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Effect of Dietary Barley Supplementation on Fattening Performance and Carcass Parameters of Native Geese (Anser anser) Fed in Local Breeder Conditions in Ağrı Province*

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Abstract: This study aimed to determine the effects of dietary barley meal supplementation on performance and carcass parameters in native geese in local breeder conditions in Ağrı province. Sixty goslings aged 1-3 days were used in this study. Goslings were divided homogeneously into three groups, with 20 animals in each group. The control group (C) fed on pasture. Barley meal was added from the 3th to the 7th week (B1) and from the 7th to the 10th week (B2) as well as pasture feeding. All geese in the groups were weighed individually until the tenth week. At the end of the tenth week, the animals were slaughtered. The live weight and slaughter weight obtained from the B1 and B2 experimental groups were found to be higher than the control group. There were no differences between the groups in the carcass yield, tight, breast, and back ratios. Also, head, foot, heart, liver, and gizzard ratios were not influenced by barley meal supplementation. As a result, it has been concluded that performance increase can be achieved with barley supplement by adhering to traditional methods in local breeder conditions.

Keywords: Ağrı, Barley, Carcass, Goose, Performance.

Ağrı İlinde Halk Elinde Beslenen Yerli Kazlarda (Anser anser) Arpa İlavesinin Besi Performansı ve Karkas Parametreleri Üzerine Etkisi

Öz: Bu çalışma, Ağrı ilinde halk elinde yetiştirilen yerli kazların besisinde arpa ilavesinin canlı ağırlık ve karkas parametreleri üzerine etkilerini incelemek amacıyla yapılmıştır. Çalışmada 60 adet 1-3 günlük yaştaki kaz civcivleri kullanılmıştır. Araştırmada kaz civcivleri her grupta 20 hayvan bulunacak şekilde üç gruba ayrılmıştır. Kontrol grubu (C) sadece mera besisi uygulanmıştır. 1. Deneme grubuna, 3 ile 7. haftalar (B1) arasında ve 2. Deneme grubuna ise 7 ile 10. haftalar (B2) arasında meraya ilave olarak Arpa ilavesi verilmiştir. Gruplardaki tüm kazlar onuncu haftaya kadar bireysel olarak tartılmıştır. Onuncu haftanın sonunda hayvanlar kesilmiştir. B1 ve B2 deneme gruplarından elde edilen canlı ağırlık ve kesim parametreleri kontrol grubuna göre daha yüksek bulunmuştur. But, göğüs ve sırt oranlarında gruplar arasında farklılık olmamıştır. Ayrıca baş, ayak kalp, karaciğer ve taşlık oranları arpa kırması ilavesinden etkilenmemiştir. Sonuç olarak, geleneksel yöntemlere bağlı kalarak halk elinde yetiştirilen kazlara arpa ilavesiyle canlı ağırlık artışı ve karkas parametrelerinde artış sağlanabileceği sonucuna varılmıştır.

Anahtar Kelimeler: Ağrı, Arpa, Karkas, Kaz, Performans.

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INTRODUCTION

Geese are known as the first poultry animals domesticated by humans. Geese, which live without the need for a special habitat like poultry, are mostly a type of poultry that can be raised in places where seasonally difficult winter conditions are more intense and harsher in order to benefit from its meat, feathers, and liver. Geese are the most durable animals among domestic poultry and have the most extended production period (1,2). Additionally, their meat is delicious and is known as high-calorie meat due to its high-fat content in the carcass (3).

Geese are that have good grazing ability. They consume the grass very short and can spend almost their entire life on pasture. Geese are classified as water birds, but they can easily live in dry places. Geese husbandry is quite easy and inexpensive compared to other poultry animals. They can live in very simple shelters. Although geese are generally raised outdoors, they enter shelters when it gets cold. Straw, sawdust, or hay can be laid on the bottom of goose shelters. Care should be taken to prevent these underlays from becoming moldy (4).

In Turkey, goose husbandry exists most in Eastern Anatolia, mainly in Kars, Ardahan, Muş, Erzurum, and Ağrı (5,6). In these provinces, goose husbandry is carried out in small family-scale farms (extensive), and some of the protein needs of the people are met by goose meat (7). Geese are slaughtered after hatching and getting fed for a maximum of eight months. It is tried to increase slaughter weight by giving additional concentrated feed between 30 and 45 days before slaughtering (8,9).

