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Use of black pepper (*Piper nigrum*) as feed additive in broilers diet

Galib A. M. Al-Kassie[1], Mamdooh A. M. Al-Nasrawi[2], Saba J. Ajeena[3]

[1]Department of Veterinary Public Health–College of Veterinary Medicine, University of Baghdad, Iraq
[2]AL-Door Technical Institute, Foundation of Technical Institutes, Baghdad, Iraq
[3]Department of Basic Science–College of Agriculture, University of Baghdad, Iraq

Abstract

This study was conducted to determine the performance of broilers fed diets with black pepper (*Piper nigrum*). A total of 250 (Rose 308) day old chicks were used in this study. Five levels of black pepper at the rate of 0.00%, 0.25%, 0.50%, 0.75% and 1% were incorporated into the basal diet of broilers for six weeks. The Results revealed that the inclusion of black pepper at the levels of 0.50%, 0.75% and 1% in the diets improved body weight gain, feed intake and conversion ratio. At the same time the black pepper of 0.50 %, 0.75% and 1% depressed the cholesterol, Hb, RBC and H/L ratio concentration. It was concluded that the use of black pepper as feed additive at 0.50%, 0.75% and 1% enhanced the overall performance of broiler chicks.

Key words: Black pepper, Feed additive, Performance, Broilers

Introduction

Black pepper (*Piper nigrum*) is a flowering vine in the family Piperaceae, genus Piper and species *Piper nigrum*. This herb is a known spice which improves digestibility (Moorthy et al., 2009). It is a common medicinal herb used in human diet. Black pepper (BP) is cultivated for its fruit, which is usually dried and used as a spice and seasoning (Moorthy et al., 2009). People take black pepper for stomach upset, bronchitis and cancer (Turner, 2004). It works to help fight germs (microbes) and causes the stomach to increase the flow of digestive juices. There is conflicting evidence about their role in cancer.

Growth promoters as digestion and absorption enhancer are important feed additives for improving growth rate, feed efficiency and prevention of intestinal infections (Mohan et al., 1996). Nowadays, scientists are working to define the most useful herbs and plant extracts to quantify what reliable effects they can have in poultry production (Gill, 1999), as well as to control the negative effect of antibiotics on the health and environment (Damme, 1999; El-Husseiny et al., 2002). Along the same line, Afifi (2001), Al-Harthi (2002a&b), Tollba and Hassan (2003), El-Deek et al. (2003) and Hassan et al. (2004) carried out a number of experiments to investigate the efficiency of adding herbs to the broiler diets.

Pepper Species, commonly used in diet and traditional medicine, were assessed for their antioxidant potential. Catalase activity predominated in Piper longum Linn, followed by Piper cubeba Linn (Karthikeyan and Rani, 2003). Black pepper (*P. nigrum Linn*) was found to be rich in glutathione peroxidase and glucose-6-phosphate dehydrogenase, it has been shown that piperine can dramatically increase absorption of selenium, vit. B complex, beta carotene and curcumin as well as other nutrients (Khalaf, 2008). Piperine enhances the thermogenesis of lipid and accelerates (Malini et al., 1999), energy metabolism in the body and also increases the serotonin and beta – endorphin production in the brain.

Pepper has been found to have antioxidant properties and anti-carcinogenic effect, especially when compared to chilli (Nalini et al., 2006). The outer fruit layer contains important odor-contributing terpenes, including, pinene, sabinene and limonene gives a tasty properties. The consumption of these spices would exert several health beneficial effects by the virtue of their innumerable therapeutic potentials, such as fever, asthma, cold, cough and other general health disorders (Chopra et al., 1992; Rakesh and Sushil, 2003).

Black pepper is very important spices in Brazil and throughout the world. BP is used directly as spice or it can be used to produce derivatives such as oleoresin and oil. However, heavy contamination by fungi often occurs because of the manufacturing practices employed. Indeed, the level of fungal contamination in pepper is one of the highest for spices so mycotoxins including aflatoxin have been frequently detected

(Francisco et al., 2001). In poultry nutrition, as it is known that feeding cost is considered the most expensive item in the whole production process. Therefore, attempts are usually made to reduce feed cost without adversely affecting performance or products safety (Gill, 1999; Dickens et al., 2001; Abaza, 2001; AL-Harthi, 2002; Hassan et al., 2004; Hassan et al., 2007).

