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The effect of use red pepper (*Capsicum annum L*) and black pepper (*Piper nigrum L*) on performance and hematological parameters of broiler chicks

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ABSTRACT

The objective of this study was to determine the effect of use of red pepper, black pepper and their mixture powder on performance of broiler chicks. 320 one day old Ross 308 chicks were used in this study. Chicks were fed by basal diet as control, 0.02% red pepper (T_1), 0.02% black pepper (T_2) and 0.01% red pepper + 0.01 %black pepper powders (T_3). Feed intake, body weight gain, feed conversion ratio were determined. At the end of trial 4 chicks form each group were separated and slaughtered. Cholesterol, triglyceride, glucose levels and antibody titer against new castle vaccine were investigated. The result revealed that the inclusion of red and black pepper in broilers diet improved body weight gain, feed intake and conversion ratio. in addition use of red and black pepper depressed the cholesterol, triglyceride and glucose concentration and decreased H/L ratio concentration in broiler's blood plasma ($p<0.05$).mucosa and sub mucosa diameters of small intestine were significantly increased ($p<0.05$).musclaris and serosa diameters were higher in T_1, and T_3than control groups. Data from this study showed use of red and black pepper powder on broilers diets cause increase total diameter of small intestine parts ($p<0.05$).It was concluded that the use of red and black pepper as feed additive at 1% enhanced the overall performance of broiler chicks.

Key words: Black pepper, Red pepper, Performance, Broilers, Hematological parameters

Abbreviations: *FI, feed intake; BW, body weight; FCR, feed conversion ratio. T_1, basal diet with 0.02% added black pepper powder; T_2, basal diet with 0.02% added red pepper powder; T_3, basal diet with 0.02% added mixed of red pepper and black pepper powder, packed cell volume; PCV, hemoglobin estimation; Hb.*

INTRODUCTION

Pepper Species, commonly used in diet and traditional medicine, were assessed for their antioxidant potential. Red pepper (*Capsicum annuum L*) comes from fruits in the capsicum family. Antimicrobial peptides from red pepper are very efficient in inhibiting growth in human and plant pathogenic bacteria and fungi. The active material capsaicin, causing the hotness, is an odorless white alkaloid soluble in hot water, ethyl and methyl alcohols and acetone [3, 4]. Black pepper (*Piper nigrum L*) is flowering vine in the family Piperaceae genus Piper.[1,2,7,8].Piperine is one of compound of black pepper which has antiache effect [14,15].Piper Nigrum has medicinal uses and have been common medicines for various disorders of humans in traditional Indian families [6,14]. There are anti-bacterial and anti-oxidant effects in medicinal plants [1, 2, 3]. Research on the use of herbal mixtures in bird's diets has produced inconsistent results. the objective of this experiment was to investigate the effects of use red pepper , black

pepper and their mixture powder on performance , some hematological parameters and small intestinal thickness of broiler chicks.

MATERIALS AND METHODS

For investigate the effect of use Red and Black pepper on performance of broiler chicks a total 320 days old male chicks were divided into 4 groups (n=20) and assigned to 4 treatment diets. The experiment was carried out in 42 days. Red & black pepper purchased from local market and grounded separately to a fine powder and then mixed with the basal diet (Table 1). Feed and fresh water were providing *ad libitum* during this experiment. treatments were basal diet as control group, 0.02% red pepper, (T_1), 0.02% black pepper, (T_2) and 0.01% red pepper + 0.01% black pepper powders, (T_3) that they were balanced according to their requirement as shown in nutrition requirement council for broilers[16]. The live body weight gains of birds were measured individually and feed consumption and feed conversion efficiency were measured weekly. At the end of trial 4birds form each groups (totally 64 birds) were slaughtered. blood samples from each bird were collected and stored at refrigerator at +4°C for 24 h, the blood samples were subjected to biochemical for determine their cholesterol, triglycerides and glucose levels[5,25]. Antibody titers against new castle vaccine were measured by Haemagglutination inhibition test [7, 8]. data were collected and analyzed by using the general, linear model procedure of [18] and different means duncan's multiple ranges test was used to detect the differences at level ($p<0.05$). The data were analyzed according to the following model:

