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Effects of Kefir as a Probiotic on Growth Performance and Carcass Characteristics in Geese (*Anser anser*)

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Abstract: The objective of this study was to investigate, the effects of Kefir as a probiotic on growth performance and carcass characteristics in Geese. For this aim, 54 goslings at 21-day-old age were randomly divided into 1 control and 2 treatment groups each of which had 3 replicates of 6 birds. The goslings were fed with a starter diet (22% HP, 2900 MJ kg^{-1} ME) from 3-6 weeks of age and then with a grower diet (15% HP, 2900 MJ kg^{-1} ME) during 6-12 weeks period. Group 1 served as control and received normal drinking water. For group 2 and 3, 2.5 and 7.5% Kefir was applied in drinking water. Feed and water was offered *ad libitum*. All birds were individually weighed at the start and then weekly intervals until the end of the experiment. Feed consumption of each experimental unit was recorded weekly on pen basis and feed conversion ratio was calculated. At the end of the study period, 2 goslings were randomly selected from each replicate treatment groups for slaughter. The results showed that total body weight gain, total feed intake, feed conversion ratio values were similar in all experimental groups during whole the trial period ($p>0.05$). Despite the numerical variations, no statistical difference was seen among the groups in terms of slaughter traits, organ weights, carcass characteristics and meat composition values ($p>0.05$). On the other hand, a gradual increase was seen in abdominal fat amount contrary to the decrease in total skin amount based on the increased kefir rates. Similarly, the numerical increase in meat weight opposite to the decrease in fat weight attracted attention. This might be an evidence to explain the different effects of Kefir on meat and fat tissue development in geese.

Key words: Kefir, geese, growth performance, carcass characteristics, probiotic

INTRODUCTION

A growing tendency has been occurred towards organic and natural products all over the world. Considering the hazardous effects of feed supplements (antibiotics and chemotherapeutics) on human and animal health, enzymes, organic acids and probiotics have become the primary alternatives (Karademir and Karademir, 2003). Studies on the influence of microbial feed supplements, in particular lactic acid bacteria have focused on their growth promoting effects on poultry but less attention has been given on their effects on carcass characteristics (Midilli and Tuncer, 2001; Lan *et al*., 2003; Arslan, 2004; Kabir *et al*., 2004; Anjum *et al*., 2005; Khaksefidi and Rahimi, 2005; Sultan *et al*., 2006; Yaman *et al*., 2006; Sahin *et al*., 2008).

Kefir is a unique natural product containing complex mixtures of lactic acid bacteria and yeast (Marshall and Cole, 1985). Some strains of several *Lactobacilli* and yeast in Kefir grains have already been reported to be probiotics such as *Lactobacillus delbrueckii* subsp. bulgaricus, *L. acidophilus*, *L. plantarum*, *L. brevis*, *L. fermentum*, *L. casei*, *L. helveticus*, *Lac. Lactis* subsp. *lactis*, *Streptococcus thermophilus*, *Saccharomyces cerevisiae* and they are used in probiotic preparations (Fuller, 1989).

According to several studies, probiotics were found to improve body weight gain and feed conversation ratio in poultry (Jin *et al*., 1996; Huang *et al*., 2004; Bozkurt *et al*., 2005), however, some other studies reported that probiotic supplementation was not effective on growth performance in the poultry (Yeo and Kim, 1997; Cavazzoni *et al*., 1998; Yaman *et al*., 2006). While, some of the researchers indicated that probiotic utilization in broilers improved meat and carcass quality (Pelicano *et al*., 2003; Khaksefidi and Rahimi, 2005; Kalavathy *et al*., 2006), some others did not observe any obvious change in yields (Denli *et al*., 2003; Bozkurt *et al*., 2005; Molnar *et al*., 2005).

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Considering the studies about probiotic utilization, it is seen that less attention has been given to their effects on carcass characteristics. Moreover, studies on the usage of probiotic as a supplement in animal nutrition have generally been limited by broilers. Therefore, research and information about the effect of kefir on performance and carcass characteristics of geese is not adequately available yet.

The objective of this study was to investigate, the effects of Kefir as a probiotic on growth performance and carcass characteristics in geese.

