

Fattening Performance of Herik Lambs underneath Thermal Stress in Intensive Conditions

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ABSTRACT

This study was carried out to determine the fattening performance of Herik lambs reared under in intensive conditions. Twenty single male lambs, all with an mean body weight of 20.78 kg, were used in the study. Concentrate was given ad libitum and alfalfa was given in the amount of 300 g/lamb/day. The lambs were slaughtered when they reached the live weight of 40 kg. In this study, daily weight gain was generally tended to increase between the initial day and 56th day while it tended to decrease from 56th day to the end of fattening. During the fattening, the daily body weight gain and the feed efficiency were determined as 211 g and 9.668 respectively. Also, the temperature humidity index was determined above to accepted threshold value in ruminants along fattening period. Consequently, daily live weight gain and feed efficiency of Herik lambs were worse than those of Turkish native breeds at the slaughter weight of 40 kg. The unsatisfactory in fattening performance of Herik lambs may be depend on exposed high temperature along fattening period and till now lack of improvement studies on them. Thus, researchs should be done for fattening performance of Herik lambs under different breeding conditions.

Keywords: Climatic conditions, fattening performance, lamb, intensive condition

Entansif Koşullarda ve Isı Stresi altında Herik Kuzuların Besi Performansı

ÖZ

Bu çalışma, entansif şartlarda yetiştirilen Herik kuzularında besi performansını belirlenmek amacıyla yapılmıştır. Araştırmada ortalama canlı ağırlığı 20.78 kg olan 20 baş tekiz erkek kuzu kullanılmıştır. Kuzular ad libitum konsantre yem ve günde kuzu başına 300 gr kuru yonca otu ile beslenmişlerdir. Kuzular 40 kg canlı ağırlığa ulaştıklarında kesime sevk edilmişlerdir. Bu araştırmada, günlük canlı ağırlık artışının besinin ilk günü ile 56. gün arasında artma eğiliminde olduğu 56. günden besi sonuna kadar ise azalma eğiliminde olduğu tespit edilmiştir. Besi süresince ortalama günlük canlı ağırlık artışı 211 g ve yemden yararlanma oranı 9.668 kg olarak belirlenmiştir. Ayrıca besi dönemi boyunca ısı nem indeksinin, ruminantlar için kabul edilen eşik değerin üzerinde olduğu belirlenmiştir. Sonuç olarak, 40 kg kesim ağırlığındaki Herik kuzularının günlük canlı ağırlık artışı ve yemden yararlanma oranının aynı ağırlıktaki yerli ırk kuzulardan daha düşük olduğu bulunmuştur. Herik kuzularının besi performansının düşük olması, besi dönemi boyunca yüksek sıcaklığa maruz kalmasına ve bugüne kadar üzerinde ıslah çalışmalarının yapılmamış olmasına bağlı olabilir. Bu nedenle, Herik kuzularının farklı yetiştirme koşullarında besi performansı ile ilgili araştırmalar yapılmalıdır.

Anahtar kelimeler: Besi performansı, entansif koşul, iklim koşulları, kuzu

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INTRODUCTION

Meat is an important protein source for human nutrition. Protein is used for growth and development in young people while it is used for the execution of body functions in older people. Livestock animals such as cattle, sheep, goat, pork and broiler chicken are used for meat production. Pork meat is not consumed because of cultural and religious causes in Turkey. Poultry meat is an affordable food source. However, B12 vitamin, iron and zinc in broiler meat are lesser than those of cattle and sheep meat. Cattle and sheep are generally used for red meat production. In addition to being an excellent source of protein, red meat is a nutrient that provides important vitamins and minerals such as B12 vitamin, iron and zinc (Williams 2007).

Sheep production has an important place in the nutrition of household and in come source of rural people in Turkey. In 2020, a total of 4 358 732 heads of sheep have been slaughtered and approximately 95 thousand tons of red meat production which was about 8.81% of the total red meat production in Turkey (FAOSTAT 2022). These results show that, researches should focus more on lamb meat production in Turkey. In this respect, evaluation of local sheep breeds is important in terms of fattening performance characteristics.