The aim of this study was to evaluate the effect of different dietary levels of black pepper on the performance and hematological parameters of broiler.

Materials and Methods

The experiment was carried out at the poultry farm of Veterinary College, Baghdad University. Two hundred fifty, days old broiler (Rose 308) chicks were divided into 5 treatments groups (50 birds each treatments). Each group was further subdivided into 2 replicates, 25 birds each. The treatments were divided as fallows:

Diet 1= basal diet with no herbal plants (control)
Diet 2 = basal diet plus 0.25% of black pepper (250 gm/100kg of feed)
Diet 3= basal diet plus 0.50% of black pepper (500 gm/100kg of feed)
Diet 4= basal diet plus 0.75% 0f black pepper (750 gm/100kg of feed)
Diet 5= basal diet plus 1% of black pepper (1000 gm/100kg of feed).

Chicks were reared on floor pens (1.5m×1.5m) with a thick litter system of wood shavings (7 cm). The feeding program consisted of starter diet that have been used until 21 days of age and a finisher diet until 42 days of age .All diets of each period were prepared with the same batch of ingredients and all diets within a period had the same composition .Diets were formulated to meet or excess requirements according to the National Research Council (NRC, 1994) for broilers at this age. The feed and water were provided *ad libitum* during the experiment. Two phases of feeding program involved in supplying: starter (1-21 days of age) and finisher (22-42days of age). The chemical compositions of the experimental basal diets are shown in table (1).

Chicks were vaccinated against the most common diseases such as Newcastle Disease (ND) and Infectious Bronchitis (IB). Body weight was determined throughout the feeding periods; feed intake was recorded for the above periods. At the end of the experiment, three chicks from each replicate were randomly selected and weighted to obtain live body weight (LBW). Chicks were slaughtered by means of a sharp knife for complete bleeding and feathers were plucked. Head, internal viscera and shanks were removed. Carcass was left for one hour to remove excess water and allowed for over night cooling at 4±2°C then weighed. Dressing percentage was calculated free from giblets and the included organs were weight separately as percentage of the carcass weight. Blood samples were taken from the brachial vein with a syringe. Samples were used for the measurement of various hematological parameters including PCV, WBC and RBC count, hemoglobin (Hb) concentrations and hetrophile to lymphocytes ratio (H/L), glucose and cholesterol concentrations. Data were analyzed using the General Linear Model Procedure of SAS (1996). Duncan's multiple range tests was used to detect the differences ($P<0.05$) among different group means.

Table 1: Composition of the experimental basal diets

Ingredient (%)	Starter 1-21 day	Finisher 22-42 day
Yellow Corn	51	53.3
Soybean meal (45% protein)	30	25
Wheat	13.8	15
Oil	1	2.5
Premix*	2.5	2.5
Salt	0.3	0.3
Methionine	0.1	0.1
Lysine	0.1	0.1
Di- Calcium phosphate	1.2	1.2
Calculated chemical analysis		
ME(Kcal/kg)	3000	3086
Crude protein %	21.3	19.5
Calcium %	0.69	0.52
Avialable phosphore	0.74	0.69
Methionine	0.33	0.31
Lysine	1.19	1.08

*Premix:- (2.5%) Provided the following (per Kg of complete diets) 367500 IU, 133500 IU Vit.D 3,1920 mg, Vit.E, 83.42 Vit.K3 ,50 mg Vit.B1, 150 Vit B2, 500 mg Vit.B 3,1775 mg Vit.B6, 0.8mg Vit B12, 600mg, folic acid, 27 mg, Biotin, 5767.5 mg choline, 2667mg Fe, 333.75 mg Cu, 3334.06 mg Mn, 203 mg Co 2334.38 mg, Zn, 100.75 mg, Ca,10 mg Se, 65446.46 mg Ph, 36667.5 mg, DL-Methionine, 200.02 mg, Ethoxyquin, 50mg, Flavophospholipol, 30 g, fish meal, 1800 g wheat bran.

