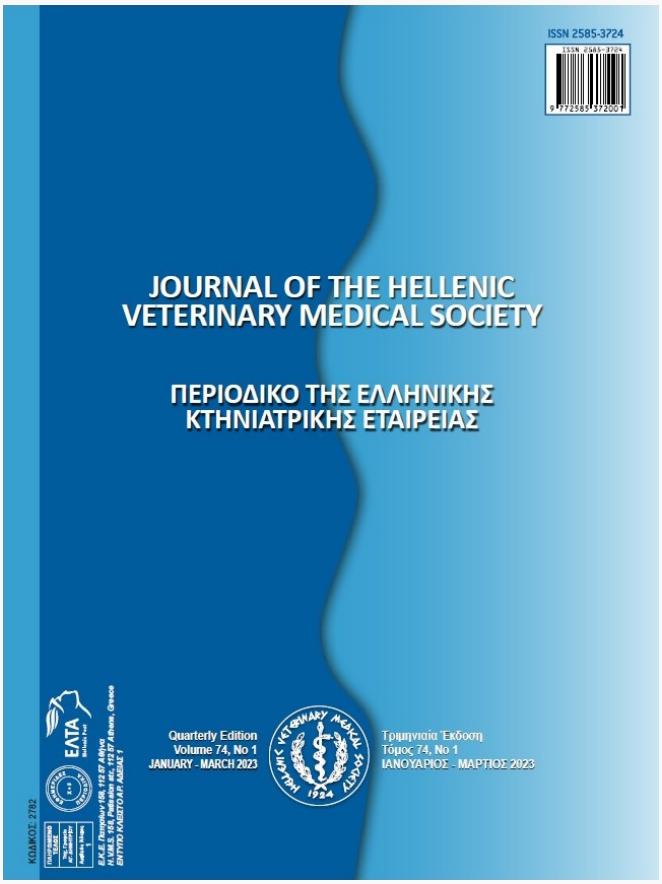
Περιοδικό της Ελληνικής Κτηνιατρικής Εταιρείας

Τόμ. 74, Αρ. 1 (2023)



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doi: 10.12681/jhvms.30492

Βιβλιογραφική αναφορά:

Şahinler, Z., Demir, Y., & Gürsoy, E. (2023). The Effect of Different Feeding on Growth in Morkaraman Male Lambs. *Περιοδικό της Ελληνικής Κτηνιατρικής Εταιρείας*, *74*(1), 5457–5462. https://doi.org/10.12681/jhvms.30492 (Original work published 12 Απρίλιος 2023)

J HELLENIC VET MED SOC 2023, 74 (1): 5457-5462
ΠΕΚΕ 2023, 74 (1): 5457-5462

Research article
Ερευνητικό άρθρο

The Effect of Different Feeding on Growth in Morkaraman Male Lambs

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ABSTRACT: The purpose of this study is to compare concentrated feeding under intensive conditions with the traditional two feed types applied in the Morkaraman lambs feeding in Ağrı province in Turkey. Three groups were formed, having 15 in each with random sampling after the male lambs were weaned (75th day), and each group was fed differently. The first group was subjected to traditional day and night sucking besides grazing on pasture, the second group was subjected to *ad-libitum* concentrated feed and hay-clover under intensive conditions, and the third group was subjected to traditional pasture grazing. The average live weights of 1st, 2nd and 3rd group of Morkaraman male lambs on the 75th-day (beginning of feeding) and 135th-day (end of feeding), and the overall average were found as 21.27±0.819, 20.65±0.564, 20.57±0.824, 20.83±0.423kg and 33.43±0.727, 35.88±0.875, 26.95±1.084, 32.08±0.765 kg, respectively. Regarding the 75th-day live weights, the differences among the three groups were similar and insignificant, the 135th-day live weights were similar in the first and second groups, and the differences with the third group were significant ($p<0.01$). Daily live weight gains on 75-90th-days were similar in the first and second groups; the difference with the third group was significant ($p<0.01$), regarding the 105-120th and 120-135th days, the differences among the three groups were found statistically significant ($p<0.01$). This study revealed not only the insufficiency of the lamb feeding on the low-quality pastures but also the inadequacy of the growth of the lambs sucking dams fed on the low-quality pastures and the lambs grazing on these pastures as well. As a result, it was concluded that the concentrated feed under intensive conditions is more efficient for lamb growth; however, feeding the lamb and dam grazing on pasture should be supported by supplementary feeding.

