Praca oryginalna *Original paper*

Effects of kefir as a probiotic on serum cholesterol, total lipid, aspartate amino transferase and alanine amino transferase activities in broiler chicks

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Summary

The effect of varied amounts of kefir applied in drinking water was investigated in relation to changes in total cholesterol serum, total lipid, aspartate amino transferase (AST) and alanine amino transferase (ALT) activities in broiler chicks. Ninety broiler chicks (one-day old) with an average weight of 37 g were divided into 3 groups including one control and 2 experimental groups. While all groups were fed with the same ration, they received kefir added in drinking water according to following regimen: chicks in the control group received normal drinking water ad libitum, group 1 was treated with 5% kefir in drinking water ad libitum and group 2 was given 7.5% kefir in drinking water ad libitum, respectively. At the end of experiment (42 day), live weights of the groups were as follows group 1: 2305 g, group 2: 2363 g and group 3: 2388 g. Live weights of chicks in group 3 significantly increased ($p < 0.05$) compared to that of the control group. Total cholesterol serum and total lipid levels were significantly reduced ($p < 0.05$) in groups 2 and 3 compared to that of in control group in response to kefir treatment. Moreover, kefir treatment in the groups did not result in any changes in serum AST and ALT activity.

The obtained results demonstrate that use of kefir as a probiotic in drinking water increases live weight, lowers total cholesterol and total lipid thus suggesting that its use in human diets may have beneficial effects.

Keywords: probiotic, kefir, broiler chicks

Probiotics are effective compounds in the treatment and protection of some alimentary track infections as they alter the intestinal flora in favor of beneficiary microorganisms. They are used to increase feed conversion as well as to decrease malnutrition and stress conditions (1, 6).

Kefir belongs to the probiotic group and is an alcohol containing, weakly acidic milky product obtained from kefir grains or via fermentation of milk using a starter culture (14). Microbiologically, kefir contains *Lactobacillus* (*L. lactis*, *L. helveticus*, *L. casei*), *Streptococcus* (*S. cremoris*, *S. lactis*) and yeast species as a starter culture (25). It is composed of 0.5-1.5% ethyl alcohol, 0.7% lactic acid, 3.2% fat, essential amino acids and some minerals such as (Ca^{++}, Mg^{+}, P^{+}). However, kefir contains more biotin, folic acid, vitamin B_1, B_{12}, and K than milk. Since all proteins in kefir are digestible, it can be easily utilized by the alimentary tract (13).

There has been an increase in the production of kefir in many countries, and reports over the last decade have indicated that patients suffering from lack of appetite, insomnia, renal diseases, hepatitis, infectious diseases (tuberculosis, AIDS), eczema, and cancer may have some benefits from the use of kefir in treating these disorders (11, 16).

As far as literature is concerned, there are some studies regarding the use of kefir in humans and some animal species, and a limited number of studies about the use of kefir in avian species (26). Therefore, this study investigated the effects of kefir on serum cholesterol, total lipid, aspartate amino transferase (AST) and alanine amino transferase (ALT) activities in broiler chicks.

Material and methods

In this study, 90 Ross PM-3 broiler chicks (one-day-old) were obtained from a commercial source, and the animals were divided into 3 groups. The chicks were placed in heated cages for 10 days, and were then reared on wood dust litter within floor pens for the rest of experimental procedure. Temperature was maintained at 32°C for the 1st week, at 27°C for the 2nd week, 25°C for the 3rd week, 23°C for the 4th week and 20°C for the 5th and 6th weeks. Light was provided 24 hours a day. Kefir was delivered via drinking water *ad libitum*. Group 1 served as the control and received normal drinking water. Chicks in group 2 were applied 5% kefir in drinking water. Group 3 received 7.5% kefir in drinking water, respectively. Animal feed was prepared using raw grain obtained from Kars Feed Mill (Kars, Turkey), soy bean meal and other grains high in corn. Feed given to the chicks and feed spilling around the cages was weighed. Daily feed intake was calculated and data were recorded.

Kefir grains were obtained from the University of Kafkas, Faculty of Veterinary Medicine, Department of Food Hygiene and Technology. Kefir was freshly prepared from 3% UHT cow's milk by mixing it with 5% active kefir grains and incubating at 22°C for 20 hours as needed (15).

At the end of experiment (42 day), blood samples were collected from the ulnar vein of each bird. The sera samples were separated and stored at –24°C until they were analyzed. The chickens were euthanatized and carcass weights were taken. Additionally, tissue samples from each bird were removed and weighed. Serum cholesterol and total lipid levels were determined according to the method of Leffler (6) and Kunkel-Fenol (6), respectively. Measurements of AST and ALT activities were carried out by the method of Reitman-Frankel (21).