Results and Discussion

The mean body weight of broilers at 2, 4 and 6 weeks of age (Table 2) Showed that inclusion of feed with different levels of dried black pepper were significantly differs ($P<0.05$). This may be due to the digestibility property of black pepper included in the broiler diet, which was similar to the findings of Ghazalah et al. (2007) and Tollba et al. (2007). According to the level of black pepper used that reflects the high activity of piperazine citrate included in the

Table 2: Effect of different levels of black pepper on average body weight (gm) and body weight gain (gm) ± standard error

Treatments		Body weight (gm)			Body weight gain (gm)			
		2 wks	4wks	6wks	0-2 wks	2-4 wks	4-6 wks	0-6 wks
Control	T_1	424±4.75^{c}	1226±13.88^{b}	2616±48.19^{c}	383±11.81^{b}	802±11.81^{c}	1390±38.64^{b}	2575±41.62^{c}
BP 0.25%	T_2	450±9.58^{b}	1270±17.57^{b}	2670±78.22^{bc}	409±14.71^{ab}	820±14.72^{c}	1400±27.33^{b}	2629±38.75^{bc}
BP 0.50%	T_3	472±11.27^{a}	1325±23.24^{ab}	2745±58.60^{b}	431±12.91^{a}	853±12.19^{bc}	1420±21.92^{ab}	2704±42.32^{b}
BP 0.75%	T_4	468±12.54^{a}	1360±19.59^{a}	2825±32.31^{a}	427±9.60^{a}	892±9.62^{ab}	1465±32.61^{a}	2784±33.44^{a}
BP 1%	T_5	460±11.19^{a}	1410±1025^{a}	2840±37.37^{a}	419±16.91^{a}	950±16.93^{a}	1430±35.62^{a}	2799±31.40^{a}

Means with different superscripts in the same column differ significantly (P < 0.05); BP=Black Pepper

Table 3: Effect of different levels of black pepper on feed consumption (gm) and feed conversion ratio of broiler

Treatments		Feed consumption (gm)				Conversion ratio			
		0-2 wks.	2-4wks.	4-6wks.	0-6wks	0-2 wks	2-4wks	4-6wks	0-6wks
Control	T_1	605±8.93^{a}	1490±3.53^{c}	2770±3.24^{a}	4865±6.51^{a}	1.58±0.23^{b}	1.85±0.36^{a}	1.99±0.24^{a}	0.05^{a}±1.89
BP 0.25%	T_2	638±5.15^{b}	1484±3.75^{c}	2636±4.08^{b}	4758±7.18^{b}	0.13^{b}±1.56	1.81±0.26^{ab}	1.88±0.19^{b}	0.09^{b}±1.81
BP 0.50%	T_3	694±3.58^{a}	1527±2.17^{bc}	2646±3.14^{b}	4867±8.12^{a}	1.61±0.27^{a}	1.79±0.19^{bc}	0.17^{b}±1.86	1.80±0.07^{b}
BP 0.75%	T_4	683±2.04^{a}	1588±3.25^{b}	2629±2.16^{bc}	4900±9.13^{a}	1.60±0.042^{a}	1.78±0.31^{bc}	0.25^{bc}±1.80	1.76±0.06^{b}
BP 1.00%	T_5	678±2.58^{a}	1623±4.23	2529±2.09^{c}	4870±7.26^{a}	1.62±0.38^{a}	1.75±0.22^{c}	1.77±0.16^{c}	1.74±0.51^{b}

Means with different superscripts in the same column differ significantly (P<0.05); BP=Black Pepper

Table 4: Effect of different levels of black pepper on percentage weight of the edible giblet and dressing percent of broiler diet

Treatments		Edible giblet			Dressing percent %
		Heart %	Liver %	Gizzard %	
Control	T_1	0.67±0.02	2.6±0.19	2.9±0.34	73.2±1.60^{b}
BP 0.25%	T_2	0.71±0.03	2.8±0.21	3.1±0.31	74.8±1.92^{ab}
BP 0.50%	T_3	0.63±0.02	2.3±0.20	2.8±029	1.83^{a}±75.9
BP 0.75%	T_4	0.69±0.04	2.7±0.18	2.8±0.33	76.8±1.10^{a}
BP 1.00%	T_5	0.70±0.05	2.6±0.22	3.0±0.30	75.1±0.98^{a}

