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Effect of Dietary Raw Chick Pea (*Cicer arietinum* L.) Seeds on Broiler Performance and Blood Constituents

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Abstract: One hundred and twenty eight broiler chicks were used to evaluate the effect of dietary level chickpea seeds, on performance and some blood parameters of broilers. Four iso caloric and iso nitrogenous Experimental diets containing 0%, 5%, 10% and 15% raw chickpea seeds were formulated to meet the nutrients requirements as outlined by NRC (1994). Experiment was in a Completely Randomize (CRD) comprised broiler chick diet. Each treatment was replicated four times with 8 birds/replicate. The study lasted for 45 days. Parameters measured were feed intake, body weight gain, Feed Conversion Ratio (FCR), pre-slaughter weight, dressing percentage, protein efficiency, some blood parameters (glucose, cholesterol, triglyceride, total protein, calcium and phosphorus) and profitability. Results revealed that treatment had no significant effect in feed intake and blood serum parameters. Birds fed 10% and 15% of chickpea showed similar performance to control significant ($p<0.05$) on body weight gain Feed Conversion Ratio (FCR), pre-slaughter weight, dressing percentage, protein efficiency, However, birds fed on 5% level is significantly ($p<0.05$) lower on weight gain, carcass weight and Feed Conversion Ratio (FCR), bird fed 10%level chickpea has better effect on net profit.

Key words: Chickpeas, broilers, performance, total protein, dressing percentage

INTRODUCTION

Intensive poultry production is based on diets high in cereal grains and conventional protein sources is the most common. However, the need to lessen the impact of imported concentrates on poultry producers has led to research on local protein sources, such as chickpeas, as poultry feeds. Chickpeas have been reported to be suitable as a protein concentrate for broiler chickens (Farrell *et al*., 1999; Viveros *et al*., 2001; Christodoulou *et al*., 2006). The chickpea (*Cicer arietinum*) is one of the world's most important grain legumes (FAO, 1993) because it is a valuable source of protein, minerals and vitamins and occupy a very important place in human nutrition.

In comparison with other legumes, such as soybeans, peas and common beans, chickpeas contain relatively small amounts of trypsin inhibitors and chymotrypsin inhibitors, offering thus fewer problems in poultry nutrition (Bampidis *et al*., 2009). In a recent study, Brenes *et al*. (2008) studied the nutritional value of raw and extruded chickpeas in an experiment with broiler chickens (Cobb) from 1 to 21 day of age. Increasing chickpea content in the diet did not affect BW gain, DFC and FCR, with no differences occurring between raw and extruded chickpeas, while relative liver weight increased with both raw and extruded chickpeas (Brenes *et al*., 2008). Christodoulou *et al*. (2006) also found that raw chickpeas can partially replace SBM at inclusion levels of 12%of diet without affecting final BW, DFC and FCR of broiler chickens. The first study of the Sudan to investigate the effect of levels of chick peas in poultry feed in the world either has conducted many researches such as (Bampidis *et al*., 2009); Brenes *et al*. (2008) Christodoulou *et al*. (2006) and others.

Chickpeas, like other legumes, contain a variety of Anti-Nutritional Factors (ANF), such as protease and amylase inhibitors, as well as lectins, polyphenols and oligosaccharides, which impair nutrient absorption from the gastrointestinal tract and can result in detrimental effects on animal health and growth (Chavan *et al*., 1989; Perez-Maldonado *et al*., 1999). In comparison to soybean (*Glycine max* L.), peas (*Pisum sativum* L.) and common beans (*Phaseolus vulgaris* L.), chickpea offers less problems as far as these factors (ANF) are concerned (Singh, 1988). Chickpeas are also a good source of dietary minerals, such as calcium, phosphorus, magnesium, iron and potassium (Chavan *et al*., 1989). The objective of this study to evaluate the effect of different levels of raw chickpea, in order to reduce the production cost of broiler chicks.

