



Research Paper

EFFECT OF HOT RED PEPPER (*Capsicum frutescens*) ON PERFORMANCE, ABDOMINAL FAT AND BLOOD SERUM PARAMETERS OF BROILER

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Abstract

This study was conducted to evaluate the response of broiler chicks to the diets containing different levels of hot red pepper (Hrp). A total of 200, five days-old, unsexes (cob) broiler chicks were used. Chicks were weighed individually and assigned randomly to five groups of 40 chicks each treatment group divided into four replicates of 10 chicks per each. Five experimental diets were formulated (A, B, C, D and E) to meet the nutrient requirements. Diet A as Negative Control (NC) basal diet with no antibiotic or Hrp, diet B basal diet supplemented with antibiotic (Neomycin 16 mg/Kg) as Positive Control (PC), diets C, D and E were basal diet supplemented with hot red pepper (Hrp) at level of 0.5, 1 and 1.5%, respectively. The studied parameters were; growth performance, carcass dressing percentage, abdominal fat percentage, serum metabolite, electrolyte and enzyme activities and economic appreciable. The results showed that addition of Hrp improved significantly ($P < 0.05$) the performance (body weight gain and feed conversion ratio) of broiler chicks compared to the group fed on NC, whereas no significant differences were observed ($P < 0.05$) in feed intake. No mortalities were recorded at all treatment groups, throughout the experiment. The results indicate that, the dressing percentage was increased significantly in bird fed on 1% and 1.5% of hot red pepper compared to those fed the NC. Supplementation of Hrp in the broiler diets at various levels resulted in significant ($P > 0.05$) reduction in serum cholesterol, abdominal fat, and AST enzyme activity compared to both NC and PC groups while the levels. Values of serum total protein, urea, ALP, calcium (Ca) and phosphorus (P) were remained unchanged. Economically the addition of Hrp improved the performance of broiler chicks, which was resulted in economical benefits. This study showed that Hrp when added as growth promoter in the broiler diets has a similar effect as that with antibiotic without any adverse effects.

Key words: hot red pepper, serum cholesterol.

INTRODUCTION

In the past the major growth promoters were antibiotics. However, the current research is looking for natural alternative to antibiotics because of their residue and subsequent resistance

to bacteria [1]. Spices and herbs have many benefits for health of broiler and their functions such as antioxidant ability, antimicrobial activity, and enhancing the digestion by stimulating endogenous enzymes [2, 3]. Hot red pepper is one of the most important herbs, which is widely used in human worldwide; it's belonged to, capsicum family [4]. The substances that give hot peppers their heat is capsaicin and several related chemicals collectively called capsinoids It was proven that capsinoids includes antimicrobial , antifungal activities, It exhibited protective effects against mutagens and carcinogens, cholesterol, obesity and pains [5, 6, 7] . Capsicum products are used not only as flavoring agent, but used to stimulate gastric acid secretion acting as therapeutic agent, especially in the form of extractives containing high levels of capsaicin [8].The objective of this study was intended to gain more information about the effect of using different level of hot red pepper *Cpsicium frutescens* in broiler ration as natural feed additives.

MATERIAL AND METHOD

A total number of 200 chicks of one day old commercial unsexed broilers of cob strain were obtained from Enmaa Breeder Company Khartoum and transported to student poultry premises, College of Agricultural Studies, Sudan University of Science and Technology, Shambat Khartoum stat. The chicks were adapted to the premises and feed over (5days) before the start of experimental period. The experimental house in which the chicks were kept was semi closed house, the house cleaned and disinfected before the commencement of the experiment. The light continuous throughout the experiment period . Feed and water were provided *adlibitum*. The experimental diet was fed for 6 weeks.

Hot red pepper used in this experiment was purchased from Baharri market, Kartoum state; the chicks were fed 5 dietary treatments, A, B, C, and E of four replicates with ten chick's arrangement. the first group A, fed on based diet,(negative control) without antibiotic or any growth promoter ,the second group B fed on basal diet containing an antibiotic as chemical growth promoter, (Neomycine 16mg/kg) as a positive control. The other groups, C, D, and E were fed on the basal diet supplemented with dietary hot pepper as a natural growth promoter, at levels of 0.5%, 1%, and 1.5% respectively. The basal diet was formulated according to nutritional research council [9] .The ingredients percent composition, calculated chemical analysis of the experiment diet was presented in Table (1) and (2).

