table. 6) which is similar to that reported by Elagib et al (2013) but lower than that estimated by Bind et al (2012) and Issa and Abo Omer (2012). While weight gain is in the range of 926.08-995.25 (table. 6) and this is in accordance to those estimated by Elagib et al (2013) but lower than estimates of Ahmed et al (2012) and Bind et al (2012) and Issa and Abo Omer (2012). On the other hand, feed conversion ratio in the present study (table. 6) is 2.5 -2.7 (Kg fedd / Kg Gain).This range is higher than the estimate reported by Abbas and Ahmed (2012) and Issa and Abo Omer (2012). Protein efficiency ratio in this study is 1.7-1.8 (table. 6) and this is lower than the results reported by Muamer et al (2012) and Akanji et al (2012).

Table 7. showed that pre-slaughter weight, carcass weight and dressing % in this study were not significantly (P≤0.05) affected by treatment differences. Estimates were in the range of 1125.62-1184.36g, 780.43.82-824.64g and 69.1-70.5% for the traits respectively. Pre-slaughter weight is lower than estimates reported by Zomrawi et al

Table (4): Effect of dietary cowpea (*vigna unguiculata*) on feed intake of broiler chick (g/bird/week):

weeks	Cowpea level%				±SEM
	0	5	10	15	
1	93.80	82.50	92.20	85.95	1.405
2	194.30	156.95	178.40	162.50	4.456
3	272.6	248.5	229.7	257.9	3.284
4	350.17	346.27	326.47	345	5.693
5	480.07	483.40	451.95	476	8.176
6	573.22	540.35	522.02	572.17	11.997
7	560.65	558.37	544.47	584.82	17.507

SEM: Standard error of the mean

Table (5): Effect of dietary cowpea (*Vigna unguiculata*) on weight gain of broiler chick (g/bird/week):

	Cowpea level%				
weeks	0	5	10	15	±SEM
1	56.70	50.45	53.07	54.62	1.006
2	83.10	70.85	82.90	73.32	2.926
3	138.4	143.5	141.4	144.6	4.853
4	169.60	158.47	139.60	139.92	4.733
5	212.07	187.52	188.95	200.95	5.536
6	194.82	208.10	194.82	263.60	14.414
7	140.57	107.20	154.22	108.32	12.562

SEM: Standard error of mean

Table (6): Effect of dietary cowpea *(Vigna unguiculata)* on overall performance of broiler chicks (g/ bird/7week):

Parameters	Cowpea level%				±SEM
	0	5	10	15	
Feed intake(F) (g)	2524.68	2416.30	2345.23	2484.53	78.95
Weight gain (G)	995.28	926.08	954.85	985.38	43.00
FCR(F/G)	2.6	2.7	2.5	2.5	0.144
Protein efficiency ratio	1.7	1.7	1.8	1.7	0.14

SEM: Standard error of the mean
FCR: Feed conversion Ratio

Table (7): Average pre-slaughtered, carcass weight, dressing percentage, liver weight and liver % of broilers fed diet containing cowpea (*vigna unguiculata*) during 0-7 weeks

Parameters	Cowpea level%				±SEM
	0	5	15	10	
Pre_ slaughter(g)	1126.2	1125.62	1184.36	1137.39	48.46
Carcass weight (g)	792.82	780.43	824.64	804.01	37.36
Dressing %	70.3	69.1	69.9	70.5	0.763
Pancreas weight (g)	2.1	2.1	2.3	2.3	0.127
Liver weight (g)	23.92	24.91	22.72	24.99	1.148
Relative liver weight (%)	2.2	2.2	1.9	2.2	0.88

SEM: Standard error of mean

Table (8): Feeding economic of experimental groups:

Item	Cow pea level %			
	0	5	10	15
Total returns/bird(SDG)	8.7	8.6	8.8	9.1
Total variable costs /bird(SDG)	6.5	6.6	7.3	7.5
Gross Margin	2.2	2.0	1.5	1.6

(2012) Carcass weight recorded in this study is comparable to that reported by Ahmed et al (2012). Dressing % is similar to the results estimated by Issa and Abo Omer (2012) but lower than results estimated by Ahmed et al (2012), Zomrawi et al (2012). Pancreas, liver and relative liver weights in the present study were 2.1-2.3, 22.72-24.99 g and 1.9- 2.2%. Liver weight estimate is lower than the result reported by Olawumi et al

(2011) while relative liver weight is slightly lower than the estimates recorded by Issa and Abo Omer (2012).

The result of feed cost and profitability of chicks were shown in Table (8). Control diet and diet contained 5% cowpea were low cost price than other diets of cowpea. Moreover, the birds consumed control diet and groups of birds received 5% cowpea were recorded the highest profit and they were followed by group of 10% cowpea. However, birds consumed 15% cowpea recorded the least profit. Regarding the result of feed cost and profit, the higher cost of feed for the diet of cowpea seeds may be related to the high price of cowpea seeds which lead to increase the cost of feed. The high profitability of the control group may be related to high score of body weight gain noticed by this groups, while the high profit that obtained for the group of birds consumed 5% cowpea seeds could be related to the low cost price of the diet received by this group than those groups consumed 10%and 15% cowpea.

Table (4): Effect of dietary cowpea (*vigna unguiculata*) on feed intake of broiler chick (g/bird/week):

CONCLUSIONS

It is concluded that up to 5% of cowpea seeds can be incorporated in broilers ration because it's cheaper source of unconventional legumes and economically similar to control diet. Broiler chicks can tolerate up to 15% cowpea "Alhinitir" in the diet without adverse effect. The dietary cowpea seems acceptable and palatable to the birds. Further study should be conducted to determine the effect of cowpea in broiler diet with different level and different feed ingredient

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