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Comparison of Using Different Level of Black Pepper with Probiotic on Performance and Serum Composition of Broiler Chickens

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ABSTRACT

In this study we tried to investigate the effect of different level of Black pepper with Probiotic on performance, serum composition and immunity parameters of broiler chickens. The study was carried out with 225 broiler chickens in 5 treatment groups and 3 repetitions for each group with 15 chickens. Experimental groups included T1, control group, T2,basal diet containing 1% probiotic(*L. acidophilus* and *L. casei)*, T3, Using 0.5% of Black pepper, T4, Using 0.75% of Black pepper, T5, Using 1% Black pepper. The results showed that using different level of black pepper had significant effects on performance, carcass traits and blood biochemical parameters of broilers ($p<0.05$). The highest percent of breast were observed in the group 2 but the lowest percent of breast was observed in control group also the lowest percent of abdominal fat and the highest level of HDL and food intake were observed in group 5. The amount of total LDL was not significantly different among groups but the effects of all treatments groups on SRBC count were significantly higher than control group. The results evidence that the using different level of black pepper and probiotic, in broiler feeds have significantly effects on performance, blood biochemical and immunity parameters.

KEYWORDS: Performance, broiler, Black pepper, Probiotic.

INTRODUCTION

Nowadays, there are a lot of concerns to finding non-synthetic alternatives for antibiotics among the scientists. The positive effect of herbal plants on broilers have been reported by many studies. Their anti biotical potential, hypocholestrolemic effects, growth promoting and availability are the most benificial part of herbs, which have drawn the scientists attention themselves [1].

There is an increasing trend in the prevalence level of disease, by industrialization of poultry science and breeding chickens in a large scale. To cope with this problem and improve the biological and nutritional characters of chickens, chemical compounds like antibiotic have been used highly in poultry industry.

Nowaday, there are a lot of concerns to finding non-synthetic alternatives for antibiotics among the scientists [1-4].There are a lot of reports indicating the positive effects of herbs like anti-coccidal , anti-oxidant, anti-fungi and etc. Some of medical effects of herbs are related to their secondary metabolites such as phenols, necessary oils, saponins and etc [2]. Herbs have been used for some disease since long time ago because of availability, easy usage, non side effects.

Black pepper (piper nigrum) is extracted from the core of pepper plant. Efficiency compounds of pepper consist: cupsaeesin, cupsisin and cupsantine that some of them allay rheumatic aches. Payperrine is another compound of black pepper which has anti-ache effect. Black pepper is of a hot temper and a good source of vitamin C.To date, probiotics are one of major food supplements for poultry industry. According to concerns about cholesterol, there are a lot of attempts to produce foods with low cholesterol. It has been reported that *L.acidophilus* can absorb cholesterol from in vitro system, and this phenomenon can decrease the cholesterol level of medium [5-6]. In this experiment we tried to investigate the comparative effects of different level of Black pepper with Probiotic on performance, blood chemistry, and immunity parameters of broiler chickens.

MATERIAL AND METHOD

In this experiment that starts 1 day following until 42 days that there are five treatments, at first 225 one day old broiler chicks were divided to 15 groups of 15 chicks each. Each 5 groups randomly assigned to one of the 5 treatments. Thus, amounts forementioned to basal diet was formulated according to table 1. Experimental groups included T1, control group, T2,basal diet

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containing 1% probiotic(*L. acidophilus* and *L. casei)*, T3, Using 1% of black pepper, T4, Using 1.5% of black pepper, T5, Using 2% black pepper powder.

During days 0-42, unbound water and dietary was in poultries' access. Dietary and chick weigh were going on weekly. Feed consumed was recorded daily, the uneaten discarded, and feed conversion ratio (FCR) was calculated (total feed: total gain). At the end of experiment, some analyses was done via SAS[7] (Statistical Analyses Software) in the statistical level of 5% according to data gathered from dietary, weight improvement, average of FCR, weight of rearing period and carcass yield.

Carcass traits

At 42 days of age, four birds per replicate were randomly chosen, slaughtered and carcass percent to live weight and percent of carcass parts to carcass weight were calculated.

Immunity system:

In the 35th day of experiment, three chicks were chosen from each group and inoculated from brachial vien by 0.1 ml (5 %). Heterophils to Lymphocytes ratio were determined and Globulin and Albumin proportion in blood were counted from blood samples which had been obtained from barchial vein of three randomly chosen chicks from each group in the 49th day of experiment.