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Table 1: Proximate analysis (%) and anti-nutrition factor of chickpeas seeds

Item	Chickpeas seed
Dry matter	93.100
Either extractives	3.780
Crude protein	24.310
Crude fiber	13.570
Ash	3.022
Nitrogen free extractives	48.410
Tannin	0.056
Poly phenol	0.030
Phytic acid	0.641
Digestibility	83.380
ME (kcal/kg)	2540.000

ME = Calculated according to equation of Lodhi *et al*. (1970)

Table 2: Percentage composition and calculate chemical analysis of rations

	Treatments			
Feed staffs%	0%	5%	10%	15%
Sorghum	60.00	60.00	60.00	57.00
Groundnut meal	14.00	14.00	12.00	10.00
Sesame meal	14.00	13.00	10.00	10.00
Chickpea	00.00	05.00	10.00	15.00
Wheat brand	05.20	01.20	01.20	01.20
Super concentrate*	05.00	05.00	05.00	05.00
Di-calcium phosphate	01.25	01.25	01.25	01.25
Methionine	00.01	00.01	00.01	00.01
Lysine	00.04	00.04	00.04	00.04
Premix**	00.25	00.25	00.25	00.25
Salt	00.25	00.25	00.25	00.25
Calculated analysis				
Crude protein (%)	22.70	22.80	22.80	22.70
Crude fiber (%)	3.62	3.73	4.26	4.67
Calcium (%)	1.00	1.00	1.11	1.10
A.V phosphorus (%)	0.56	0.55	0.54	0.54
Lysine	1.11	1.10	1.00	1.00
Methionine	0.50	0.50	0.61	0.61
ME (kcal/kg) diet	3038.00	3061.00	3019.00	3050.00

*Super concentrate in%: Crude protein 40.00min, Vit 200.000 IU/Copper 160mg, Crude fat 2 min, Vit D3 40.000 IU/kg, Manganese 1.200 mg, Crude fiber 5 max, Vit E 500 mg/kg, Zink 1.000 mg, Calcium 5-8 VitK3 40 mg/kg, Iron 800 mg, Posphours (vail) 4.3 Vit B130 mg/kg, Iodine 8 mg, Lysine 12 VitB2 100 mg/kg, Selenium 3 mg, Methionine 3.0 vit B6 40 mg/kg, Mth+cystin 3.2 vitB12 0.50 mg/kg, Sodium 2.4 Niacin 600 mg/kg, Met. Energy 2.100 kcal/kg min, Folic acid 20 mg/kg, Pantothenic acid 200 mg/kg, Choline cholride 10.000 mg/kg.

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

MATERIALS AND METHODS

Experimental birds and design: 128 One hundred and twenty Eight day old unsexed commercial broilers chicks (ross) were used for this study the initial weight of birds ranged 37-45 g The chicks were randomly assigned to the four experimental diets 32 birds per treatment group in a completely randomize design, each treatment group was further subdivided in to four replicates of 8 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 were formulated with grade levels of raw chickpea seeds 0, 5, 10 and 15% the composition and the proximate constituent 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 does before and after vaccination Measurements taken were feed intake, weigh gain and feed conversion ratio. At the end 4 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 tube and allowed to clot and serum was separated and collected for frozen and later analyzed. Carcasses weight was recorded and the dressing percentage was determined by expressing carcass weight to the live weight. Protein efficiency ratio calculated as wight gain divided by protein intake.

The birds in each pen had continuous access to one metallic fountain drinker and the experimental diets were fed *ad-libitum* using metallic tubular feeders. Feeders and drinkers were kept cleaned; drinkers were cleaned once a day. Each pen was provided with bulb (60 watts) for continuous lighting throughout the experimental period. Artificial light was provided by lambs (12 hrs) in the evening and 12 hrs natural day-light. The bulbs lambs were hanged about one foot high from the flour during the first two weeks of age and then maintained to about 6 feet. All chicks were vaccinated against Gumboro at tow weeks of age, vitamins and antibiotics were offered via drinking water at the first three days. Vitamins were offered as supportive dose before and after vaccination.

Statistical analysis: The data collected were subjected to analysis of variance and the means were separated using Duncan 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 Ration (FCR), dressing percentage and Protein Efficiency Ratio (PER) are showed in Table 3. Results revealed that treatment had no significant ($p<0.05$) effect on birds feed intake among the treatment, this finding is agreed with that

Table 3: The effect of feeding chickpea levels on overall performance of broiler chicks