MATERIALS AND METHODS

Fifty four goslings of 21 days old age were used as the study material. The birds were randomly divided into one control and 2 treatment groups, each of which had 3 replicates of 6 goslings. Nine wooden cages of 100×150×98 cm were used to accommodate 6 goslings m^{-2}. Wood shavings were used as bedding. The goslings were fed with a starter diet (22% HP, 2900 MJ kg^{-1} ME) from 3-6 weeks of age and then a grower diet (15% HP, 2900 MJ kg^{-1} ME) during 6-12 weeks period. Only sun day light was provided during the experimental period. The goslings were allowed to access feed and water *ad libitum*. The experimental design consisted of 2 different (2.5, 7.5%) levels of Kefir supplementation in drinking water. Group 1 served as the control and received normal drinking water, goslings in group 2 were applied 2.5% Kefir whereas, group 3 received 7.5% Kefir in drinking water.

Kefir grains were obtained from Food Hygiene and Technology Department in Faculty of Veterinary Medicine, Afyon Kocatepe University. Kefir was freshly prepared from 3% UHT cow's milk by mixing with 5% active kefir grains and incubating at 22°C for 20 h.

All the birds were individually weighed in the beginning of the experiment (3 weeks age) and weekly intervals thereafter. Feed consumption of each experimental unit was recorded weekly on pen basis and Feed Conversion Ratio (FCR) was calculated. At the end of the study period, 2 goslings were randomly selected from each replicate treatment groups for slaughter. At 12 weeks of age, a total of 18 geese were starved for 12 h with access to water and then slaughtered by severing the carotid artery and jugular veins. After plucking, the geese were eviscerated. Feet and shanks were removed at the tibio-tarsus joint and the head at the atlanto-occipital articulation. The viscera were removed as usual dressing of poultry carcasses. The heart, liver and empty skinned gizzards were weighed individually and their sum of weights giblets was taken. Abdominal fat was gathered from the abdominal membrane and surrounding gizzard and liver. The percentage of the weight of organs, total skin (with fat) or abdominal fat was calculated as weight of organ/body weight ×100. Carcass yield dressing percentage was obtained by expressing the dressed carcass weight (without giblets) as a percentage of live body weight. Subsequently, carcasses were stored +4°C for 24 h. The carcasses were divided into neck, wings, legs, breast and back. Breast and left leg parts were then dissected into muscle, fat and bones and calculated as percentage of the total parts. Obtained data were recorded for each gosling separately.

Data were analyzed using SPSS-10 program designed for Windows. Group means were compared by analysis of variance (ANOVA) and significance was determined by Duncan's multiple range test at $p<0.05$ level.

RESULTS AND DISCUSSION

The effects of Kefir on growth performance and FCR values are summarized in Table 1. Kefir supplementation seemed to slightly improve the performance of the animals by increasing live body weights when given in drinking water. The lowest total feed consumption and FCR values were determined in group 3. Body weight gain and feed consumption values were highest in group 2; however, no significant difference was determined among the groups. In a limited number of studies in which kefir was supplemented into the drinking water of animals, it was reported that 2 and 5% rates resulted in no significant differences in terms of body weight gain, daily feed intake and FCR in geese (Yaman *et al*., 2006) but a considerable difference ($p<0.05$) was seen in the weight gain of broilers by 5 and 7% kefir supplementation. Moreover a parallel increase was seen in live weight with the increasing rates of kefir supplementation (Cenesiz *et al*., 2008). Arslan and Saatci (2004) supplemented *Lactobacillus bulgaricus* into both feed and drinking water of quails and found a positive response on live weight, feed consumption and FCR.

A great deal of studies was conducted on probiotic supplementation into the diets of broilers. However, there are some contradictions between the results of these studies. Some researchers reported that feed consumption was reduced or body weight gain and feed conversion rates were increased after utilization of several probiotics such as 0.5% fermented product from *B. subtilis* ($p<0.05$) (Santoso *et al*., 2001), commercial *Lactobacilli* (Jin *et al*., 1996), *Bacillus coagulans* (Cavazzoni *et al*., 1998), *L. Acidophilus* (Abdulrahim *et al*., 1999), 12 *Lactobacillus strains* (Kalavathy *et al*., 2003). On the other hand, some others found, no significant

