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EVALUATION OF HOT PEPPER (*Capsicum frutescens*) POWDER EFFECTS ON THE PERFORMANCES AND SOME BLOOD PARAMETERS OF BROILER CHICKS

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Abstract: This study was carried out to evaluate the effect of dietary levels of hot pepper (Capsicum Frutescence) on the performance and some blood parameters of broiler chicks. A total number of 144 broiler chicks (Arbor-acres) were used. Birds were distributed randomly into 16 pens (9/pen) as replicates, in complete randomized design. The experimental diets were formulated with four levels of hot pepper of (0.0%), (0.25%), (0.5%) and (0.75%). Feed intake, feed conversion ratio, body weight gain and mortality rate were recorded weekly, while the carcass weight, dressing percentage, weight of the internal organs (liver, spleen, heart and abdominal fat) and serum contents (cholesterol, glucose and triglyceride) were determined at the end of experimental period. The results showed that the addition of hot pepper to the diet improved significantly ($P \leq 0.05$) feed intake, body weight gain and reduced mortality rate of the broiler chicks. The birds fed (0.5%) hot pepper gave the highest live weight (1450g) and weight gain (1406.3g). While there were no significant difference in the feed conversion ratio (FCR), dressing% and internal organs weight. Addition of hot pepper at the level of (0.5%) and (0.75%) has significantly ($P \leq 0.05$) decreased cholesterol and triglycerides ratio concentration. It could be concluded that dietary hot pepper especially in the level of (0.5%) dietary hot pepper improved the performance and profitability ratio, while level of (0.75%) depressed cholesterol and triglycerides of serum blood of broiler chicks.

Keywords: Hot Pepper, *Capsicum Frutescence, broiler performance, blood parameters*

Introduction:

Sudan poultry production has continuously adopted new technologies (genetic improvement, nutrition, management, health control), which ensures its competitiveness in the global meat market. Since the 1950s, antimicrobial feed additives (antibiotic and chemotherapeutic drugs) have been used as growth promoters, with generalized use in animal production, allowing adequate productivity of animals raised under intensive conditions (Menten, 2001). Hot red peppers are one of the most important spices that are widely used in human diet. Despite the observed improvement in broiler performance, the use of antibiotic growth promoters has been criticized due to its possible role in the occurrence of antimicrobial resistance in humans and poultry species as well. This new context caused an increase in the search for alternative growth promoters. In Europe, research on plant extracts as alternatives to the use of antibiotics as

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growth promoters has significantly increased, but in Sudan, this issue is rather new, and the number of studies is still small. One of the most frequently studied plants to be used in animal nutrition today is red pepper which has appetite, digestion promoters, antimicrobial properties, anti-diarrheal and anti-inflammatory potential (Kamel, 2000). Capsaicin a pungent principle of hot red pepper, has been used as spices, feed additives and drugs in hot red pepper (Nwaopara *et al.,* 2007) carotenoids, capsanthin, capsorubin, and steroidal saponins known as capsicidins found in seed and root (Saber, 1982). CAP is the main component of herb, including hot taste and is known to active afferent nerve fiber (Holzer, 1991), CAP has been shown to have a protective function in the gastric mucosa as the stimulation of afferent nerve endings by capsaicin protects against aspirin or alcohol-induced gastric injury (Gonzalez et al., 1998). Research has proven that *Capsicum annuum* is the only plant that produces alkaloid capsaicinoids and approximately 48 percent of the active substances in capsaicinoids are capsaicin (8-Methyl-N-vanillyl-6- nonemide) which is the main active compound responsible for the pungent effects of various species of the hot red peppers

The main purpose of this study was carried out to evaluate the effect of different dietary levels of Hrp on the performance and some haematological parameters of broiler.

MATERIALS AND METHODS

Experimental site

This experiment was carried out in the premise of Poultry Research Unit, Department of Poultry Production, Faculty of Animal Production University of Khartoum, Shambat (Khartoum north) during the period between 18th Augusts to 28th September 2018.

Housing

The Experiment was conducted in a naturally ventilated, open-sided, deep litter poultry house. The house was partitioned into 16 pens each of them one-meter square. Continuous Lighting was provided for 24 hours.

The temperature inside the poultry house was recorded daily and the reported temperature was found to range between 39 and 41ºC.

Experimental Diets

Four experimental iso-caloric and iso-nitrogenous diets were formulated to meet or exceed the NRC (1994) requirements of broiler chicks. Graded levels of chilli powder were added to the basal diet at a rate of (0.0, 0.25, 0.50 and 0.75%).