Herik sheep is one of the local sheep breeds, raised in the border area between Central Anatolia and Black Sea Region, in Turkey. Herik sheep is thought to have resulted from the irregular crossbreeding of the Akkaraman breed, raised predominantly in Central Anatolia, with the Karayaka breed, raised predominantly in the Black Sea Region (Akçapınar 2000). Herik sheep has a fat-tail, wide at the base narrows towards the end. (Yalçın 1986, Akçapınar 2000). It has a white or brown-black fleece and has black or brown spotted around the eyes and mouth and on the legs. Rams has horizontal spiral and strong horns extending sideways, sheep has poor structure horns. It is reported to be adult live weight 60 and 47 kg; wither height 65 and 61 cm; body length 67 and 62 cm. Also it is reported to be fleece weight 1.8-3.5 kg, lamb born weight 3.3-3.5 kg and the number of lambs per parturition 1.1 (TAGEM 2009).

Climate conditions such as ambient temperature and relative humidity are used for the identification of thermal stress (Donnelly 1984, Davis 2003). Relative humidity affects the feeling degree of ambient temperature. The common effect of ambient temperature and relative humidity is expressed in a single value which called "temperature-humidity index (THI)" on production traits in livestock. In measurement of thermal stress, usage of temperature-humidity index is recommended (Armstrong 1994). The threshold value of THI is known as 74 for ruminants (Mader et al. 2006).

Recently years researchers have focused on determining the slaughter and carcass characteristics

(Teke et al. 2017, Uğurlu et al. 2017, Teke et al. 2018) and meat quality (Uğurlu et al. 2017) in Herik lambs. However, there has no information about the fattening performance of Herik lambs under the intensive conditions. The current study aimed to investigate the fattening performance of Herik lambs under the intensive conditions and to compare their fattening performance with that of other indigenous sheep breeds.

MATERIAL AND METHODS

Animals, housing, nutritional and climatic conditions

The present study was approved by the Animal Experiments Ethical Committee of Ondokuz Mayıs University (HADYEK 2014/37). The study was conducted at a private farm, where the altitude is approximately 171 m Samsun Province. Preparatory work was performed before the planning of this study and it was determined that the Herik lambs have two types of tails, i. short round fat tail, ii. Long and semi-fat tail. In this study twenty single male lambs, ten with short-round fat tails and ten with long, semi-fat tails, were randomly selected after weaning (90 days), with an approximately initial live weight of 20 kg.

The stocking density at stockyard was 0.7 m². In the stockyard, 30 cm for concentrate feeder and 30 cm for roughage feeder per lamb were allocated. All lambs were vaccinated against clostridial disease and they were treated with anthelmintics for parasitic disease (Akçapınar 2000).

Nutrient content of concentrate mixture and alfalfa hay were analyzed (AOAC 2000). As for, metabolic energy was calculated for concentrate mixture (TSE 1991) and alfalfa hay (Kirchgeßner and Kellner 1981). Before the fattening period, the amount of diet offered to animals daily was 10% more than the previous day's consumption, the two weeks of dietary adaptation was applied. All lambs were fed with ad libitum concentrate mixture consisting of approximately 2700 kcal/kg metabolic energy and 18% crude protein until lambs reached 30 kg live weight and approximately 2500 kcal/kg metabolic energy and 17% crude protein from 30 kg live weight until to the end of fattening period. Alfalfa hay (300 g lamb/day) and free access to water were also supplied. Lambs were weighed individually on a weekly basis, after fasting for 16 h with free access to water and daily feed consumption was recorded during the fattening period.

Climatic data such as maximum daily temperature, minimum daily temperature and relative humidity was provided by the General Directorate of Turkish State Meteorological Service (MGM, 2022). Temperature-humidity index (THI) was calculated with a formula reported by Davis et al. (2003). $THI = (0.8 \times \text{maximum}$

ambient temperature)+[% relative humidity/100 x (mean ambient temperature-14.4)]+46.4.

Descriptive statistics of live weight, average daily weight gain, daily feed intake and feed conversion ratio were determined for fattening performance (SPSS, 1998).

RESULTS

Fattening performance

The results of average daily weight gain, daily concentrate intake and feed conversion ratio are shown in Table 1. In this study, the highest daily

weight gain (297 g) was determined between 43-49. days of the fattening period while feed conversion ratio of that period was determined to be 7.138. Daily weight gain followed a fluctuating pattern between the initial and 56th day, however it generally tended to increase.. Also, it was seen that the daily weight gain tended to decrease after 56th day until the end of fattening (Figure 1). During the fattening period, the daily weight gain and the daily average feed consumption were determined as 211 g and 9.668 kg/day respectively.