Table 1: Average values for growth performance and FCR parameters in geese

Parameters	Group 1 (Control) x±Sx	Group 2 (2.5%) x±Sx	Group 3 (7.5%) x±Sx	F	p-value
Initial body weight (g bird^{-1})	505.49±30.850	503.66±28.330	502.61±28.430	0.002	0.998
Final body weight (g bird^{-1})	3612.50±119.35	3654.00±115.19	3705.00±155.93	0.069	0.933
Body weight gain (g/bird/day)	49.08±1.6400	50.74±2.0500	49.46±1.7200	0.389	0.680
Feed consumption (g/bird/day)	199.92±17.550	205.41±15.930	198.83±10.960	0.086	0.918
Feed Convertion Ratio (FCR) (kg feed kg^{-1} BW)	4.05± 0.350	4.11±0.1800	3.91±0.1200	0.171	0.847

Table 2: Some organ weight percentages (BW%) in experimental groups

Traits	Group 1 (Control) x±Sx	Group 2 (2.5%) x±Sx	Group 3 (7.5%) x±Sx	F	p-value
Head	3.41±0.08	3.51±0.10	3.56±0.09	0.629	0.547
Foot	2.96±0.08	3.05±0.08	2.97±0.06	0.385	0.687
Liver	2.19±0.19	2.04±0.04	1.87±0.19	1.585	0.238
Heart	0.64±0.02	0.61±0.01	0.61±0.03	0.352	0.709
Gizzards	3.48±0.12	3.73±0.10	3.90±0.22	1.658	0.224
Giblets	6.32±0.19	6.37±0.11	6.39±0.28	0.029	0.971

BW: Body Weight

improvement in FCR or growth values by the supplementation of different probiotics such as 0.1% Protexin (Denli *et al*., 2003), *Lactobacillus* cultures (Watkins and Kratzer, 1984), *L. casei* (Yeo and Kim, 1997), Probiolac (Mohan *et al*., 1996) and *B. coagulans* (Cavazzoni *et al*., 1998) similar to our study.

The data regarding some organ weight percentages (BW%) in the experimental groups are presented in Table 2. The results for all traits were found to be non-significant among the groups. As a response to the increasing rates of kefir, the decrease in liver weight and increase in head, gizzard and giblet weights were dramatic. Particularly the decrease in liver weight was interesting. It is known that geese develop fatty liver in response to overfeeding (Zhao *et al*., 2007). From this point of view, our finding could be a useful tool in explaining the effect of Kefir on fat metabolism.

Average values for carcass traits in experimental groups are shown in Table 3. No significant difference was seen among the groups in terms of any parameters. However, numerically, carcass weight and dressing percentage were determined to be highest in 2nd group and lowest in 3rd group.

For the carcass parts, again the 2nd group numerically displayed the highest values in terms of leg, breast and neck weights but the lowest values in terms of wing and back portion weights. Similarly although no statistical significance was occurred among the groups, a gradual increase was seen in abdominal fat amount contrary to the decrease in total skin amount when kefir supplementation rates increased.

Likewise, Pelicano *et al.* (2006) reported that growth promoters supplemented to the diet did not affect the studied quantitative and qualitative carcass parameters and breast meat in broiler chickens. In addition, Anjum *et al.* (2005) supplemented 110 g ton^{-1} protexin in starter and 55 g ton^{-1} in finisher diets of broilers and found no significant difference among the groups in terms of meat composition, dressing percentage and empty organ weights but they observed a significant decrease in the abdominal fat content.

Denli *et al.* (2003) observed no change in liver weight or abdominal fat after probiotic supplementation in broiler diets. Molnar *et al.* (2005) indicated no significant difference between the treatment groups in terms of abdominal fat weight as Chiang and Hsieh (1995) reported for broilers.