The performance of the experimental chicks in term of feed intakes, live weight gain and feed conversion ratio were recorded weekly. Health of experimental stock and mortalities were closely observed and recorded daily. At the end of 6th week the experiment birds were individually weighted then slaughtered to determine dressing percentage and blood serum paramertes.Blood sample were collected from the jugular vein of bird using non-Heaparinized tubes and immediately subjected to centrifugation at 300 r.p.m. for 15 minutes and serum were stored at -20c until analyzed by using spectrophotometer, (Hitachi - 902, Germaney.) to measuring the concentration of metabolites,enzyme activities of Aspartate amino transferase (AST) and Alkaline phosphatase (ALP), cholesterol using commercial kits (DIALAB Laboratories, Ltd, Austria), urea, total protein glucose , and mineral Ca and P by using kit (Bio System, S.A., Spain). All slaughtered birds were then scalded, manually plucked, washed and allowed to drain on wooded tables, Evaluation was per performed by a ventral cut and visceral as well as thoracic organs were removed , eviscerated carcasses and abdominal fat were weighed and expressed as percentage of live body weight.

The experimental design was completely randomized. Data of performance, serum metabolites, electrolytes and enzymatic activity be side carcass dressing and abdominal fat percentage were all analyzed using one way Analysis of variance (ANOVA).frequency distribution were set and treatment means were compared for significance at 5% level of probability [10]

Table (1) the ingredients percent composition and the calculated chemical analysis of experimental diets.

Ingredient%	A	B	C	D	E
Sorghum fetarita	64	64	64	64	64
Ground nut cake	28.61	28.61	28.61	28.61	28.61
Wheat Brand	1	1	1	1	1
Concentrate*	5	5	5	5	5
Dicalcium phosphate.	0.5	0.5	0.5	0.5	0.5
Oyster shell	0.5	0.5	0.5	0.5	0.5
Salt	0.25	0.25	0.25	0.25	0.25
Methionine	0.14	0.14	0.14	0.14	0.14
Total	100	100	100	100	100
Antibiotic (Neomycin) Mg/kg	-	16	-	-	-
Hot pepper	-	-	0.5	1	1.5

* crude protein 40; crud fiber; calcium; phosphorus (aval) lysine methionine met +sys 3.20 met energy 2100 kcal; Sodium2.60 product vit. A:200.000IU/Kg; vit E :500Mg/Kg; vit B1: 15Mg/Kg; vitB2: 100 Mg/Kg; vit B620Mg/Kg ;vit B12 300Mg /Kg; Biotin:1.000mg/kg; Nicotinicacid:600mg/kg; Folicacid : 10mg/kg; vit K30mg/kg ;pantothenic acid: 150mg/kg; choline chloride: 5.000mg/kg; copper 100mg/kg; iodine 15mg/kg Cobalt :3mg/kg; selenium:2mg/kg;manganese:1200mg;zinc;800mg/kg; iron1.000mg/kg;B.H.T.:900MG/KG;Salinomycin-Na;1.200.

Table (2) Calculated chemical analysis of experimental diets

Ingredient%	A	B	C	D	E
Dry matter	89.20	89.20	89.20	89.20	89.20
Crud protein	23.10	23.10	23.10	23.10	23.10
Crud fiber	4.44	4.44	4.44	4.44	4.44
Ether extract	3.9	3.9	3.9	3.9	3.9
Ash	4.60	4.60	4.60	4.60	4.60
Nitrogen free extract	63.96	63.96	63.96	63.96	63.96
Calcium	0.91	0.91	0.91	0.91	0.91
Total phosphorous	0.70	0.70	0.70	0.70	0.70
Available phosphous	0.50	0.50	0.50	0.50	0.50
ME(.Kcal/kg)	3102.84	3102.84	3102.84	3102.84	3102.84

Calculated according to (ELLis, 1981;Kuku Bulletin)^[11]

RESULTS

The effect of feeding different levels of dietary Hrp on performance of broiler chicks is shown in Table (3). The result indicated that the chicks of groups B, C, D and E obtained significantly ($P \leq 0.05$) higher weight gain and better feed conversion ratio than that of groups A. No significant differences were observed between groups, A, B, C, D, and E, in feed consumption ($P > 0.05$). As shown in table (3) chicks fed rations D and E had the significantly ($P \leq 0.05$) higher percent of carcass dressing. The abdominal fat percentage of group A and B was significantly ($P \leq 0.05$) higher than that of groups C, D and E (Table 3)

Table (3): Effect of adding different levels of hot pepper on body weight gain (gm), feed intake (gm) and feed conversion ratio