Keywords: Morkaraman,live weight gain, lamb growth, pasture, feeding programs

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Date of initial submission: 06-02-2022
Date of acceptance: 29-07-2022

INTRODUCTION

The importance of sheep breeding is quite considerable in Turkey in terms of both economic reasons and fulfillment of animal product needs of people. Sheep can utilize meadow and pasture areas which are our natural sources. Usually, they spend a large part of the year on meadow pastures within the bounds of weather conditions. Nowadays, sheep cannot sufficiently benefit from the pasture areas where the quality deteriorates with early and over-grazing. As a result, obtaining sufficient and high-quality products from sheep is impossible.

The Morkaraman Sheep breed is predominantly and commonly raised in Eastern Anatolia. It is Turkey's fat-tailed, in different brown tones, coarse wool mixed type, heavy size, and low meat quality domestic breed. The meat production capabilities of lambs depend on live weight, weight gain, and vigor (Koyuncu and Akgün, 2018). Among the factors affecting growth in lambs is the amount of milk sucked from their mother. It is known that the milk amount is valuable during the first trimester of the lambs. As the age progresses, the feed given besides the milk is also influential (Bhatt et al., 2018). In Turkey, where traditional breeding is dominant, sheep feeding is usually done in an extensive system. The purpose of meat production in lamb feeding is to obtain the highest yield and quality with minimum cost in a short time. For this purpose, lambs are taken to intensive feeding for 2-3 months after weaning (Aytekin, 2015).

To meet the demand for animal protein and meat, the orientation toward meat production in sheep breeding is gaining importance (Boğa and Seçer, 2015). To increase the meat production in sheep breeding, improvement works regarding the standards such as birth weight, weaning weight, pasture-end weight, and live weight gains between these periods are conducted; therefore, lamb meat production has gained importance. The studies increasing the number of offspring and improving the growth and development characteristics of lambs by enhancing their vigor have furthered (Kaymakçı, 2013; Bingöl and Aygün, 2014; Çulha, 2019).

Live weight is one of the most practical parameters in monitoring the health and welfareof sheep. Low live weight significantly reflects poor health conditions in sheep as well (Richmond et al., 2017). In Turkey, various lamb feeding techniques (suckling lamb feeding intensive lamb feeding following weaning, pasture lamb feeding, and yearling lamb feeding) are applied, and the emerging differences are caused by factors such as regional climate factors, the structure of the genetic material and meat consumption habits (Koçak, 2009; Pala and Gülşen, 2021). Intensive lamb feeding is a feeding system made primarily of concentrated feed. The lambs, after weaning, are taken for feeding at 15-20 kg live weight. At the end of this feeding, the live weight varies according to the breeds, and while it is 38-40 kg for the local breeds, it may reach 40-45 kg in crossbreed genotypes (Kor et al*.,* 2009; Pala and Gülşen, 2021). Growth, as a yield trait, is determined by birth weight and the level of live weights at various periods. Birth weight affects survival and growth rate in the early stages of life. Fattening studies are carried out to reach the highest live weight, which is financially advantageous and suitable for the genetic structures of animals (Çulha, 2019). For this reason, there is a need to study on whether supplementary feeding will be made to lambs breeding on pastures, which is practiced widely in the country.

Esenbuğa and Dayıoğlu (2002) found the general averages of birth weight, weaning weight, daily live weight gain until weaning, pasture-end weight, daily live weight gain in pasture 4.10 kg, 16.64 kg, 134 g, 34.39 kg, and 136 g respectively, in their study with Awasi and Morkaraman lambs. In the same study, they also reported that the values related to the same parameters were 4.03 kg, 17.61 kg, 145 g, 35.31 kg, and 143 g for Morkaraman lambs in the same order.

Kopuzlu et al. (2014), in a study they carried out with Morkaraman lambs, determined the birth weight, live weight at pasture, live weight at pasture-end, daily live weight gain until pasture, and daily live weight gain in the pasture as 3.5 kg, 21.4 kg, 37.4 kg, 239 g, and 201 g, respectively.

Birth, pasture, pasture-end weights, and daily live weight gains at pasture-beginning, pasture-end, and pasture of Morkaraman lambs grazing in the pasture were determined as 3.97 kg, 21.63 kg, 39.45 kg, 230.3 g, 226.2 g and 216.0 g, respectively. The effect of the year on pasture-end weight was found to be significant (Kopuzlu & Sezgin, 2017).

To provide correct and conscious feeding in lamb breeding, there is a need for scientific studies on the subject. This study was carried out to determine whether the traditional pasture and pasture + milk feeding types or the concentrated feed under the

intensive conditions applied to Morkaraman breed lambs have more contribution to growth in the butchery lamb breeding.