Meat composition values for leg and breast parts in the experimental groups of this study are shown in Table 4. Numerically, highest meat development was seen in group 2 whereas the lowest was in control. For fat amount, highest value was determined in control group while the lowest was in 3rd group for leg and in 2nd group for breast. Regarding bone development, highest value was found in 3rd group and lowest in 1st group for leg and in 2nd group for breast. Similar results were reported by several researchers. Pelicano *et al.* (2003) supplemented different probiotic sources into drinking water and diet of broilers to examine the effects on meat and carcass quality. They indicated that probiotic supplementation didn't cause any change in the carcass yield but increased the meat quality by affecting the color, pH, softness and general appearance as well as decreasing the abdominal fat content. Likewise, addition of microbial supplement into drinking water and 12 strains of *Lactobacilli* in broiler diets reduced abdominal fat deposition (Safalaoh, 2006; Kalavathy *et al*., 2003) *L. strains* also reduced the fat content of the liver, muscle and carcass of broiler chickens (Kalavathy *et al*., 2006). Although, no statistical difference was seen between the carcass meat composition values in this study, the numerical increase in meat weight as well as the decrease in fat weight attracts attention. This might be an evidence for the different effects of Kefir supplementation on the meat and fat tissue development.

No mortality was recorded in all groups throughout the experiment and macroscopic observations did not show any differences in the appearance of the organs of experimental groups. Similar results were found by Kalavathy *et al.* (2003), who supplemented 12

Table 3: Average values for carcass traits in experimental groups

Traits	Group 1 (Control) x±Sx	Group 2 (2.5%) x±Sx	Group 3 (7.5%) x±Sx	F	p-value
Body weight (g)	3612.50±119.35	3654.00±115.19	3705.00±155.93	0.124	0.884
Hot carcass (g)	2441.67±100.64	2498.00±95.860	2435.00±119.10	0.107	0.899
Cold carcass (g)	2346.93±90.380	2414.58±84.100	2353.35±114.44	0.148	0.864
Dressing percentage (%)	67.52±0.8700	68.31±0.8900	65.64±0.5800	2.981	0.081
Total skin (with fat) (%)	19.92±0.3200	19.42±0.5900	18.98±0.4800	0.989	0.395
Abdominal fat (%)	3.00±0.1600	3.40±0.1400	3.56±0.3100	1.635	0.228
Portion of carcass parts (%)					
Leg	14.98±0.5300	15.25±0.1000	14.81±0.4800	0.276	0.762
Breast	30.58±0.4400	31.53±0.4700	30.55±1.0500	0.600	0.562
Wing	9.37±0.2100	8.67±0.3900	9.24±0.2500	1.547	0.245
Neck	13.13±0.3100	13.86±0.3200	13.59±0.7700	0.512	0.610
Back	31.93±0.2600	30.69±0.4800	31.82±1.2100	0.801	0.467

Table 4: Meat composition values for leg and breast parts (%) in experimental groups

Traits	Group 1 (Control) x±Sx	Group 2 (2.5%) x±Sx	Group 3 (7.5%) x±Sx	F	p-value
Leg					
Muscle	49.20±1.67	50.31±1.52	51.20±0.67	0.543	0.592
Fat	3.75±0.32	3.39±0.35	3.25±0.40	0.512	0.609
Bone	15.84±0.96	15.62±0.44	17.20±0.64	1.439	0.268
Skin (with fat)	30.49±2.54	29.26±1.18	27.87±1.26	0.803	0.466
Breast					
Muscle	47.10±1.82	47.70±0.64	48.37±1.21	0.232	0.796
Fat	1.06±0.22	0.97±0.23	0.87±0.14	0.209	0.814
Bone	14.35±0.32	15.43±0.45	16.52±1.56	1.268	0.310
Skin (with fat)	36.11±0.62	35.90±1.86	33.91±1.26	0.803	0.466

Lactobasillus strains into the diets of broilers. These results suggest that supplementation of kefir into water have no adverse effect on the general health status of the geese.

Considering our findings and the mentioned studies, variable results occur in response to Kefir supplementation into the drinking water of the animals. These different results could be due to the usage of different animal species with different metabolism, type of probiotic, different strains and doses as well as different application processes and periods.

As a result, although, no statistical significance was occurred among groups with the supplementation of 2.5 and 7.5% Kefir into the drinking water of geese. A gradual increase was seen in abdominal fat amount contrary to the decrease in total skin amount based on the increased Kefir rates. Similarly, the numerical increase in meat weight opposite to the decrease in fat weight attracted attention. This might be an evidence to explain the different effects of Kefir on meat and fat tissue development in geese.

CONCLUSION

Further studies involving more animals are required to determine the exact effects on performance and carcass characteristics using different levels of Kefir within longer periods in geese.

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