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# Effect of Probiotic Bacteria Utilization on Serum Cholesterol and Triglycrides Contents and Performance of Broiler Chickens

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**Abstract:** A study was conducted to determine the effect of diet supplementation with *Lactobacillus acidophilus* and *Lactobacillus casei* alone or in combination with water on total cholesterol and triglycerides concentrations in the blood serum and also, on growth performance of broilers. Two hundred one day old male Ross 308 broilers were randomly assigned to 5 treatments, with 4 replicate, 10 birds per each. Experimental diets consist of basal diet as control (T1), basal diet with water containing 0.5% *L. casei* (T2), basal diet with water containing 0.5% *L. acidophilus* (T3), basal diet plus 1% *L. casei* (T4) and basal diet plus 1% *L. acidophilus* (T5), were fed to birds throughout 1 to 42 day breeding period. Total cholesterol (Chol) and triglyceride (TG) were measured in blood samples of day 40.The amount of total Chol and TG in the serum did showed a significant decline (P<0.01) in all dietary groups except control. The best performance was detected in birds fed on T3 diet and followed by dietary T5 group; however, all treatments were presented a good performance in compared to control group. It was concluded that diet supplementation with *L. acidophilus* and *L. casei* in combination with water and or alone, significantly decreased total cholesterol and triglycerides concentrations in the blood serum of broiler chickens accompanying with improving feed conversion ratio, body weight gain and finally carcass yield.

**Key words:** Cholesterol · Triglyceride · Broiler · Supplemented diet and water · *L. acidophilus, L. casei* · Breast · Thigh

## INTRODUCTION

Antibiotic means against life and probiotic means for life [1]. Probiotics are microbial supplements which can improve host body by microbial balance of intestine [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 [2, 6]. Panda *et al*. (2003) reported that probiotics cause the reduction of serum and yolk cholesterol and also increase of egg production [7].

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 [8, 9].

In the present study, we investigated the effect of *L. acidophilus* and *L. casei* as probiotics on serum cholesterol and triglyceride, carcass parameters and growth performance of broiler chickens.

## MATERIALS AND METHODS

A total of 200 one day old male broiler chickens (Ross 308) divided in 5 groups with 4 replicates (10 birds per each). Experimental groups: $T_1$) control, $T_2$) basal diet with drinking water containing 0.5% *L. casei*, $T_3$) basal diet with drinking water containing 0.5% *L. acidophilus*, $T_4$) basal diet containing 1% *L. casei*, $T_5$) basal diet containing 1% *L. acidophilus* were fed to birds for a period of a 42 days breeding. The treatment diets were formulated to meet the NRC (1994) and all hens were given free access to corn and soybean meal diets. MRS Broth was used as medium culture for *Lactobacillus*. *L. casei* have been incubated in 30°C and *L. acidophilus* has incubated in 37°C for 48 hours.

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Table 1: Effects of diet supplemented probiotics on food consumption, daily weight gain, feed conversion ratio and final body weight

| | Food consumption (g) | | | Daily weight gain | | | Feed conversion ratio (g) | | | Final body weight (g) |
|---|---|---|---|---|---|---|---|---|---|---|
| Groups | 1-21 days old | 21-42 days old | 1-42 days old | 1-21 days old | 21-42 days old | 1-42 days old | 1-21 days old | 21-42 days old | 1-42 days old | At the end of experiment |
| $T_1$ | 1001.20 | 2668.12 | 3669.14 | 634.54 | 1387.68$^{b}$ | 223.96$^{b}$ | 1.76 | 1.98$^{b}$ | 1.86$^{b}$ | 2061.15 |
| $T_2$ | 851.85 | 2691.54 | 3541.35 | 604.29 | 1551.17$^{a}$ | 2152.31$^{ab}$ | 1.38 | 1.71$^{ab}$ | 1.63$^{ab}$ | 2200.72 |
| $T_3$ | 882.61 | 2813.72 | 3700.07 | 638.34 | 1577.98$^{a}$ | 2216.01$^{a}$ | 1.31 | 1.75$^{ab}$ | 1.64$^{ab}$ | 2264.95 |
| $T_4$ | 851.89 | 2660.96 | 3514.87 | 613.08 | 1559.97$^{a}$ | 2169.56$^{ab}$ | 1.38 | 1.66$^{a}$ | 1.58$^{a}$ | 2218.65 |
| $T_5$ | 917.98 | 2594.78 | 3514.75 | 664.32 | 1550.13$^{a}$ | 2213.52$^{a}$ | 1.39 | 1.64$^{a}$ | 1.55$^{a}$ | 2263.70 |
| SEM | 60.87 | 60.87 | 88.58 | 24.70 | 24.70 | 36.23 | 0.037 | 0.037 | 0.038 | 40.97 |
| *P*-value | NS | NS | NS | NS | * | * | NS | * | * | NS |