$Y_{ij} = \mu + T_i + e_{ij}$

Y ij = Average effect observed, μ = Total average, T i = Effect of treatments, e ij = Effect of errors

Table 1 – Composition of the experimental diets for broiler chicks

Ingredients %	0-14 (days old)	15-29 (days old)	29-42 (days old)
Corn grain	51.64	56.61	60.37
Soybean meal	37.74	32.30	27.81
Wheat grain	5.00	5.00	5.00
Vegetable Oil	1.40	2.03	2.84
DCP	1.56	1.47	1.39
Oyster shells	1.17	1.13	1.08
Methionine D-L	0.30	0.29	0.27
Lysine-L	0.13	0.13	0.30
Edible Nacl	0.26	0.24	0.14
Vitamin Premix*	0.30	0.30	0.30
Mineral Premix*	0.30	0.30	0.30
Red/Black Pepper/ Mixed	0.20	0.20	0.20
Calculated nutrient content			
ME(K_{cal}/K_{gr})	2.850	2.950	3.050
CP (%)	22	20	18.5
Ca (%)	0.90	0.85	0.80
Available Phosphorus (%)	0.45	0.42	0.40
Lysine (%)	1.35	1.20	1.16
Na (%)	0.16	0.15	0.15
Methionine+Cystine (%)	0.97	0.87	0.85

Supplied Per Kilogram Of Feed: 7.500 IU of vitamin A, 2000IU vitamin D3, 30 Mg vitamin E,1.5 µg vitamin B12,2Mg B6,5 Mg Vitamin K,5 Mg vitamin B2,1 Mg vitamin B1,40 Mg nicotinic acide,160µg vitamin Biothine,12 Mg Calcium pantothenate,1MgFolic acid 20 Mg Fe,71 Mg Mn,100µg Se,37Mg Zn,6 Mg Cu,1.14 Mg I,400 µg Cu.

RESULTS

Data from FI, BW and FCR are in (Table 2). Chicks were fed by red pepper, black pepper and mixed powders had, higher FI, BW and lower FCR ($p<0.05$).This result showed that T_1,T_2 ,T_3 have better final result in compare with control groups. This can be caused from the effects of dietary and nutrition increase [7, 8, 9]. The pathogenic microbial flora in the small intestine compete with host for nutrients while at the same time inhibiting the binding of the bile acids to the pertinent substances, they decrease the digestion of fats and fat-soluble vitamins [8,9,11]. This leads to a decrease in performance and increase in disease rate. Antibiotics in herbal plants which have been used as an additive in poultry feed for a long time, improve the growth performance by stabilizing the microbial flora in the

intestine and preventing some specific intestine pathogens[6]. It was determined that antibiotic, red pepper and black pepper powders had significant effects on some digestion system parameters compared to control group ($p<0.05$).

Table 2 – The effect of added experimental diets on broilers performance

Treatments	FI(g/d)	BW(g/d)	FCR	FI(kg)	Pre-slaughter weigh(g)	Carcass (%)
Control	68.33^{c}	33.80^{d}	1.97^{a}	2870^{c}	1420^{d}	70.11^{d}
T_1	69.26^{b}	37.26^{c}	1.85^{b}	2909^{b}	1565^{c}	72.21^{c}
T_2	70.33^{b}	38.33^{b}	1.83^{c}	2954^{b}	1610^{b}	71.70^{b}
T_3	72.11^{a}	38.83^{b}	1.85^{b}	3024^{a}	1631^{a}	74.00^{a}
MSE	0.056	0.141	0.217	0.521	1.114	0.104