MATERIALS AND METHODS

The animal material of the study consisted of 45 male lambs that were born as singletons between 13-17 March 2018 in an enterprise within the scope of the "National Project for Small Ruminant Farming Run by Public" initiated in 2013 in Ağrı province. The lambs were weighed at the 75th-day age and weaned and then they were separated into three groups having 15 heads each (Overall 20.83±0.423 kg). The first group was fed with grazing on pasture beside *ad-libitum* sucking in the morning. The evening after the 75th-day (feed beginning) age, the second group was fed with *ad-libitum* lamb grower feed (%16 crude protein, 2500 Kcal ME/kg energy, %9.5 crude cellulose, % 6 crude ash) + hay-clover under intensive conditions after the 75th-day age, and the third group was fed only with *ad-libitum* grazing on pasture at 75th-day (feed beginning) age. The weights of the lambs in each of the three groups were taken every two weeks on an empty stomach (24 hours). All three groups were given water three times a day. At the135th-day (feeding end) age, each of the three groups wassent for slaughter. The dams of the sucker lambs were fed merely with *ad-libitum* grazing on pasture and given water three times a day.

All calculations were done in accordance with the Least Squares Method by using SPSS (2012) packageprogram. In comparing the subgroups' averages, Duncan's multiple comparison tests were applied.

RESULTS AND DISCUSSION

Live weights of the lambsin various periods according to different feeding systems

Regarding the different feeding systems on the Morkaraman lambs, the average live weights (kg) related to the 75th (weaning-beginning of feeding), 90th, 105th, 120th, and 135th days (end of feeding) are shown in Table 1.

When Table 1 is evaluated,the 75th-day age average live weights in the 1st, 2nd, and 3rd groups are found as 21.27±0.819, 20.65±0.564, and 20.57±0.824 kg, respectively. The differences among them are insignificant (P>0.05). The 75th-day weights, when compared with the results of the other studies conducted with the Morkaraman breed, are seen to be higher (12.85-18.73 kg) than the value reported by Özbey and Akcan (2001 and 2003), Esenbuğa and Dayıoğlu (2002), Arslan et al. (2003), Laçin and Aksoy (2003), Aksakal and Macit (2008), and Kopuzlu et al.(2014), lower (22.49-25.94 kg) than the values reported by Odabaşıoğlu et al.(1996), Küçük et al.(2002) and Bozgüllü and Macit (2022), and similar (20.17 kg) to the value reported by Öztürk et al.(2012).

The average live weights of the 1st, 2nd, and 3rd groups and overall average arefound for the 90thday as 25.91±0.677, 25.37±0.471, 23.12±0.912, 24.80±0.440 kg, and they are higher (15-23.21 kg) than the values reported for lambs by Şireli et al. (2015), Kopuzlu and Sezgin (2017) (87th day), and lower (25.41-27.13 kg) than the values reported by Küçük et al.(2002), Sezenler et al.(2013), Üstüner and Oğan, (2013). The values 28.51±0.677, 28.63±0.447, 24.50±0.984, 27.21±0.506 found for the 105thday are higher (17.71-26.40 kg) than the values reported by Odabaşıoğlu et al.(1996), Öztürk et al.(2012). The values 30.89±0.682, 32.06±0.615, 25.75±1.039, 29.57±0.612 found for the 120th day are (28.08-28.71 kg) higher than the values reported by Odabaşıoğlu et al.(1996), but similar to the ones reported by Öztürk et al.(2012) and Çulha (2019).The 135th-day live weights are similar to the value (32.79 kg) determined by Öztürk et al.(2012), and for the 135th day, the values found as 33.43±0.727, 35.88±0.875, 26.95±1.084 and 32.08±0.765 kgis higher than the live weight

Table 1. The Live Weights of the Lambs in Various Periods, kg

Periods	Group 1 $\bar{X} \pm S_{\bar{X}}$	Group 2 $\bar{X} \pm S_{\bar{X}}$	Group 3 $\bar{X} \pm S_{\bar{X}}$	Overall $\bar{X} \pm S_{\bar{X}}$	
75 days	21.27±0.819	20.65±0.564	20.57±0.824	20.83±0.423	ns
90 days	25.91±0.677[a]	25.37±0.471[a]	23.12±0.912[b]	24.80±0.440	*
105 days	28.51±0.677[a]	28.63±0.447[a]	24.50±0.984[b]	27.21±0.506	**
120 days	30.89±0.682[a]	32.06±0.615[a]	25.75±1.039[b]	29.57±0.612	**
135 days	33.43±0.727[a]	35.88±0.875[a]	26.95±1.084[b]	32.08±0.765	**

: P<0.01; *: P<0.05; ns: not significant; a.b.c:** Differences between the averages bearing the different letters in the same row are statistically significant.