Table 1. Fattening performance of the Herik lambs

Days	n	BW (kg)	ADWG (g)	DFI (g)	FE
Initial-7.	20	22.73±0.49	279±0.021	1422	5.096
8-14.	20	24.03±0.58	195±0.027	1795	9.205
15-21.	20	24.96±0.59	132±0.016	1958	14.833
22-28.	20	25.98±0.61	146±0.014	1861	12.746
29-35.	20	27.94±0.71	279±0.024	1780	6.378
36-42.	20	29.37±0.67	211±0.023	2170	10.284
43-49.	20	31.45±0.66	297±0.023	2120	7.138
50-56.	20	32.97±0.69	216±0.018	2549	11.800
57-63.	18	33.73±0.55	211±0.022	2227	10.554
64-70.	18	35.05±0.55	198±0.019	2704	13.656
71-77.	18	36.36±0.58	202±0.018	1883	9.321
78-84.	17	37.50±0.53	192±0.023	2160	11.250
85-91.	15	38.52±0.54	202±0.029	2068	10.237
92-98.	14	39.50±0.47	181±0.026	2089	11.541
99-105.	14	40.38±0.54	160±0.032	1820	11.375
Initial-35.	-	-	204±0.011	1763	8.642
Initial-70	-	-	218±0.007	2043	9.371
Initial-105.	-	-	211±0.006	2040	9.668

ADWG: Average Daily Weight Gain, BW: Body weight, DFI: Daily feed intake, FE: Feed efficiency

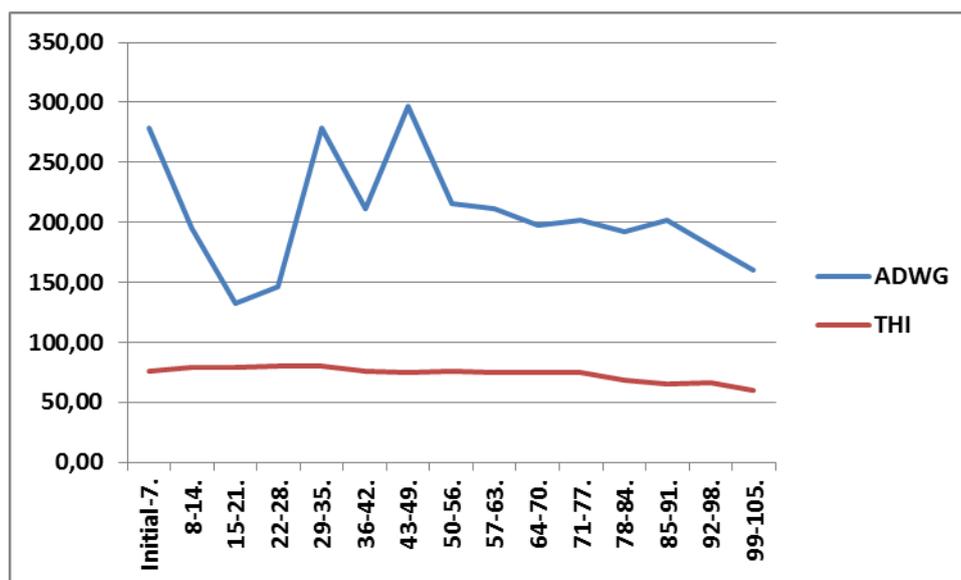


Figure 1: Change of ADWG and THI during the fattening period
ADWG: Average Daily Weight Gain, THI: Temperature Humidity Index

Climatic conditions

The results of climatic conditions, during the fattening period are shown in Table 2. The average ambient temperature and relative humidity at the basin were 22 °C and 76% during the study period respectively. This study was conducted between 16-

July-2015 and 30-October- 2015. Thus, the ambient temperature and relative humidity were high during the first 70 days of the fattening period, However, the ambient temperature and relative humidity decreased after the 71st day.