Serum parameters:

Blood samples were obtained from barchial vein and centrifuged in order to getting serum, after 12 hours of fasting in the 49th day of experiment. Serums have been analyzed for Cholestrol, Low-density lipoprotein (LDL), High-density lipoprotein (HDL) and Triglyceride by ELISA set.

Table 1. Ingredients and chemical analyses composition of the starter and grower diets

Ingredients (g/kg)	1-28	29-42
Maize	557	300
Wheat	--	330
Soybean meal	370	300
Soybean oil	30	40
Fish meal	20	--
Limestone	10	--
Oyster shell	--	12
Dicalcium phosphate	5	15
Vitamin-mineral mix[2]	5	5
dl-methionine	1	1
Sodium chloride	2	2
Vitamin E (mg/kg)	--	100
Zn	--	50
Analyzed chemical composition (g/kg)		
Dry matter	892.2	893.5
Crude protein	222.3	200.7
Fat	62.4	62.9
Fiber	36.1	35.6
Ash	61.7	57.0
Calcium	8.22	8.15
Phosphorus	5.48	5.57
Selenium (mg/kg)	0.53	0.58
ME by calculation (MJ/kg)	12.78	12.91

[1] starter diet fed to birds from 0 to 21 days. [2]Provides per kilogram of diet: vitamin A, 9,000 IU; vitamin D3, 2,000, IU; vitamin E, 18 IU; vitamin B1, 1.8 mg; vitamin B2, 6.6 mg B2,; vitamin B3, 10 mg; vitamin B5, 30 mg; vitamin B6, 3.0 mg; vitamin B9, 1 mg; vitamin B12, 1.5 mg; vitamin K3, 2 mg; vitamin H2, 0.01 mg; folic acid, 0.21 mg; nicotinic acid, 0.65 mg; biotin, 0.14 mg; choline chloride, 500 mg; Fe, 50 mg; Mn, 100 mg; Cu, 10 mg; Zn, 85 mg; I, 1 mg; Se, 0.2 mg.

RESULT AND DISCUSSION

The effects of different levels of black pepper and probiotic on performance of broilers are showed in Table 2. According to comparisons of this table it has been proven that different treatments were observed for Weigh Improvement ($P<0.05$), Dietary, Average of feed conversion Ratio (FCR) and Average of Weight ($P<0.05$) in the experiment. The result showed that all the treatments have better final result in compare with control treatment. This can be caused from the effect of dietary and nutrition increase. Black pepper increases digestion through arousing digestive liquids of stomach and

eradicating infectious bacteria. Black pepper affects the absorption power of nutrition, decreases material transit velocity and increases digestive enzymes, chicks' dietary and weight gain.
These results are in agreement with Endens et al. [8] reported that probiotics improved digestion, absorption and availability of nutrition accompanying with a positive effect on intestine activity and increasing digestive enzymes.

Table 2- The effect of different treatments on the performance of broiler chicks during days 0-42

Experiment Treatments[1]	Weigh Improvement	Food Intake (G)	Average of FCR	Average Of Weight
T1	40.2^{a}	87.3^{a}	1.83^{a}	1986.2^{a}
T2	43.8^{ab}	89.2^{ab}	1.60^{ab}	2062.3^{ab}
T3	40.9^{a}	87.1^{a}	1.82^{a}	1980.5^{a}
T4	41.1^{a}	88.7^{ab}	1.81^{a}	2001.1^{a}
T5	43.2^{ab}	89.5^{ab}	1.64^{ab}	2031.5^{b}
SEM	0.54	0.90	0.04	39.7
P-value	0.03	0.007	0.004	0.03

a-c Means with in columns with different superscript differ significantly

Table 3 shows the effect of black pepper and probiotic on carcass parameters. According to the data, there are significant differences in the carcass characters ($p<0.05$). The highest percentage of breast was in the 2th group but the highest percentage of liver was in group 5. The present of antioxidants and phenolic substance in herbal plant may be the main cause of improvement percent of broilers carcass. The presence of harmful bacterial populations in the gastrointestinal tract may cause breakdown of amino acids and thereby reduce their absorption as antimicrobial substances can reduce the harmful bacterial populations in the gastrointestinal tract and improve the levels of absorbed amino acids [4,9].