**Means within row with no common on letter are significantly different ($p<0.05$).*

Black pepper increases digestion through arousing digestive liquids of stomach and eradication infectious bacteria [11]. Black pepper affects the absorption power, decrease material transit velocity and increase digestive enzymes acts and increased chicks dietary and weighs gain. [7,8] showed that according to the level of black pepper used that reflects the high activity of Piperazine citrate included in the broilers diet which may have affected the flow of digestive juices across the stomach[11]. Some researcher proved that there is an increase in BW, FCR with decreasing hematological values of some important blood parameters using of ginger or black pepper in broiler diets [12].Use of red pepper seed oil meal can improve the FI and BW for broilers [4]. The broiler chicks which fed supplemented diets with hot pepper showed improved feed conversion ratio. It may be due to its stimulant, carminative, digestion and anti microbial properties. The findings of these researchers in this case are in agreement with the other Scientifics' findings [7, 8, 9, 10].

The liver percentage was significantly increase were broilers fed with T_1,T_2 ,T_3 and the lowest decrease was for control group ($p<0.05$). There were significant differences for Heart percentage between treatments. The use of T_1 , T_2 and T_3 cause to reduce abdominal fat percentage significantly ($p<0.05$). Drumstick percentage was increase were broilers fed with T_1,T_2,T_3 ($p<0.05$). Data from table 3 showed that percentage of gizzard was higher in the T_3 groups and it was at the lowest in control groups ($p<0.05$).spleen weight percentage was higher on T_3 groups and at the lowest on control group ($p<0.05$).These observations are correlated with the data published by some authors [7, 8, 9, 21]. The ingestion of piperine increases the production and activation of salivary amylase. The digestive enzymes production by the ingestion of piper nigrum probably the stimulate liver to secrete bile, which Furth digests food substances [20, 22, 24].

Table 3 – The effect of experimental diets on percentage some part of chicks' bodies

Treatments	Liver (%)	Abdominal Fat (%)	Drumstick (%)	Breast Meat (%)	Gizzard (%)	Heart (%)	Spleen (%)
Control	2.50^{d}	4.10^{a}	20.24^{d}	25.21^{d}	2.51^{d}	0.67^{b}	0.217^{c}
T_1	2.81^{b}	3.02^{c}	22.62^{c}	25.73^{c}	2.70^{b}	0.68^{b}	0.230^{b}
T_2	2.70^{c}	3.22^{b}	22.64^{b}	25.89^{b}	2.65^{c}	0.68^{b}	0.231^{b}
T_3	3.01^{a}	2.65^{d}	23.45^{a}	26.17^{a}	2.81^{a}	0.71^{a}	0.241^{a}
MSE	0.115	0.126	0.234	1.67	0.121	0.137	0.145

**Means within row with no common on letter are significantly different ($p<0.05$).*

Table 4 – The effect of added experimental diets on some blood parameters

Treatments	Triglyceride(Mg/dl)	Glucose (Mg/dl)	Cholesterol (Mg/dl)	Hb (Mg/dl)	PCV (Mg/dl)	H/L (Ratio)	HI (log_2)
Control	73.13^{a}	138.21^{a}	131.3^{a}	8.75^{a}	28.40^{a}	0.44^{a}	3.87^{c}
T_1	71.42^{b}	129.45^{b}	124.5^{b}	8.21^{ab}	26.41^{b}	0.41^{b}	4.17^{b}
T_2	70.44^{b}	131.52^{b}	126.4^{b}	8.04^{b}	24.11^{c}	0.40^{b}	4.07^{b}
T_3	67.42^{c}	123.92^{c}	122.1^{c}	7.97^{b}	22.20^{d}	0.38^{c}	4.24^{a}
MSE	0.178	3.340	4.121	0.132	0.174	0.113	0.16

