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Effects of Kefir on Growth Performance and Carcass Characteristics in Pekin Ducks (*Anas platyrhynchos domestica*)

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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 Pekin ducks. For this purpose, 42 ducklings at 2-week-old age were randomly and equally divided into 1 control and 2 treatment groups. All groups were fed with the same diet during the 6 week study 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. At the end of the study, a total of 30 ducks, 5 male and 5 female from each group was randomly selected for slaughter. The results showed that after a 6 week feeding period, the total body weight in group 2 and 3 were significantly lower than group 1 ($P < 0.05$). Despite the numerical variations, no statistical difference was seen among the groups in terms of body weight gain, feed intake and FCR values ($P < 0.05$). Group 3 with high kefir percentage was significantly lower and different than the other experimental groups in terms of liver and gizzard weights, hot carcass (g), cold carcass (g) and abdominal fat (%) ($P < 0.05$) parameters. Despite the numerical variations, no statistical difference was seen among the groups in terms of meat composition values ($P > 0.05$). Our findings showed that, the decrease in total body weight, abdominal fat ratio, liver and giblets weights based on the increased kefir rates attracted attention. In conclusion, kefir usage as a supplement in ducks doesn't provide an economical benefit but kefir could be used for human consumption for antiobesity.

Keywords: Abdominal fat, Fattening, Liver, Poultry, Probiotic

Kefir is a unique natural probiotic containing complex mixtures of lactic acid bacteria and yeast (Marshall and Cole 1985). It contains several microorganisms, possesses more complex structure because of microbiological and chemical compositions (Farnworth 2005).

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). Some studies showed that kefir was improved performance of the laying hens (Karademir *et al.,* 2012; Yenice *et al.,* 2014). According to several studies, probiotics were found to improve body weight gain and feed conversation ratio in poultry (Huang *et al.,* 2004), however some other studies reported that probiotic supplementation was not effective on growth performance in poultry (Cavazzoni *et al.,* 1998; Yaman *et al.,* 2006; Sahin and Yardimci 2009). 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; Molnar *et al.,* 2005).

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 ducks 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 ducks.

MATERIALS AND METHODS

Forty two ducklings of 14-days-old age were used as the study material. The birds were randomly divided into one control and 2 treatment groups, each of which consists of 14 ducklings. The birds were placed on wood dust litter within floor pens during the whole experimental procedure. Light was provided 24 hours a day. A basal diet was used in the experiment. Diets were formulated to meet nutrient requirements (NRC, 1994) for ducklings. The ducklings were fed with a growing diet (22% HP, 2900 MJ/kg ME) during the trial. The ducklings were allowed to access feed and water *ad libitum*. The experimental design consisted of 2 different levels of Kefir supplementation (2.5%, 7.5%) in drinking water. Group 1 served as the control and received normal drinking water; ducklings 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 ºC for 20 hours (Marshall and Cole, 1985).

All the ducks were individually weighed in the beginning of the experiment (2 week 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, 5 male and 5 female ducklings were randomly selected from each replicate treatment groups for slaughter. After 6 weeks of feeding, a total of 30 ducks (15 male, 15 female) were starved for 12 h with access to water and then slaughtered by severing the carotid artery and jugular veins. After plucking, the ducks 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 x100. 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 +4ºC for 24 hours. 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 duck 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. Total body weight in group 1 (control) was significantly higher than group 2 (2.5%) and 3 (7.5%) ($P < 0.05$). Body weight gain and feed consumption values were highest in group 1; however no statistical significant difference was determined among the groups ($P > 0.05$).