Table 2. Climatic conditions during the fattening period

Days	MADT (°C)	MIDT (°C)	RH (%)	THI
Initial-7.	26.38± 0.18	19.46±0.54	64.26±0.79	75.53±0.33
8-14.	28.45±0.24	21.44±0.33	66.88±2.11	78.79±0.30
15-21.	29.82±0.78	23.10±0.36	66.06±1.23	79.61±0.62
22-28.	29.51±0.27	22.52±0.23	64.04±1.04	79.72±0.21
29-35.	29.31±0.22	23.64±0.49	68.28±1.24	79.93±0.34
36-42.	27.75±0.50	21.54±0.75	62.04±2.19	76.07±0.93
43-49.	26.80±0.21	19.14±0.54	60.21±2.28	75.28±0.45
50-56.	27.30±0.88	19.94±0.35	66.98±2.87	75.78±1.09
57-63.	26.34±0.37	20.48±0.52	72.08±1.61	75.05±0.69
64-70.	26.60±0.45	19.82±0.25	73.27±1.33	75.10±0.58
71-77.	26.26±0.27	19.10±0.20	72.05±0.71	74.69±0.55
78-84.	23.07±0.74	16.82±0.73	70.25±1.66	68.25±1.75
85-91.	20.74±1.19	14.75±1.16	71.10±3.20	65.11±1.60
92-98.	20.77±0.58	14.94± 0.82	78.07±1.77	66.07±1.09
99-105.	19.15±1.90	13.02±0.91	70.22±1.24	60.44±2.19

MADT: Maximum Daily Temperature (°C), MIDT: Minimum Daily Temperature (°C), RH: Relative Humidity (%), THI: Temperature Humidity Index

DISCUSSION

In previous studies, slaughtering and carcass characteristics (Teke et al. 2017, Uğurlu et al. 2017, Teke et al. 2019) and meat quality traits (Uğurlu et al. 2017) of Herik lambs in intensive conditions were published. However, there is no information about fattening performance of Herik lambs. Herik sheep is considered to be produced from the irregular crossbreeding of the Akkaraman, a fat-tailed breed, and with the Karayaka, a long and thin-tailed breed (Akçapınar 2000). For this reason, results obtained in the current study were compared and interpreted with previous results of Akkaraman, Karayaka and other native breeds. Fattening performance was determined with the use of average daily weight gain and feed conversion rate. It was reported that slaughter weight of lambs is generally range from 25 to 40 kg based on market conditions (Diaz et al. 2002, Zapletal et al. 2010). In this study, the lambs were slaughtered when they reached alive weight of 40 kg. In this study, average daily weight gain and feed conversion rate were determined to be 211 g and 9.668, respectively for the entire fattening period (105 days) (Table 2). Average daily weight gain and feed efficiency for approximately slaughter weight of 40 kg was reported to be 224 g and 5.77 for Akkaraman (Akmaz and Şahin 2002), 214 g and 8.60 (Balci and Karakaş 2007), 212 and 7.06 (Olfaz et al. 2005) for Karayaka, 218 g

and 6.16 for Awassi (Tekel et al. 2007), 227 g and 4.63, 241 g and 4.96 (Yakan and Ünal, 2010) for Bafra lambs. Daily live weight gain and feed efficiency of Herik lambs were lower than the results of above mentioned native breeds at the slaughter weight of 40 kg. Therefore, fattening performance of Herik lambs were insufficient compared to other native breeds. This situation of Herik lambs may be due to lack of improvement studies on them. Also, daily weight gain followed a fluctuating course from beginning of fattening until end of fattening. In parallel with this, the daily ambient temperature and relative humidity and temperature humidity index were generally above to threshold value for thermal stress during fattening period. The threshold temperature humidity index is known as 74 for ruminants (Mader et al., 2006). Therefore, one of the reasons for the lower daily weight gain in the current study may be the temperature humidity index above the threshold value during fattening period.

CONCLUSION

Consequently, our study indicates that the fattening performance of Herik male lambs was poor than that of Turkish native breeds at the same slaughter weight. Thus, it can be considered that fattening performance of Herik lambs was unsatisfactory. However, THI was generally above to threshold value along fattening

period due to this study was conducted during the summer and autumn months. Therefore, insufficient of fattening performance in Herik lambs might be attributed to the combined effects of the high ambient temperature and relative humidity, namely temperature humidity index, Also, researchers should planned for fattening performance characteristics of Herik lambs under different breeding conditions due to scarce information about to fattening performance of Herik lambs.

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Ethical Approval: The present study was approved by the Animal Experiments Ethical Committee of Ondokuz Mayıs University (HADYEK 2014/37).

Conflict of interest: The authors declared that there is no conflict of interest.

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