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Comparative Effects of Using Garlic as Probiotic on Performance and Serum Composition of Broiler Chickens

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ABSTRACT

The aim of this study was evaluated the effects of Garlic and Probiotic on performance and serum composition of broiler chickens. In this study that started 1 day following until 42 days. At first 225 one day old broiler chicks were divided to 15 groups of 15 chicks each. Each 3 groups randomly assigned to one of the 3 treatments. Experimental groups included T1, control group, T2, basal diet containing 1% probiotic (*L. acidophilus* and *L. casei*) 1-28, T3, was fed by basal diet plus 1 gr/Kg Garlic powder. As compared to the control group with the other groups observably to give improve performance in all of the experimental ($P < 0.05$). According to the results, total cholesterol (Chol), triglyceride (TG), HDL, and LDL were measured in blood samples of day 42. The amount of total Chol and triglyceride (TG) in the serum did showed a significant differences, but HDL and LDL was not significantly different among groups.

Key words: cholesterol, broiler, Garlic, Probiotic, broiler

INTRODUCTION

Nowaday, 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 [1]. Their anti biotical potential, hypocholestrolemic effects, growth promoting and availability are the most beneficial part of herbs, which have drawn the scientists attention themselves. After many years, the long term side effects of these products like microbial resistance and increase of the blood cholesterol level in the livestock lead to the ban of these commercial antibiotics [2,3].

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 [4-5]. There are reports that probiotics can reduce the cholesterol level of blood in broiler chickens [6-7]. Panda *et al.* [8]

reported that probiotics cause the reduction of serum and yolk cholesterol and also increase of egg production. Probiotics prescription is a good alternative for antibiotics for several reasons: suitable function, nonexistence of residue in poultry productions, environmental protection and also prohibition of antibiotics usage in Europe union [9-10].

Garlic (*Allium sativum*) is one of the most traditionally used plants as a spice and herb. Garlic has been using for a variety of reasons which most of them has been approved scientifically: anti atherosclerosis, anti microbial, hypolipidemic, anti thrombosis, anti hypertension, anti diabetes and etc. There are a lot of active components in garlic like: Ajoene, S-allyl cysteine, Di allyl (di/three) sulfide and the most active one Allicine [11]. Allicine possibly reduces LDL, triglyceride and cholesterol in serum [12] and it has been used for cardiovascular diseases [13].

The objective of this study was to investigate the interaction effects of supplementation of probiotic (*L. acidophilus* and *L. casei*) and garlic on the performance and blood chemistry of broiler chickens under commercial conditions.

MATERIALS AND METHODS

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.

In this experiment that started 1 day following until 42 days that there are three treatments, at first 225 one day old broiler chicks were divided to 15 groups of 15 chicks each. Each 3 groups randomly assigned to one of the 3 treatments. Thus, amounts forementioned to basal diet was formulated according to table 1 Experimental groups included T1. Control group, T2. basal diet containing 1% probiotic (*L. acidophilus* and *L. casei*)1-28, T3. have been fed by basal diet plus 1 gr/Kg Garlic.

Performance parameters

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[14] (Statistical Analyses Software) in the statistical level of 5% according to data gathered from dietary, average of FCR, weight of rearing period and carcass yield.

On 42 day of experimental period, 3 ml of blood was collected from brachial vein from one bird of each penpen (from four birds of each treatment). Serum was isolated by centrifugation at 3,000×g for 10 min. The serum concentrations of total triglyceride, cholesterol, high density lipoprotein (HDL) cholesterol and low-density lipoprotein (LDL) ratio in serum samples were analyzed by an automatic biochemical analyzer (Clima, Ral. Co, Spain).

RESULTS AND DISCUSSION

Table 2 shows the effect of different dietary on performance of boiler chickens. According to comparisons of this table it has been proven that three-way interaction between dietary treatments were observed that Dietary, Average of feed conversion Ratio (FCR), and Average of Weight in the experiment were significantly higher than control group. The result showed that both the treatments have better final result in compare with control treatment.

These data are against the results of *Fadlalla et al*'s [15] study in 2010 and *Onibi et al.* [16] study in 2009; they found that there is no difference between control group and broilers fed with garlic in both body weight gain and feed intake, but on the other hand *Sibel et al* in 1999 [17], *Kumar* in 2005 [18] and *Afsharmanesh et al* [19] in 2008 achieved the same results as we did; they reported the positive effect of Garlic on broiler performance.

The results of this study were expected about feed probiotic conversion ratio in control group. *Endens et al.* [20] reported that probiotics improved digestion, absorption and availability of nutrition accompanying with a positive effect on intestine activity and increasing digestive enzymes. *Jin et al* [21] reported that in low levels of *Lactobacillus* culture (0.05, 0.01%), feed intake rate have been increased, while *Timmerman et al.* [9] found inconsistent results, maybe because of type of diet ingredients which can affects probiotic's growth or their metabolites.

The mean values of serum constituents in broiler chicken fed different supplemented diets are shown in table 3. The serum total cholesterol and Triglycerides concentration were significantly reduced by dietary with Garlic compared to the control group. ($P < 0.05$). *Ologhobo et al* [22] reported that Garlic has reducing effect on triglyceride level and the best result were obtained in 2 % of garlic in the basal diet. Our results about cholestrol were against some of studies [23]; some of researchers found no diminishing effect for Garlic. But on the other hand, the results of *Al-Kassie* [24], *Ologhobo et al* [22] and *Afsharmanesh et al* [19] study agree with ours. *Al-Kassie*

and *Ologhobo et al* reported a big statistically difference in blood cholesterol level compared to control group respectively for Garlic. *Afsharmanesh et al* reported that Garlic decreases the blood cholesterol level.

The cholesterol level of serum significantly decreased in groups supplemented with probiotics in compared to control group (Table 3). There are many reports that are in agreement with presented results in the current study. *L. acidophilus* is capable to deconjugate glycocholic and taurocholic acids under anaerobic condition. Deconjugation of gallbladder acids in small intestine can affect control of serum cholesterol, while deconjugated acids are not capable to solve and absorb fatty acids as conjugated 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 [20].

There is a significant decrease in the serum level of triglycerides between control group and groups treated with *L. acidophilus* and *L. casei* supplemented in male broiler diet in combination with water or alone. *Moharrery et al.* [25] reported that fat digestion rate is linked to rate of gallbladder acids in digestion latex, and subsequently the lipid concentration. *L. acidophilus* and *L. casei* in diet or water cause a decrease in gallbladder acids in digestion latex and this resulted in a reduction in ability of fat digestion and therefore decreasing lipid level of blood.

Table 2- The effect of different treatments on the performance of broiler chicks

Experiment Treatments	Dietary (G)	Average of FCR	Average of Weight
T1	87.9 ^a	1.83 ^a	1994.7 ^a
T2	81.5 ^b	1.41 ^b	2365.6 ^b
T3	84.2 ^a	1.44 ^b	2199.7 ^c
SE	0.93	0.04	34.1
P-value	0.03	0.002	0.03

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

Table 3: Effect of different supplementation on serum constituents of broiler chicken

Experiment Treatments ¹	Total cholesterol	HDL	LDL	Triglycerides
T1	171.5 ^a	58.22	79.12 ^a	153.74 ^a
T2	132 ^{ab}	60.12	42.21 ^{ab}	121.46 ^b
T3	133 ^{ab}	62.28	67.32 ^a	122.64 ^b
SE	6.56	4.21	6.54	14.69
P-value	0.003	0.3	0.001	0.02

Means with in columns with different superscript differ significantly

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