Means with different superscripts in the same column differ significantly (P<0.05); BP= Black Pepper

Table 5: Effect of different levels of black pepper on haematology parameters of broiler

Treatments		Hb (gm/100ml)	PCV (%)	RBC (10^6/mm^3)	WBC (10^3/mm^3)	H/L ratio	Cholesterol (mg/100ml)
Control	T_1	8.9±0.2^{a}	27.1±0.4^{a}	3.4±0.02^{a}	13.7±0.38^{a}	0.41±0.05^{a}	132.5±0.96^{a}
BP 0.25%	T_2	8.1±0.3^{b}	26.8±0.4^{a}	3.1±0.02^{b}	13.6±0.21^{a}	0.40±0.04^{a}	128.4±0.57^{a}
BP 0.50%	T_3	8.0±0.7^{b}	24.3±0.3^{b}	3.0±0.02^{bc}	14.1±0.32^{a}	0.33±0.05^{b}	1.17^{b}±107.4
BP 0.75%	T_4	7.6±0.4^{bc}	24.2±0.5^{b}	2.9±0.03^{c}	14.0±0.29^{a}	0.32±0.03^{b}	109.5±0.96^{b}
BP 1.00%	T_5	7.7±0.5^{b}	23.2±0.6^{b}	2.9±0.01^{c}	13.8±0.31^{a}	0.32±0.06^{b}	116.4±1.14^{b}

Means with different superscripts in the same column differ significantly (P<0.05); BP=Black Pepper

broiler diet which may have affected the flow of digestive juices across the stomach.

The mean cumulative feed consumption (g/bird) of broilers as influenced by dietary inclusion of dried black pepper powder is given in the in the table (2). There were no significant differences among treatment groups during 2nd, 4th and 6th week. This may be due to isocaloric and isonitrogenous diet fed throughout the experiment. This was in agreement with the findings of Ademola et al. (2009) and Doley et al. (2009) who observed no difference in feed intake in broiler fed black pepper.

Feed intake of the experimental groups during the growth period (0-2 and 2-4 wks.) showed a significant effect (P<0.05) as compared with control (Table 3). This may explain the growth improvement of this group during the same period (Table 2). At the same time the increase in feed intake of groups fed diet supplemented with different levels of black pepper could explains the superior body weight gain for that group in comparable with that reported by Al-Harthi, (2006), who found that broiler chicks fed diets supplemented with hot pepper showed improved feed conversion ratio. It may be due to its stimulant, carminative, digestion and anti-

microbial properties (Harithi, 2008; El-Husseiny, 2008). Table (4) shows that different levels of black pepper had no significant effect (P<0.05) on the percentage of edible giblets as compared with control group. This result was in contrary with Al-Kaisse (2009) who reported that use of herbal plants had no effect on the percentage of dressing.

Table (5) illustrates the effect of different levels of black pepper on haematological parameters treatments. This study showed that treatment groups fed black pepper had significantly (P<0.05) lowered cholesterol, H/L ratio, RBC, PCV and Hb as compared with the control group, but had no significant effect on WBC among treatments. These observations are correlated with the data published by some authors (Gross and Siegel, 1983; Avallone et al., 1996) who referred that H/L ratio could be regarded as a good indicator to examine the stress level of birds. The fact that active compounds in black pepper having receptors on adrenal gland may affect the nervous system and decrease ACTH secretion that causes stress which may lead to increase blood glucose concentration.

The reduction of the parameters (PCV, Hb and RBC) may be due to the activity of black pepper which may act on oestrogen hormone. Sturki (1976) reported that oestrogen hormone decreases erythrocyte formation and PCV and this agree with our results.

It was concluded that the use of black pepper as feed additive at 0.50%, 0.75% and 1% enhanced the overall performance of broiler chicks.

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