**Means within row with no common on letter are significantly different ($p<0.05$).*

Data from (Table 4) that showed the triglyceride, glucose, cholesterol Hb and PCV levels were changed. Blood calcium decreased when chicks used T_1 ,T_2 ,T_3 respectively. H/L ratio was lowest when chicks used T_3 ($p<0.05$). de conjugation of gallbladder acids in small intestine can affects control of serum cholesterol, while de conjugated acids are not capable to solve and absorb fatty acids as conjugated acids. As a consequence, they prevent from absorption of cholesterol [1, 2, 3, 13]. The pungent compound of piper nigrum especially piperine increases the production of saliva and gastric secretions [10]. Also free gallbladder acids attach to bacteria and fibers

and this can increase the excretion of them. This is consistent with the well-observed effect of pepper on lowering blood cholesterol level [17, 19, 20, 22,23].

Antibody titers against new castle vaccine was significantly higher when broilers were fed by T_1 ,T_2 ,T_3 ($p<0.05$). Piperine is an excellent bactericidal activity against all the gram positive and gram negative bacteria tested. In many studies the alkaloids like piperine, piperidine, volatile oil and resins might be responsible for the antibacterial activity. The mechanism of antibacterial action appears to be loss of control over cell membrane permeability [14, 15, 23, 19]. These results proved that red and black Pepper additives though being less effective- performed like antibiotic to certain extent and have a great potential to be utilized as an alternative. Black pepper also prevent the intestine induced oxidative stress, inhibit lipid per oxidation, arresting different radicals such as hydroxyl and super oxides radicals [12, 17, 20]. Pepper species also contain peptides with strong antimicrobial activity and that these peptides are encoded in the pepper genome [3,4].The inclusion of hot red pepper at levels of 0.50%, 0.75% and 1% in the diets improved body weight gain and conversion ratio improved at levels 0.50%, 0.75% and 1%. At the same time the hot red pepper of 0.25%, 0.75% and 1% depressed the cholesterol, Hb, RBC and H/L ratio concentration [3, 4, 8].

Some researcher reported that some plants or specific combinations of herbs in formulations may act as antioxidants by exerting superoxide scavenging activity or by increasing superoxide dismutase activity in various tissue sites [12, 13, 14, 15, 23].

Table 6 – The effect of experimental diets on intestinal morphology of broilers (Micron)

Treatments	Mucosa	Muscular	Serosa	Total
Control	110^{d}	11.20^{d}	6.41^{d}	128^{d}
T_1	113^{b}	12.24^{c}	7.21^{b}	131^{b}
T_2	112^{c}	12.40^{b}	7.20^{c}	130^{c}
T_2	114^{a}	13.11^{a}	8.21^{a}	135^{a}
MSE	0.146	0.017	0.414	0.723

**Means within row with no common on letter are significantly different (p<0.05).*

Data from (Table 6) showed that mucosa and sub mucosa thickness of small intestine were significantly increased by use T_1, T_2 and T_3 ($p<0.05$).musclaris and serosa diameters were higher in T_1, and T_3 than control group. Data from this study showed use of red and black pepper powder on broilers diets cause increase total diameter of small intestinal parts ($p<0.05$).use of red and black pepper significantly increased the absorption surface of the duodenum and the ileum. In fact, herbal growth promoters are able to modify the morphology of the small intestine. This could be attributed to the fact that the promoters reduce the growth of many pathogenic or nonpathogenic intestinal organisms [21]. The reduction of the inflammatory reactions at the intestinal mucosa leads to the increase of the villus area and of the functions of secretion, digestion, and absorption of nutrients by the mucosa [12].

CONCLUSION

It can be concluded that supplementation with Red pepper and Black pepper lead to significant increase in live body weight and improvement in initial weight gain, feed efficiency and blood chemical as compared to that of control group of broilers. In spite of the low consumption compared with other by the fact that is help herbal plant may provide some compounds that enhance digestion and absorption of some nutrients in these diets, but the mechanism of their actions is not clear known, so further studies are needed for more explanations.

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