Parameter	Samples					Lsd _{0.05}	SE±
	A	B	C	D	E		
Body weight gain (gm)	1559.95 ^b	1649.93 ^a	1657.19 ^a	1708.05 ^a	1718.19 ^a	80.06*	32.11
Feed intake (gm)	3269.73 ^a	3304.62 ^a	3322.86 ^a	3363.89 ^a	3402.74 ^a	227.9 ^{ns}	73.95
FCR	2.09 ^a	2.00 ^b	2.01 ^b	1.97 ^b	1.98 ^b	0.04872*	0.01581
Dressing (%)	68.95 ^c	69.03 ^b	69.05 ^b	69.13 ^a	69.14 ^a	0.5435*	0.1672
Abdominal fat (%)	2.73 ^a	3.53 ^a	2.54 ^b	2.43 ^b	2.39 ^b	0.4568*	0.1439

Any two mean values having same superscript within rows are not significantly different ($P \leq 0.05$).

n.s = No significant difference ($P \leq 0.05$), * Significant difference ($P \geq 0.05$).

A = Control without antibiotic, B = Control with antibiotic, C = Hot pepper 0.5%, D = Hot pepper 1.0%, E = Hot pepper 1.5%, FCR=Feed conversion ratio

The serum metabolite value of broiler chicks fed on different levels of hot pepper for 6 weeks were shown in table (4) mean values of cholesterol were higher significantly ($P < 0.05$) in group A, and B, compared to group C, D, and E, no significant difference is seen between, C, D, E.

Treatments effect on total protein, urea. Glucose and Ca and P was not significant ($P > 0.05$). Enzyme activities values of broiler chicks fed on different levels of hot pepper for 6 weeks were shown in Table (5) no significantly ($P > 0.05$) differences were observed in ALP, values between the various treatment groups. The AST values were Significantly ($P < 0.05$) higher in group A when compared to groups C, D and E, although no significant differences were found between groups C, D, and D.

The total costs, returns and profitability ratio per head of broiler chicks fed on different levels of hot pepper and antibiotic showed that profitability ratio (1.21) of tested group E was found to be the highest than the others tested groups.

Table (4): The effect of different levels of hot pepper on the serum metabolites and enzyme activity, of broiler chicks for (6) weeks

Treatments	A	B	C	D	E	Lsd _{0.05}	SE±
Urea	5.33 ^a	5.00 ^a	5.00 ^a	4.33 ^a	4.00 ^a	0.5953 ^{NS}	0.1826
Total protein	3.37 ^a	3.43 ^a	3.40 ^a	3.43 ^a	3.47 ^a	0.352 ^{NS}	0.108
Glucose	227.67 ^a	215.90 ^a	223.23 ^a	228.77 ^a	220.03 ^a	22.37 ^{NS}	6.86
Cholesterol	126.20 ^a	129.17 ^a	110.07 ^b	113.77 ^b	114.67 ^b	8.244*	2.528
ALP	155.90 ^a	152.27 ^a	148.30 ^a	141.77 ^a	140.03 ^a	23.933 ^{NS}	7.339
AST	37.77 ^a	34.65 ^a	30.36 ^b	30.31 ^b	30.58 ^b	8.24*	2.527
Ca	4.80 ^a	4.77 ^a	4.10 ^a	4.83 ^a	4.30 ^a	0.3766 ^{NS}	0.1155
P ⁺⁺	7.67 ^a	7.63 ^a	7.43 ^a	7.67 ^a	7.53 ^a	1.106 ^{NS}	0.339

Any two mean values having same superscript in a column are not significantly different ($P \leq 0.05$).

A = Control without antibiotic, B = Control with antibiotic, C = Hot pepper 0.5%, D = Hot pepper 1.0%, E = Hot pepper 1.5%

DISCUSSION

Throughout of the experiment period, the mortality rate was negligible, with no differences was recorded among all treatment groups and the appearance health of the experimental stocks was good throughout the experimental groups. This was in line with the finding of [12, 13], Who found that the addition of Hrp to diet containing 1, 1.5 and 2% of Hrp, did not significantly affect on mortality rate. This is may be due to natural occurring biological active components in herbs are generally assumed to be more acceptable and arich sources of potential disease control when added at suitable doses [14].