Calculation of experimental diets has been done according to NRC (1981). The metabolizable energy of local ingredients was calculated according to equation:

Me (kcal/kg) = 32.95 (% crude protein + ether extract x 2.25 x % available carbohydrates) – 29.2 (Lodhi *et al*., 1976)

The chemical composition of hot pepper was noted in table (2)

Table (1) Ingredient Composition of Experimental Diets as Percent (%):

Ingredients	(0)	(0.25)	(0.50)	(0.75)
Sorghum	68	67.75	67.5	67.25
G.N.M.	25.8	25.8	25.8	25.8
Super concentrate	5.00	5.00	5.00	5.00
Chilli powder	0.00	0.25	0.50	0.75
D.C.P	0.4	0.4	0.4	0.4
NaCl	0.25	0.25	0.25	0.25
Lysine	0.2	0.2	0.2	0.2
Methionene	0.1	0.1	0.1	0.1
Premix	0.25	0.25	0.25	0.25
Total	100	100	100	100

Table (2): Proximate analysis (%) of hot pepper

Nutrients	Dry hot pepper
DM	92.29
CP	11.8
EE	6.5
CF	4.19
Ash	6.1
NFE	63.7
ME/Kcal/kg)	2662.7

Table (3) Calculated Crude Protein and Metabolizable Energy Value of the Experimental Diets :

	Calculation of experimental diets			
Compound	**Chilli powder level %**			
	(0)	(0.25)	(0.50)	(0.75)
Crude protein	22.24	22.25	22.26	22.28
Metabolizable energy (kcal/kg)	3143.7	3130.7	3126.5	3107.91
Calcium	1.121	1.15	1.106	1.105
A – phosphorus	0.563	0. 581	0. 560	0. 544
Lysine*	1.112	1.114	1.113	1.111
Methione*	0.521	0.512	0.511	0.511
Crude fiber	4.276	4.132	4.411	4.054
Proximate analysis of the experimental diets:				
Crude protein	23.18	23.32	23.35	23.38
Crude fiber	5.64	5.88	6.13	6.11
E.E	3.57	3.61	3.70	3.66
ASH	4.84	4.77	4.86	4.62
NFE	59.2	58.93	58.48	58.55

Experimental Birds:

A total of 144 one-day old unsexed commercial broiler chicks (Arbor-acer), were used in this study. Chicks were weighed and randomly divided into (4) groups of 36 chicks. Each group was further subdivided into four replicates with 9 chicks' per replicate. The initial weight of chicks ranged between 42 to 46g.

Feed intake and body weight gain were measured on a weekly basis. Mortality rate and temperature were recorded throughout the experimental period. At the end of the experiment, Four birds from each replicate were randomly selected and slaughtered. The chicks were weighted before and after slaughtering to determine hot weight and carcass weight. The dressing percentage was determined by expressing hot carcass weight to live weight. After slaughtering, the hot carcass weight was recorded. Internal organs were weighed mainly; liver, gizzard, spleen, heart and abdominal fat. On day 42, blood samples were collected from two randomly selected bird from each cage to determine Serum cholesterol, tri-glyceride and glucose contents using com-mercial kits

Chemical Analysis

Experimental diets were approximate analyzed on dry matter basis for chemical components according to AOAC (1980).

Statistical Analysis

Data were analyzed by analysis of variance for a completely randomized design. Where the F-test was significant, the treatment means were compared using least significant differences (LSD).

Results and Discussion

Data of overall feed intake, final body weight, body weight gain, feed conversion ratio and dressing percentage are summarized in table (4). The data showed that the effect of addition of chilli powder on feed intake, body weight gain and final body weight were found to be significant ($P<0.05$), However, there was no significant effect on feed conversion ratio and dressing percentage. Birds fed 0.50% Chilli powder showed significantly higher live weight (1450.3g) and weight gain (1406.3g). This observation leads to two assumptions. Firstly, the proteins in Chilli powder may not be inferior in quality. Several studies (Hernandez et al. 2004; Garcia et al. 2007) have shown that plant extracts such as capsaicin improved the digestibility values of diets in broilers. Secondly, it may be argued, though the quality of CP in Chilli powder diets were inferior, the improved digestion arising from capsaicin compensated the adverse effects associated with poor protein quality of the diets supplemented with Chilli powder. Moreover, Adegoke *et al.* (2018) observed significantly higher body weight on hot red pepper supplemented diet as compared to control group.