The number of studies in which kefir was tested as a supplement in drinking water of animals is limited. Sahin and Yardimci (2009) were used 0%, 2.5% and %7.5 supplementation levels of kefir in geese with drinking water and found no significant difference among the groups in terms of live body weights, feed consumption and FCR values. Yaman *et al.,* 2006 were reported that 2% and 5% rates of kefir resulted in no significant differences in terms of body weight gain, daily feed intake and FCR in geese. Some other researchers found no significant improvement in FCR or growth values by the supplementation of different probiotics such as 0, 1% Protexin (Denli *et al.*, 2003), *L. casei* (Yeo and Kim, 1997), *B.coagulans* (Cavazzoni *et al.,* 1998) similar to this study. On the other hand, a great deal of studies conducted on broilers on probiotic supplementation into the diets resulted in an increase in live weights

Table 1. Average values for growth performance in ducks (**X±SEM)**

	n	Initial body weight (g)	Final body weight (g)	Body weight gain (g/week)	Feed İntake (g/ week)	FCR (feed/ bw)
Group 1 (0%)	14	244.77±21.46	2100.43±63.03a	309.13±11.46	1158.41±198.99	3.69±0.60
Group 2 (2.5%)	14	245.95±15.32	1967.14±49.68ab	288.91±7.81	1090.13±171.32	3.80±0.60
Group 3 (7.5%)	14	245.28±15.40	1882.86 ±45.83b	280.09±6.82	990.35±154.73	3.57±0.59
P		0.999	0.022*	0.094	0.797	0.967

*Significant difference at P < 0.05

(Cavazzoni *et al.*, 1998, Abdulrahim *et al.*, 1999; Santoso *et al*., 2001; Kalavathy *et al.,* 2003; Arslan and Saatci 2004; Karademir and Unal 2008; Cenesiz *et al.,* 2008; Salarmoini and Fooladi 2011; Cho *et al.,* 2013).

Data regarding some organ weights in the experimental groups are presented in Table 2. The results for head, foot and heart were found to be non-significant among the groups. However, considerable difference (P < 0.05) was seen in liver and gizzard weights among the experimental groups. As a response to the increasing rates of kefir, the decrease in liver and giblets weight was remarkable in this study. Some researchers reported no marked effect on the organ weights in geese (Sahin and Yardimci 2009) and broilers (Karademir and Unal 2008). In addition, Kalavathy *et al.* (2006), demonstrated that Lactobacilli strains reduced the fat content of the liver in broiler chickens. On the other hand, Yenice *et al.* (2014) were investigated the effect of kefir upon the performance, intestinal microflora and histopathology of certain organs in laying hens. They observed no effect of kefir on heart weights similar to our findings, but they determined an increase in liver and gizzard weights in kefir-treated groups. The decrease in liver and giblet weights group 3, could be related to the low level of feed intake and FCR.

Average values for carcass traits in experimental groups are shown in Table 3. Among the groups; body weight, hot and cold carcass weights as well as abdominal fat were significantly differed. Notably, a decrease was seen in all carcass traits, especially in high level of kefir (7.5%) used group. However, dressing percentage and total skin were similar in all groups. Among the obtained results, the decrease in abdominal fat seemed more important. In a similar research, Anjum *et al.* (2005) supplemented 110g/t protexin in starter and 55g/t 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. 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). Lactobacilli strains also reduced the fat content of muscle and carcass of broiler chickens (Kalavathy *et al.,* 2006). 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 carcass yield but decreased the abdominal

Table 2. Some organ weights (g) of experimental groups (**X±SEM)**

		Traits				
	n	Head	Foot	Liver	Heart	Gizzards
Group 1 (0%)	10	108.33±10.93	49.34±5.59	39.92±5.15^{a}	11.85±1.69	0.10±13.42^{a}
Group 2 (2.5%)	10	103.31±15.33	48.96±9.46	34.34±7.40^{ab}	12.33±1.75	73.45±12.63^{ab}
Group 3 (7.5%)	10	97.91±9.77	49.13±5.14	32.81±3.33^{b}	11.92±1.88	65.18±7.66^{b}
P		0.183	0.993	0.020*	0.811	0.026*

*Significant difference at P < 0.05

fat content. Bayram *et al.* (2010) found that kefir supplementation (7.5%) in the water of ducks significantly ($P < 0.05$) reduced the abdominal fat and serum total lipid concentration. On the other hand, Denli *et al.* (2003) observed no change in liver weight or abdominal fat after probiotic supplementation into the broiler diets. Molnar *et al.* (2005) indicated no significant difference between the treatment groups in terms of abdominal fat weight for broilers.