The effect of feeding graded level of hot red pepper (Hrp) as a natural feed additive , indicated that, supplemented chicks with Hrp had no significant affect on feed consumption in all levels ($P>0.05$), The absence of significantly affects of this additive on feed intake may probably due to the bird requires of long time to adapted to this additive. In contrast, [13] ,reported that feed intake of broiler decreased as the level of hrp increased to 2%. They attributed that to the addition of capsaicin to the diet may affected energy metabolism by activating the sympathetic nervous system (SNS) in animals. Body weight gain and feed conversion ratio in the present study , showed a significant ($P<0.05$) improvements of chicks that fed on the diets supplemented with Hrp at various levels impaired with those feed on (NC) whilst the differences were not significant when compared with (PC) group, These results were agreement with [13]who stated that , the levels of 1, 1.5 and 2% of bird in the diets improved significantly body weight gain and feed conversion ratio. Similar results were reported by [15,16,17] who reported that, inclusion of Hrp in the diet at levels of 0.5, 0.75, 1% improvement significantly the body weight gain and feed efficiency of broiler chicks.. the better body weight gain and feed conversion ratio on hrp may be due to the antimicrobial properties of capsaicin the active ingredient in this supplement which possess which can lead to decrease the harmful microbes in digestive system and increased the mucosa and sub-mucosa thickness of the small intestine and absorption surface of duodenum an alliums in broiler [18],The results of the present study showed that, Hrp powder at different levels of inclusion, performed similar to antibiotic growth promoter on body weight gain, feed intake and FCR of broiler chicks.

The effect of inclusion of Hrp at levels of 1% and 1.5% in the diet were produced significantly ($p > 0.05$) higher dressing percentage as compared to NC and PC. These results are equally in harmony with the findings of [17] ,and [13], who stated that, the addition of hot red pepper at levels of 1% and 1.5% in the diet improved significantly the dressing percentage, similarly [16] found that, birds fed on the highest level of Hrp on 1% was significantly increased the dressing percentage when compared with the control group. This result disagreed with finding of [12] who found that the dressing percentages was not affected significantly by inclusion of Hrp in broiler diet at level of 1 and 1.5%.

With respect to the effect of dietary inclusion of Hrp in the diet on the abdominal fat percentage, significantly ($P>0.05$) lower abdominal fat percentage were recorded for broiler chicks fed on Hrp at all levels of inclusion. The reduction in abdominal fat of chick fed Hrp may be due to capsaicin which may possess lipids lowering effect [19]. However the mechanisms of reducing abdominal fat by the herbs feed additives may be through increasing the secretion of lipase and secondary bile acids. Which reducing accumulation of fatty acids in abdominal cavity [20].This result was in line with [13] who found that, addition of Hrp powder in the diet significantly decreases the abdominal fat in broilers . The highest abdominal fat values produced by antibiotic diet in this study is supported by the finding of [21] who found that , Flavomycine antibiotic significantly increased the amount of abdominal fat in broiler.

The results of serum metabolites showed that, cholesterol levels were significantly ($P>0.05$) lower in the group fed on Hrp than NC and PC groups, The reduction in serum cholesterol in diet supplementing by Hrp could be attributed to the active ingredients of medicinal herbs and spices which inhibit the activity of 3-hydroxyl-3- methyl glutaryle- co enzyme A reeducates (HMG- COA) in the liver [22], [23]. This enzyme is a key regulatory in cholesterol enzyme synthesis. According to [24], 50% inhabitation of MMG- Co-A reeducates will lower serum cholesterol in poultry up to 2%. [25] also reported that red pepper could stimulate the conversion of cholesterol to bile acids, an important path way of excretion of cholesterol.

Using of hot red pepper powder in different levels in broiler diets caused significant ($P>0.05$) reduction in the in aspartic amino transferase (AST) enzyme level compared to PC and NC groups, whereas the alkaline phosphatase (ALP) enzyme activity remained unchanged and all values of both enzymes being within the normal range. This result was supported by the finding of [13] who found that, the addition of Hrp at level of 1, 1.5 and 2% in broiler diet had no any significant cumulative toxicity at doses administered. Vital organs lesions, especially the liver were believed to be the sources of enzyme linkage to the blood, hence normal peripheral enzyme values reflect the integrity of most vital organs [26]. This was confirmed by absence of liver disease in the experimental birds, in the present study. This was explained [27] who reported that, Hrp was found to have high level of antioxidants like phenolics and flavonoid content, this has a modulating role on physiological function and biotransformation reaction involved in detoxification process there by providing protection from cytotoxic, genotoxic and metabolic effect of environment toxicant so inclusion of hrp caused stabilized cell membrane and protect the liver deleterious agent and free radicals mediated toxic damages to the liver cells which is desirable [28].

The effect of experimental natural feed additive of various levels of inclusion in the diet, on serum electrolytes (Ca and P) was not significant and they were within the normal range.

The addition of hot red pepper at various levels to the diet of broiler was economically more profitable compared to NC., this may be due to the highest return of the weight gains recorded by chicks fed this feed additive without affecting feed intake significantly. This result could be supported by the finding of, [13, and 16] who reported that, the broiler fed 1% of hot red pepper obtained higher net profit when compared with control group.

Based on the results of this study, the hot red pepper powder could be considered as potential growth promoters that may replace antibiotics in broiler diets without any adverse effect.

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