Geese have been subjected to various breeding and feeding methods. After hatching, goslings are fed with concentrated feed for two weeks, after two weeks with green grass (pasture) and cereal grains (18 weeks). Another feeding method is to feed on limited concentrate and pasture during the whole feeding period (14 weeks). Third, goslings are subjected to intensive feeding for ten weeks. Moreover, after 12 weeks, geese are fed in order to produce a fatty liver (10). Geese can consume feed in various forms (pellets, mash, grains). Geese can consume grain or ground prepared feeds together or separately. When there is limited special commercial feed for geese, mixtures of various grain feeds such as barley, oat, corn, wheat can be given as grain feed. As geese are highly skilled in digesting crude fiber compared to other birds, they can also benefit from pasture as a source of roughage. As a traditional feeding method in the Eastern Anatolia region, goslings are fed a mixture prepared with bread, milk, and egg yolk for the first 15 days. After, feeding is continued with whole or crushed grains. With the snow melting, the animals are taken to the pasture. Since the majority of engaged in goose farming are family type, geese are fed mainly on pasture (11,12). In order to increase meat and fat through goose fattening, barley is supplemented to the animals subjected to pasture feeding during 4-6 weeks before slaughter. Some studies have demonstrated that barley and wheat, which is rich in energy and has a sufficient protein level (10-14%) for the goose, can be used as an alternative to concentrates (13,14).

The present study aimed to investigate the barley supplementation in order to increase the fattening and slaughtering performance of geese subjected to a 10-week feeding.

MATERIALS and METHODS

This study was conducted upon permission obtained from the Kafkas University Local Ethics Committee for Animal Experiments (KAÜ-HADYEK/2019-004).

Animals and Diets

In the study, without changing the care and feeding conditions applied to geese in the region, only during certain periods, barley meal was used in supplementation to the pasture. Sixty 1-3-day-old goslings were randomly assigned to three groups of

20 animals, each according to a similar group weight. It was established were control, and two barley supplemented groups in the trial. Control group (C) was subjected to only pasture feeding. The barley was added to the animals in the first group (B1) between the 3rd and the 7th weeks of the study to the animals in the second group (B2) between the 7th and 10th weeks of the study. Barley meal was fed to geese by gradually increasing from 100 g to 150 g. The barley was procured by a commercial feed company in Ağrı. The analysis of nutrient content and values of pasture and barley was carried out according to AOAC (15) (Table 1).

Table 1. Values of the nutrient content of barley and meadow grass.

Tablo 1. Arpa ve çayır otunun besin madde içeriklerine ait değerler.

Nutritional Values (%)	Barley Meal	Meadow Grass
Dry matter	88.05	94.62
Organic matter	96.36	92.61
Crude protein	12.44	7.86
Crude fat	2.16	1.69
Ash	3.64	7.39
Crude cellulose	5.75	42.28
Notral detergent fiber (NDF)	23.40	59.92
Acid detergent fiber (ADF)	5.93	48.51
Lignin	0.57	9.78
Nitrogen free extract (NFE)	76.01	40.78
Hemicellulose	17.47	11.41
Starch	55.57	-
Metabolic energy Poultry kcal/kg DM	3069.44	-

Performance Parameters

The data regarding growth performance such as live weight (LW), live weight gain (LWG) were recorded during the trial.

Measurement of Carcass Parameters

By the end of the tenth week, the geese were left hungry before the slaughtering. All geese were weighed and slaughtered. After 10-15 minutes of bloodshed, the plucking process was completed. Feet were separated from the *Articulatio intertarsicus* part and weighed. Then the internal organs were removed and cleaned. Head, food, heart, liver, and gizzard were weighed separately, and their ratios to slaughter weight were calculated. After the internal organs were separated, the carcass was cleaned, and the hot carcass weight was determined. Neck, wings, thighs, breast, and back weights were weighed with the fragmentation of carcasses, and their ratio to LW was determined.