The total feed intake was significantly different between treatments compared with control, during trial, feed intake of the birds fed 0.50% Chilli powder (71.3 g/day) was tend to be higher than that of the birds fed 0 % Chilli powder (65 g/day). These may be due to the active compound (capisicine) rich in Vitamin, which improves feed consumption which was reflected on body weight improvement. Similar results were obtained by Several studies (Hernandez et al. 2004; Garcia et al. 2007) who showed that plant extracts such as cap-saicin improved the digestibility values of diets in broilers, moreover, (Al-Kassie *et al*., 2012), (Al-Kassie *et al*., 2011), (Atapattu and UD Belpagodagamage,.2010) found a same results. In addition to that, Younis and Abdel - Latif (2017) had also reported that dietary supplementation of hot red pepper at 0.5, 1.0, 1.5 and/or 2.0 percent of feed level had no effect on feed consumption of broiler chicken. Atapattu and Belpagodagamage (2011) and El- Deek et al. (2012) observed that the feed intake of the broiler birds was significantly ($P < 0.05$) higher on a diet

supplemented with 3 to 5% chili powder feed than on that supplemented with 1% chili powder feed. Shahverdi et al. (2013) observed that the FI of broiler birds was significantly ($P < 0.05$) higher on a diet supplemented with a mixture of equal quantities of HRP and black pepper at 0.02% of feed than on the control diet. El-Tazi (2014) observed that the FI of broiler birds was significantly ($P < 0.05$) higher on a diet supplemented with a mixture of HRP and black pepper (0.5% + 0.5% of feed) than on the control diet. Contradicting results were Divya (2017) who reported that the feed intake reduced significantly ($P \leq 0.01$) with increased level of black pepper incorporation up to 1.0% in the quail diet as compared to those fed the control diet during the experimental period. Also these results of feed intake were not on the line of *Abd EL-Haliem* (2019) Feed intake for the whole experimental period revealed that groups fed diets supplemented with 0.3 or 0.4 % HRP was significantly ($P \leq 0.05$) lower than that of the other groups. The reason for decreased feed intake with the addition of black pepper in diet might be because of strong and spicy flavor resulting in the reduce palatability of the feed.

Feed conversion ratio showed a lowest value of (0.50) and (0.75), as compared with (0.25) and control, that may explains the growth improvement of these groups as a result of increase in feed intake of chicks fed on above diets and superior body weight gain for these groups. These results was comparable with Al-Harthi (2006) who found that feeding chicks hot pepper supplemented diet showed an improved feed conversion ratio, its attributed to its stimulant carminative, digestion and antimicrobial properties. Same results were concluded by Adedoyin *et al.* (2019) and Al-Kassie *et al.* (2011) who stated that, the supplementation of HRP in the diet improved feed conversion ratio. On the other hands, Eldeeb et al. (2006) reported that broilers had a significantly ($P < 0.05$) better FCR on a diet supplemented with a combination of 5% corn oil and 150 ppm capsicum than on a diet supplemented with 150 ppm botanical extract. More over, Atapattu and Belpagodagamage (2011) observed that the FCR of broiler chickens significantly improved by 6% on a diet supplemented with 5% HRP that on a diet supplemented with 0, 1, and 3% HRP. Compared with the control group.

It would be noted that as conclusion from the experiment, birds fed diet (0.50% Chilli powder) were observed to the have the best performance in term of total body weight gain, total feed intake, live weight and economic value. These may attribute to the effect of some antimicrobial Components which may act as growth promoters and may be improvement of digestion and absorption of the nutrient.

Table (4): Effect of Chilli Powder on Overall Performance of Broiler Chicks

Parameters	**Chilli powder level %**				± SEM
	(0)	(0.25)	(0.50)	(0.75)	
Initial weight	45	44	44	44.75	0.6693
Final body weight (g)	1289.8[b]	1331.5[ab]	1450.3[a]	1423.3[ab]	62.235
Body weight gain (g)	1244.0[b]	1287.5[b]	1406.3[a]	1378.3[ab]	62.223
Total feed intake (g)	2730.5[b]	2881.5[a]	2996.0[a]	2920.0[ab]	122.10
FCR	2.1397[a]	2.1976[a]	1.9689[a]	2.0553[a]	0.1168

Live weight, dressing percentage and carcass weight is shown in table (5). There were significant differences (P<0.05) found between treatments and control in live weight, the highest value was obtained in group (0.50) compared with groups (0.0, 0.25 and 0.75).

Dressing percentage for the four treatments found to be 71.42, 70.35, 70.36 and 70.99 respectively. The dressing percentage was not significantly (P>0.05) affected by addition of hot red pepper.

Carcass weight showed no significant differences between treatments. Compared with the controls, the meat percentage of broiler birds was significantly (P < 0.05) higher when using a diet supplemented with 150 ppm capsicum (Eldeeb et al. 2006). Al-Kassie et al. (2012) reported that the dressing percentage of broiler birds was significantly (P < 0.05) higher on a diet supplemented with a mixture of black pepper and HRP at 0.75 and 1% of feed than that on a diet supplemented with the mixture at 0, 0.25, and 0.5% of the feed.