Table3: Effect of different treatments on carcass traits.

T5	T4	T3	T2	T1	Characters (%)
^{b}2/65±0.21	^{ab}2/73±0.21	^{a}2/99±0.18	^{b}2/69±0.19	^{a}3/1±0.20	**Abdominal Fat**
^{a}2/68±0/44	^{a}2/69±0/13	^{a}2/59±0/85	^{ab}2/93±0/15	^{a}2/51±0/61	**Gizzard**
^{b}33/52±0/72	^{ab}31/82±0/55	^{ab}31/39±0/48	^{b}33/22±0/26	^{ab}31/28±0/75	**Breast**
^{a}26/96±0/65	^{a}26/49±0/93	^{a}26/61±0/46	^{a}26/98±0/77	^{a}26/28±0/81	**Lap**
^{a}3/35±0/42	^{a}3/05±0/09	^{a}3/01±0/23	^{ab}3/20±0/56	^{a}3/06±0/61	**Liver**

a-b: in each column the numbers which have different letters have significant differences ($p<0.05$).
*The blood biochemical parameters are in mg/dl.

The mean values of serum constituents in broiler chicken fed different level of black pepper is shown in Table 4. The serum HDL concentration was significantly induce also the level of the cholesterol and triglycerids reduce by dietary with black pepper and probiotic compared to the control group (P<0/05).. The main reason of cholesterol and triglycerids decrease in blood of chicks is substances like carvacrol and tymol which are present in herbs. These substances have effect on cholesterol and triglyceride and decrease these harmful parameters in blood [10]. According to *Akiba* and *Matsumoto* high level of fibers can increase the excretion of bile and this can decrease the cholesterol level of blood [11]. Since black pepper has high level of fiber so this can be another reason for decline of cholesterol and triglyceride in blood stream.

The cholesterol and triglyceride level of serum significantly decreased in groups supplemented with probiotics in compared to control group (Table 4). There are many reports that are in agreement with presented results in the current study. *L. acidophilus* is capable to deconjucate glyco cholic and taurocholic acids under anaerobic condition [12]. Deconjucation of gallbladder acids in small intestine can affects control of serum cholesterol, while deconjucated acids are not capable to solve and absorb fatty acids as conjucated acids.As a consequence,they prevent from absorption of cholesterol. Also free gallbladder acids attach to bacteria and fibres and this can increase the excretion of them.

The results of SRBC, Heterophils to Lymphocytes ratio, Globulin and Albumin counts are presented in table 4. The effects of all treatments groups on SRBC count were significantly higher than control group. Heterophils ratio to Lymphocytes were higher in groups T2 and T5 than T1. The Globulin and Albumin concentration were same in all groups except in group 2.

Table4: Effect of different treatments on blood biochemical and immune system parameteof broiler chickens.

Blood* parameters	T1	T2	T3	T4	T5
Cholesterol	^{ab}130/11±5/1	122/07±6/14	^{b}125/97±2/53	^{b}125/04±4/26	^{ab}123/07±6/1
Triglyceride	^{a}70/07±6/24	^{ab}62/27±3/10	^{a}69/22±3/34	^{ab}68/95±0/92	^{ab}64/42±6/69
LDL	70.12±3/2	68.18±4/86	69/07±6/14	68/91±2/40	68/11±5/6
HDL	58/31±1/25^{a}	61/29±1/35^{b}	59/05±1/38^{a}	59/39±1/75^{a}	62/49±1/13^{ab}
SRBC	^{a}5/15±0/24	^{ab}7/05±0/56	^{ab}6/09±0/13	^{ab}6/80±0/22	^{ab}6/91±0/67
Globulin	^{a}1/45	^{ab}1/86	^{a}1/39	^{a}1/43	^{a}1/48
Albumin	^{a} 1/30	^{ab} 1/61	^{a}1/37	^{a} 1/32	^{a}1/34
Heterophile /Lymphocyte	^{b}0/120±0/06	^{a}0/139±0/07	^{b}0/122±0/09	^{a}0/136±0/04	^{a}0/135±0/05

a-b: in each column the numbers which have different letters have significant differences ($p<0.05$).*The blood biochemical parameters are in mg/dl.

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