Statistical Analysis

Statistical analysis of the data was performed using the one-way ANOVA method in the SPSS (portable PASW 18) package program. Duncan's multiple range test was used to determine differences between groups.

RESULTS

The LW of geese in the groups were (C, B1, B2); 3180.00, 3347.00, and 3465.50 g, respectively (Table 2). Geese in B2 group had the highest LW in the study ($P<0.05$).

Table 2. Hatching period and weekly of geese live weights.

Tablo 2. Kazların çıkım dönemi ve haftalık canlı ağırlıkları.

Weeks	Groups	N	Live Weights	SEM±	Significance
Hatching	C	20	102.0	0.59	N.S
	B1	20	103.5	0.43	
	B2	20	102.2	0.64	
3	C	20	772.6^{b}	3.64	***
	B1	20	842.2^{a}	2.82	
	B2	20	762.9^{b}	4.19	
7	C	20	2237.5^{c}	11.44	***
	B1	20	2425.6^{a}	11.09	
	B2	20	2274.8^{b}	7.68	
10	C	20	3180.0^{c}	19.83	***
	B1	20	3347.0^{b}	14.07	
	B2	20	3465.5^{a}	17.20	

C: Kontrol; B1: Barley-1; B2; Barley-2; N.S.: No significant; SEM: Standart error means.
^{a,b,c}: Between values with different letters in the same row the difference is significant (**: P<0.05. ***: P<0.01).

The LWG observed at the end of the study were higher in the barley meal-supplemented groups compared to the control group (C: 45.41, B1: 47.78, B2: 49.46 g). The highest LWG occurred in the B2 group at the end of the study (Table 3).

Table 3. Weekly live weight gains of geese (LWG/g).

Tablo 3. Kazların haftalık canlı ağırlık atışları (CAA/g).

Weeks	Groups	BWG(g)	SEM±	Significance
0-3	C	31.9[b]	0.16	***
	B1	35.2[a]	0.13	
	B2	31.5[b]	0.21	
3-7	C	52.3[c]	0.37	***
	B1	56.5[b]	0.39	
	B2	54.0[a]	0.29	
7-10	C	44.9[b]	1.19	***
	B1	43.9[b]	1.11	
	B2	56.7[a]	1.01	
0-10	C	45.4[c]	0.90	***
	B1	47.8[b]	0.64	
	B2	49.5[a]	0.78	

C: Kontrol; B1: Barley-1; B2; Barley-2; SEM: Standart error means.
[a,b,c]: Between values with different letters in the same row the difference is significant (**: P<0.05. ***: P<0.01).

The slaughter weight in B1 and B2 groups were higher than in the control group. (P<0.05), but no difference was found in the eviscerated carcass yields (P>0.05). While significant differences were found among groups in neck and wings ratio, back, breast, and thigh ratio were not observed changes among groups (P<0.05) (Table 4).

Table 4. Slaughtering parameters of geese.

Tablo 4. Kazların kesim parametreleri.

Parameters	Groups	Values	SEM±	Significance
Slaughter Weight (g)	C	3224.00[c]	10.02	***
	B1	3347.00[b]	14.07	
	B2	3465.50[a]	17.20	
Dressing (%)	C	68.61	0.33	N.S
	B1	69.12	0.84	
	B2	68.46	0.42	
Neck ratio (%)	C	7.01[ab]	0.16	**
	B1	6.77[b]	0.17	
	B2	7.35[a]	0.11	
Wing ratio (%)	C	8.70[a]	0.13	***
	B1	8.17[b]	0.22	
	B2	8.97[a]	0.07	
Thigh ratio (%)	C	24.63	0.16	N.S
	B1	24.77	0.20	
	B2	24.45	0.22	
Breast ratio (%)	C	16.00	0.16	N.S
	B1	15.92	0.16	
	B2	16.01	0.11	
Back ratio (%)	C	7.63	0.28	N.S
	B1	7.23	0.26	
	B2	7.32	0.16	

C: Kontrol; B1: Barley-1; B2; Barley-2; N.S.: No significant, SEM: Standart error means.

There were no differences between the groups in the ratio of head and foot (P>0.05). Also, heart, liver, and gizzard ratios were not influenced by barley meal supplementation (P>0.05) (Table 5).