Results concerning the effect of hot red pepper levels on internal organs are given in table (4). liver, spleen, heart and abdominal fat were not affected by increased hot red pepper levels no significant difference. (Hernandez et al., 2004) also found that plant extracts such as oregano, cinnamon, pepper and Labiatae (Labiatea extract, Furfural Espanol, Murcia, Spain) had no effects on internal organ weights of broilers.

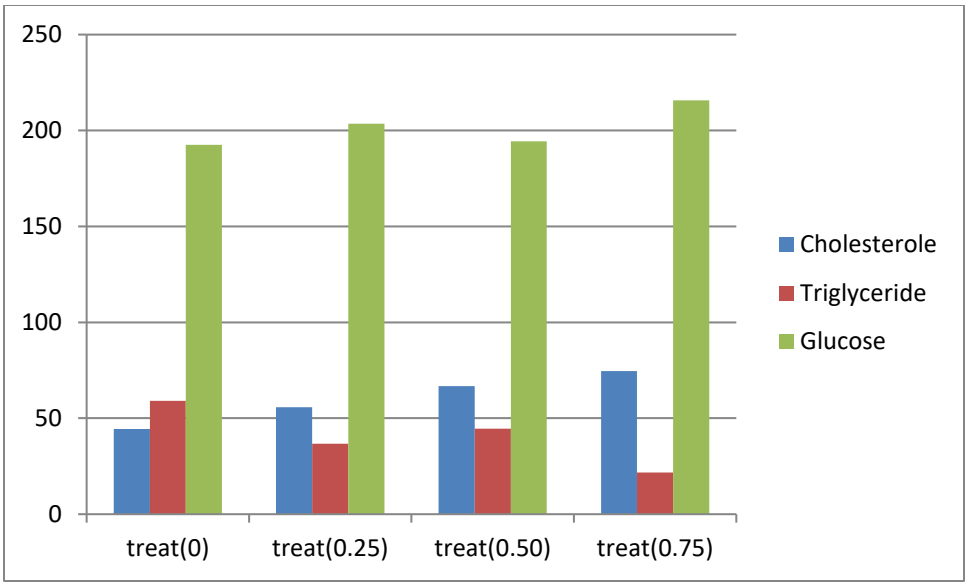
Table (5): Average Pre-slaughtering Weight, Carcass Weight, Internal Organs Weight and Dressing%

Parameters	Chilli powder level %				± SEM
	(0)	(0.25)	(0.50)	(0.75)	
L. weight(g)	1289.8[b]	1331.5[ab]	1450.3[a]	1423.3[ab]	62.235
Carcass (g)	921.25[a]	938.25[a]	1022.0[a]	1009.8[a]	58.230
Abdominal fat(g)	1.60[a]	1.56[a]	1.76[a]	1.40[a]	0.2432
Liver(g)	3.04[a]	3.08[a]	3.21[a]	3.39[a]	0.2644
Heart(g)	0.68[a]	0.59[a]	0.73[a]	0.57[a]	0.0924
Spleen	0.10[a]	0.07[a]	0.10[a]	0.11[a]	0.455
Dressing (%)	71.42[a]	70.354[a]	70.36[a]	70.98[a]	1.9096

* SEM = Standard error of the means

Chilli powder feeding at level of (0.75) % resulted in a significant decrease in serum total cholesterol than that of control as shown in fig (1). Dietary capsaicin and dihydrocapsaicin have been reported to reduce the level of serum cholesterol in experimental animals fed cholesterol-enriched diets. (Negulesco et al., 1987; 1989). It has been referred to decreased cholesterol synthesis, increased cholesterol excretion, or both as possible mechanisms for reduction in blood cholesterol level. Bravo (2008) reported that broiler chicken fed plant extract (Xract 6930) containing 2% capsaicin produced breast meat with higher protein and lower cholesterol. Chilli powder had hypo-choleaterolaemic effects in broiler chicken. On the other hand, our results showed a significant ($P<0.05$) effects in triglyceride as results presented by (Hencken, 1991), and there was no significant effects in glucose.

Figer (1) Blood parameters are affected by addition of Chilli powder.



CONCLUSIONS

- Feeding broiler chicks with high dietary Chilli powder level improved the growth performance in term of total body weight gain, total feed intake and economic value and carcass yield.
- The study emphasized that better performance, body weight gain andcarcass yield obtained by birds fed (0,50) % Chilli powder.
- Cholesterol and tri-glyceride were decreased with increasing dietary Chilli powder.
- The result showed no effects on internal organ weights of broilers.

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