The analysis of variance (ANOVA) procedure was utilized to compare treatment groups using SAS statistical packet program. Group data were presented as mean ± SE and significance levels of 0.05* were used for comparison of treatments.

Results and discussion

Table 1 shows mean live weights and liver weights of the treatment groups. Live weights of the groups were as follows group 1: 2304.6 g, group 2: 2362.6 g and group 3: 2387.6 g. Live weights of chicks in group 3 significantly increased ($p < 0.05$) compared to that of control group. As the amount of applied kefir increased, there was a corresponding increase in the mean live weight of treatment groups. However, the difference between treatment groups was not statistically significant with the exception of group 3. There was no difference among the treatment groups in terms of the liver weights.

Table 2 shows serum cholesterol, total lipid levels, AST and ALT activities. Total serum lipid concentration was significantly reduced in group 2 and 3 ($p < 0.05$) when compared to the control, while serum cholesterol values were significantly lower in group 2 and 3

Tab. 1. Mean live and liver weights of the treatment groups

Group	Live weight (g)	Liver weight (g)
1	2305.6 ± 23.9^{a}	48.3 ± 2.2
2	2363.6 ± 21.5^{ab}	48.4 ± 2.8
3	2388.6 ± 18.6^{b}	51.1 ± 1.6

Explanation: difference between the groups is denoted by different letters within the same column $p < 0.05$

Tab. 2. Serum cholesterol, total lipid levels, AST and ALT activities of treatment groups

Group	Total cholesterol (mg/dl)	Total lipid (mg/dl)	AST (IU)	ALT (IU)
1	173.46 ± 3.14^{a}	392.40 ± 3.31^{a}	63.60 ± 1.11^{a}	46.46 ± 0.84^{a}
2	146.36 ± 3.14^{b}	375.70 ± 3.31^{b}	61.43 ± 1.11^{a}	48.06 ± 0.84^{a}
3	142.10 ± 3.14^{b}	370.53 ± 3.31^{b}	62.60 ± 1.11^{a}	46.23 ± 0.84^{a}

Explanation: as in tab. 1.

($p < 0.005$). Furthermore, no difference was observed between the experimental and control group in terms of AST and ALT activity.

It has been previously reported that adding *Lactobacillus* culture into broiler feed has resulted in an increase in live weight (9, 27, 28). Accordingly, we investigated the effects of kefir delivered via drinking water on selected parameters in broiler chicks. Similar to the above mentioned reports, we observed an increased mean live weight in chicks receiving the highest dose of kefir in group 3. This increase in live weight may have been a result of alterations in gut micro flora in favor of beneficiary microorganisms via probiotics as well as an improvement in feed conversion due to *Lactobacillus spp.*

Several studies reported that the use of probiotics did not result in an increase in liver weight (9, 19), whereas one study indicated that use of probiotics significantly increased liver weight (17). In the present study, no change has been observed in liver weight in response to the various doses of kefir treatment.

It is suggested that reduced serum cholesterol concentration induced by kefir could be attributed to the fact that the deconjugation of bile acids by *Lactobacillus spp.* increases a discharge of bile acids which in turn increases the expenditure of cholesterol to produce bile acids as well as precipitating cholesterol due to the low pH value of kefir (3, 23). In addition, inhibition of 3HMG-Co A which is an intermediate of mevalonate during the synthesis of cholesterol from acetyl-Co A by fermented milk products has been suggested as the reason for the reduced level of cholesterol in serum (22).

In a previous report, supplementing rations with probiotics reduced cholesterol levels in the serum and eggs of laying hens (18). Adding yoghurt into rat's diets also reduced total serum cholesterol levels (10). Fur-

thermore, it was reported that fermented milk products have resulted in lowered serum levels of cholesterol in healthy males (1). Indeed, a number of studies have indicated that fermented milk products have been able to decrease total cholesterol (7, 8, 20). Our results were in accordance with those previous reports in so far as there was a decrease in serum cholesterol levels of all kefir-treated chickens in a dose dependent manner. Decrease in cholesterol levels could be associated with both a reduction in cholesterol biosynthesis in the liver and an increase in degradation of bile acids by *Lactobacillus species*.

Xiao et al. (24) reported that rats receiving fermented milk products had reduced serum lipid levels. However, Kiyosava et al. (12) reported that fermented milk products did not affect serum lipid levels in rabbits. In this study, we observed a decline in serum total lipid concentration in group 2 and 3.

The liver plays an important role in metabolic processes, and the metabolic activity of the liver is important for the normal functioning of cellular events. Serum AST and ALT are indicators of normal liver functioning (4). In this study, there was no change in AST and ALT activities in all groups.

In conclusion, we suggest that the application of kefir in the diet of broiler chickens increases live weight which, in turn, may be of economical benefit for the poultry industry. Furthermore, kefir may also be beneficial for humans due to its effect of lowering total cholesterol and total lipids.

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