Table 5. The ratio of some organs to live weight on geese (%).

Tablo 5. Kazlarda bazı organların vücut ağırlığına oranları (%).

Parameters	Groups	Values	SEM±	Significance
Head	C	4.38	0.06	N.S
	B1	4.44	0.05	
	B2	4.45	0.08	
Food	C	2.85	0.03	N.S
	B1	2.86	0.03	
	B2	2.80	0.06	
Heart	C	0.79	0.01	N.S
	B1	0.81	0.01	
	B2	0.82	0.02	
Liver	C	1.74	0.03	N.S
	B1	1.79	0.02	
	B2	1.80	0.04	
Gizzard	C	3.70	0.06	N.S
	B1	3.77	0.11	
	B2	3.6433	0.06	

C: Kontrol; B1: Barley-1; B2; Barley-2; N.S.: No significant, SEM: Standart error means.

DISCUSSION and CONCLUSION

In this study, differences in live weight and slaughter parameters were found with barley supplemented at different periods in native geese raised under local breeding conditions in Ağrı province.

The data showed many similarities with the results of the studies of Tilki et al. (16), Arroyo et al. (17), Baowei et al. (18), and Tilki and İnan (19). In terms of LW, it was determined that the LW's of the geese in the groups with barley added after the 3rd week had the highest during the study. It was determined that the B1 group values were higher than the B2 group until the 7th week. The B2 group was higher than the B1 group in terms of LW values between the 7th and the 10th weeks. While the LW results obtained were similar to the study of Chen et al. (20), they were different from the results of many other studies (9,21,22). Also, live weights in the present study were found to be lower than the results of the study conducted in Kars province (9,16 21).

There were some studies that had similar LWG results as the current study (20,22,23). On the other hand, according to the results of the study that investigated the effects of different cellulose sources on the performance of geese, LWG was lower than (31.00, 31.30, 29.80, and 30.90 g) current study (24). Hsu et al. (25) determined the effects of different cellulose sources on goose performance; the LWG was higher by (87.40, 75.10, 87.10, 84.70, 83.10, and 70.60 g) than the present study. The reason for these differences in growth performance is thought to be management and nutrition conditions as well as geographical conditions.

Slaughter weights were determined as; C: 3224.00, B1: 3347.00, B2: 3465.50 g ($P<0.05$). The current study results are similar to the results of the study carried out by Yakan et al. (22) and Saatçi et al. (26). But, they were different from the results of the study made by Tilki et al. (16), Mazonowski et al. (27), Shrestsha and Grunder (28) in terms of slaughter weights.

The eviscerated carcass yields of the groups were 68.61%, 69.12%, 68.46%, respectively. In the study conducted under local breeder conditions, carcass weights were lower than the current study (29). Contrary to this study, there were studies with higher carcass yields (24,30,31). It is thought that the differences in yield rates are caused by the feeding method of geese of different breeds and climatic conditions.

Yakan et al. (21) found that the thigh, breast, back, and wing ratios were higher than the current study results. However, it was reported that the neck ratio was lower. Şahin et al. (32) found that the breast, back, and wings ratios were higher and the thigh ratio was lower. Tilki et al. (16) found that the wing and back ratio were higher, the neck ratio was similar. The results of this study showed similarity with the studies conducted by Arroyo et al. (17), He et al. (24), Abou-Kassem et al. (23) in terms of the determined heart, breast, thigh, and back ratios. The differences among studies were thought to be related to feeding, feed ingredients, and slaughter age.

There were no differences between head and foot, heart, liver and gizzard ratios of the groups. While there were studies that were compatible with the current study (21,32), there were also studies that differed (16,33). Goose liver is an essential product in goose breeding commercially. In the presented study, the ratio of liver weight was found to be 1.78%. While these results are similar to the results of some studies (17,34), they differ from the results of some studies (19,23). The differences in parameters are thought to be caused by factors related to feeding method, food, and animals.

In conclusion, it was thought that barley supplementation to the pasture feeding of geese could provide an increase in performance.

Conflict of interest

The authors declare that they have no conflict of interest.

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