$^{a-b}$Values in the same row and variables with no common superscript differ significantly. $^{*}$: P<0.05, $^{**}$: P<0.01, NS: not significant

After 40 days, one chicken from each group randomly selected for blood sampling. Serums were used for further experiments.

All data have been analyzed by EXCEL and SAS software. Also, GLM and Tukey tests were used (P > 0.05). Data from food consumption, daily weight gain and feed conversion ratio were analyzed by LSD and mixed models in SAS software. For one time measured specifics, the below statistical model were used:

$$y_{ij} = \mu + T_i + \varepsilon_{ij}$$

## RESULT AND DISCUSSION

There was no significant difference in food consumption rate between treatments (Table 1). The results of this study are in agreement with results reported by Jin *et al*. [10]. In study of tree different level of *Lactobacillus,* Jin *et al*. [10] reported that in low levels of *Lactobacillus* culture (0.05, 0.01%), feed intake rate have been increased, while Timmerman *et al*. [11] found inconsistent results, maybe because of type of diet ingredients which can affects probiotic's growth or their metabolites [11].

There were no significant differences among groups in weight of chickens. Watkins *et al*. [12] found the same results and reported that the optimized condition which probiotics could not perform their ability under these circumstances[12].

The results of this study were expected about feed conversion ratio in control group. Endens *et al*. [1] reported that probiotics improved digestion, absorption and availability of nutrition accompanying with a positive effect on intestine activity and increasing digestive enzymes [1].

Table 2: Effects of diet supplemented probiotics on carcass yield and percentage of different parts of carcass

| Groups | Carcass output | Breast /carcass | Thigh / carcass |
|---|---|---|---|
| $T_1$ | 71.76$^{ab}$ | 31.91$^{ab}$ | 30.16$^{b}$ |
| $T_2$ | 77.54$^{a}$ | 33.26$^{bc}$ | 32.43$^{b}$ |
| $T_3$ | 73.08$^{b}$ | 32.31$^{c}$ | 36.22$^{a}$ |
| $T_4$ | 75.18$^{ab}$ | 36.04$^{a}$ | 32.35$^{b}$ |
| $T_5$ | 72.97$^{b}$ | 36.48$^{a}$ | 32.91$^{b}$ |
| SEM | 0.00065 | 0.00047 | 0.00052 |
| P-value | * | ** | * |

$^{a-b}$Values in the same row and variables with no common superscript differ significantly. $^{*}$: P<0.05, $^{**}$: P<0.01, NS: not significant

Table 3: Effects of diet supplemented probiotics on cholesterol and triglycerides levels of blood in broilers

| Groups | Triglyceride | Cholesterol |
|---|---|---|
| $T_1$ | 101.22$^{b}$ | 199.76$^{b}$ |
| $T_2$ | 57.00$^{a}$ | 158.75$^{ab}$ |
| $T_3$ | 53.04$^{c}$ | 181.00$^{ab}$ |
| $T_4$ | 52.98$^{c}$ | 151.23$^{a}$ |
| $T_5$ | 56.38$^{a}$ | 161.57$^{ab}$ |
| SEM | 9.26 | 9.058 |
| P-value | * * | ** |

$^{a-b}$Values in the same row and variables with no common superscript differ significantly.$^{*}$: P<0.05, $^{**}$: P<0.01, NS: not significant

There are many reports that indicated the carcass weight increased by increasing protein amount of diet. In the present study, increase in the carcass weight could be probably because of increase in available protein (Table 2) and it was demonstrated that adding bacteria to diet directly enhance the protein availability [13].

There is an increase in proportion of breast compared to carcass weigh probably because of changes in fat metabolism in breast's tissuewhich could affected by *Lactobacillus*es activity.

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 deconjucate glyco cholic and taurocholic acids under anaerobic condition [4]. 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.

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*. [14, 15] reported that fat digestion rate is linked to rate of gallbladder acids in digestion latex and subsequently the lipidconcentration. *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.

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