	Chickpeas seed levels				
Item	0%	5%	10%	15%	±SEM
Total feed intake g/bird	3103.750	3056.86	2994.870	2978.440	64.664
Total weight gain g/bird	1607.100	1362.11[a]	1619.110	1561.640	36.157
Pre-slaughter g/bird	1773.770	1574.03[a]	1804.840	1775.000	0.045
Feed conversion ratio	1.932	2.25[a]	1.850	1.910	0.045
Dressing percentage	73.000	72.00	73.978	73.233	1.265
Carcass weight	1110.000	996.00[a]	1183.000	1108.000	36.606
Protein efficiency ratio	2.073	1.795	2.175	2.130	0.037

Values are means of 4 replicates per treatment - means with different superscripts in same row were significantly different ($p \geq 0.05$). SEM = Standard error of the mean from ANOVA

Table 4: The effect of feeding chickpea levels on serum composition of broiler chicks

	Chickpeas seed levels				
Item	0%	5%	10%	15%	±Se
Glucose	250.000	245.000	242.000	293.750	37.899
Cholesterol	160.000	161.000	183.500	185.500	12.894
Triglyceride	65.000	85.000	67.500	81.250	13.099
Total proteins	5.388	5.300	5.850	6.238	0.362
Calcium	8.010	8.340	8.250	7.700	0.455
Phosphorus	6.350	6.150	6.110	6.900	0.463

Values are means of 4 replicates per treatment - means with different superscripts in same row were significantly different ($p \geq 0.05$). SEM = Standard error of the mean from ANOVA

Table 5: The feeding economics of experimental diets

	Chickpeas seed levels			
Item	0%	5%	10%	15%
Feed cost per bird (SDG)	05.84	04.52	05.02	05.60
Feed cost per bird ($)	02.12	01.64	01.82	02.04
Average weight of bird (kg)	01.11	01.00	01.18	01.11
Total returns (SDG)	12.21	10.95	13.01	12.18
Total returns ($)	04.44	03.98	04.73	04.43
Total cost per bird (SDG)	08.84	07.52	08.02	08.60
Total cost per bird ($)	03.21	02.73	02.92	03.13
Net profit per bird (SDG)	03.37	03.43	04.99	03.58
Net profit per bird ($)	01.23	01.25	01.81	01.30

SDG: Sudanese pounds - Rate: 1$ = 2.75 SDG

Scot *et al*. (1982) who reported that when diet were iso caloric, this birds were expected to consume similar quantity of feed, body weight gain pre-slaughter weigh there had no significant difference on 10% and 15% compare to control diet this mean the 10% and 15% levels reached the same level of protein as the control treatment. Feed Conversion Ratio (FCR) dressing percentage, protein efficiency, also there is no significant ($p<0.05$) among 10% and 15% compare to control this resulted meaning 10% and 15% adequate for protein and amino acid balances to sport growth as the control This result similar with the finding reported by Christodoulou *et al*. (2006).

Partial replacement of SBM with chickpeas, at inclusion levels up to 12% of concentrate mixture, as the main protein source in diets of broiler chickens resulted in similar productive performance. mixture) partial replacement of soybean meal with chickpeas at inclusion levels of 12% of the concentrate mixture (i.e., treatments CKP120 and HCKP120) did not affect final body weight, daily feed consumption, feed conversion ratio and carcass yield traits compared to treatment CKP0.

Serum chemical values (glucose, cholesterol, triglyceride, total protein, calcium and phosphorus) presented in Table 4 show no significant difference among the groups fed on different experimental diet´s levels of chickpea. There is no statistically significant difference among treatment this result agrees also with the finding reported by Magboul (1998) and Teguia *et al*. (2003). When they used the same levels of the cowpea seed. The birds fed 5%chickpea there is lower significant ($p<0.05$) in weight gain, Feed Conversion Ratio (FCR), Protein Efficiency Ratio (PER) compare with 10%, 15% and control this result may attributed to the 5% level of chickpea in the feed was not enough and can be referred to the imbalance in diet (less protein content). The birds fed chickpea (up to 15%) had no

adverse effect on health, performance and no mortality was recorded.

Feed economics of experimental diets ere shown in Table 5. The highest net profit was observed on bird fed with 10% chickpea compared to 15%, 5% and control (0%) respectively. It is recommended to use diet contain 10% chickpea to increase the profitability. In general, raw chickpeas can be used in poultry diets, at inclusion levels up to 15% level, to support growth, without any detrimental effects on birds. However in term of net profit 10% level is the best. So advisedly 10% is enough to reached this balance in protein content and high net profit compared to control.

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