Regarding the carcass parts shown in Table 4, the values showed a similarity among the groups which were also non-significant. Meat composition values for leg and breast parts in the experimental groups of this study are shown in Table 5. All the parameters were similar and non-significant between the experimental groups. Similar results were reported by Sahin and Yardimci (2009) for geese. 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.

No mortality was recorded during the experiment and macroscopic observations did not show any differences in the form of the organs of the animals. These results show that supplementation of kefir into the water has no undesirable effect on the general health status of ducks. Similar results were found in geese by Sahin and Yardimci (2009) and Kalavathy *et al.* (2003) who supplemented 12 *Lactobasillus* strains into the diets of broilers. By the way, Fidan *et al.* (2011) reported that application of kefir with drinking water (2.5%,7.5%) in ducks, decreases oxidative stress and DNA damage, during the normal cellular metabolism by increasing the total antioxidant activity and free radical scavenging potential. That result could mean that application of kefir in ducks might increase livability.

Considering our findings and mentioned studies, it could be said that 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 which has different metabolism, type of probiotic, different strains and doses as well as different application processes and periods. Among the poultry, kefir supplemented diet result in better performance in broilers than others (geese and duck).

Table 3 Average values for carcass traits in experimental groups (**X±SEM)**

		Traits					
	N	**Body weight (g)**	**Hot carcass (g)**	**Cold carcass (g)**	**Dressing percentage (%)**	**Total skin (with fat) (%)**	**Abdominal fat (%)**
Group 1 (0%)	10	2110.6±59.17^{a}	1322.68±47.28^{a}	1303.36±47.21^{a}	62.59±1.04	30.10±1.13	1.76±0.17^{a}
Group 2 (2.5%)	10	1938.0±39.15^{b}	1296.19±53.89^{ab}	1281.08±53.84^{a}	67.21±3.29	30.98±0.74	1.70±0.06^{a}
Group 3 (7.5%)	10	1870.0±39.46^{b}	1166.88±31.86^{b}	1148.72±30.51^{b}	62.37±0.81	28.96±0.57	1.38±0.09^{b}
P		0.004**	0.049*	0.046*	0.188	0.261	0.017*

*P < 0.05; **P < 0.01

Table 4. Average values (%) for carcass parts in experimental groups (**X±SEM)**

		Carcass Parts				
	n	**Leg**	**Breast**	**Wing**	**Neck**	**Back**
Group1 (0%)	10	14.98±0.53	30.58±0.44	9.37±0.21	13.13±0.31	31.93±0.26
Group2 (2.5%)	10	15.25±0.10	31.53±0.47	8.67±0.39	13.86±0.32	30.69±0.48
Group3 (7.5%)	10	14.81±0.48	30.55±1.05	9.24±0.25	13.59±0.77	31.82±1.21
P		0.762	0.562	0.245	0.610	0.467

P > 0.05

Table 5. Meat composition values for leg and breast parts (%) in experimental groups (**X±SEM)**

		Leg			Breast		
	N	**Muscle**	**Fat**	**Bone**	**Muscle**	**Fat**	**Bone**
Group1 (%0)	10	74.34±0.91	5.10±0.61	20.55±1.25	67.07±1.08	2. 35±0.37	30.58±1.24
Group2 (2.5%)	10	73.13±1.18	5.10±1.16	21.77±0.73	66. 99±1.20	2.36±0.51	30.65±1.21
Group3 (7.5%)	10	74.14±0.57	4.43±0.50	21.42±0.56	65.13±1.68	2.66±0.23	32.23±1.65
P		0.618	0.799	0.622	0.523	0.824	0.646

P > 0.05

CONCLUSION

As a result, some statistical significance was occurred among the groups with the supplementation of 0%, 2.5% and 7.5% levels of kefir into the drinking water of ducks. Particularly, the decrease in total body weight, abdominal fat ratio, liver and giblets weights based on the increased kefir rates attracted attention. The results suggest that supplementation of kefir in to drinking water (2.5% and 7.5%) does not play an active role in the growth performance, feed consumption or feed conversion rates in ducks. Therefore kefir usage as a supplement in ducks doesn't provide an economical benefit but it could be beneficial for human consumption for antiobesity.

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