(32.85 kg) determined by Aksakal and Macit (2008) for the 165th day. The 150th-day live weight (23.93) was determined by Kopuzlu et al. (2014), and the live weight (23.93 kg) for the 155th day was determined by Türkyılmaz (2014). Bozgüllü and Macit (2022), concluded that considering the performance characteristics of merino calves in the pasture, it would be more appropriate not to wean the lambs but to graze on the pasture with their mothers during the pasture. It is thought that the difference in the 135th-day lamb live weight values in the research from the other studies might stem from the pasture quality, feeding, and Morkaraman breed variety differences. The differences between the current study and the studies on this subject might occur due to the weaning age, breed or genotype of the animal, the capacity and quality of the pasture grazed, the time the animal stayed in the pasture, and the rearing method or method applied in the pasture.

Daily average live weight gains of lambsunder the different feeding systems

The different feeding systems on Morkaraman lambs, the least mean squares, and standard error results regarding the daily live weight gains are illustrated in Table 2.

It was found that the live weight (g) gains of the 1stand 2nd groups between the days of 75-90 and 90-105 were similar and not significant but the difference with the 3rd group was significant (P<0.01). Especially in these three groups, the differences between the values of the daily live weight gains found for the day periods 105-120 days, 120-135 days, 75-105 days, 75-120 days, and 75-135 days were determined to be significant (P<0.01). The lambs of the 1st and 2nd groups differ considerably (p<0.01) from the lambs of the 3rd group fed only by grazing on pasture. Regarding their daily live weight gains after the 90th day, the difference between the1st group suckling in addition to the pasture and the 2nd group fed with the intensive, concentrated feed was significant (P<0.01). This is thought because the feeding of the mothers lactating the lambs depends on the pasture, and the decrease of the nutritive value of the pasture grass in the 7th month of the year following the season causes the milk production of the mothers to decrease, and thus the daily milk consumption of the lambs reduces. This situation can be put forward as proof regarding the decrease in the pasture grass production when the 3rd group is examined as the daily live weight gain, which was 170.27±16.135g between 75-90th days, decreased to 79.53±7.511g between 120-135th days.

In the study, it is determined that the live weight gains (264.8 g) between 75-90th days are higher than the findings (152-217 g) of the studies by Odabaşıoğlu et al.(1996), Özbeyve Akcan (2001), Arslan et al. (2003). The live weight gains (160.8 g) between 90-105th days is higher than the value (66 g) reported by Odabaşıoğlu et al. (1996) and (230.47 g) reported by Özbey and Akcan (2001). The live weight gains between 105-120th days are found to be higher (157.24 g) than the value (112 g) reported by Odabaşıoğlu et al. (1996).

The 75-135th day general live weight gain (187 g) of the lambs is higher than the values of the 75-135th day live weight gain (167 g) of Aksakal and Macit (2008), the 75-150th day live weight gain (165 g) of Kopuzlu et al. (2014) and 65-155th day live weight gain (93 g) of Türkyılmaz (2014) but is lower than the 87-174th day live weight gain value (215 g) of Kopuzlu and Sezgin (2017). It is thought that the pasture quality and plant chemical composition discrepancy besides the milk feeding in addition to the pasture might be the reason for the difference in the values in

Table 2. The Live Weight Gains of the Lambs in Various Periods, g

Periods	Group 1 $\bar{X}\pm S_{\bar{X}}$	Group 2 $\bar{X}\pm S_{\bar{X}}$	Group 3 $\bar{X}\pm S_{\bar{X}}$	Overall $\bar{X}\pm S_{\bar{X}}$	
75-90 days	309.33±27.927^{a}	314.80±22.039^{a}	170.27±16.135^{b}	264.80±16.233	**
90-105 days	173.40±19.986^{a}	216.93±19.701^{a}	92.07±9.091^{b}	160.80±12.376	**
105-120 days	159.20±18.685^{b}	228.93±19.018^{a}	83.60±7.415^{c}	157.24±12.699	**
120-135 days	169.00±22.748^{b}	254.67±21.011^{a}	79.53±7.511^{c}	167.73±14.963	**
75-90 days	309.33±27.927^{a}	314.80±22.039^{a}	170.27±16.135^{b}	264.80±16.233	**
75-105 days	279.93±25.820^{b}	354.27±25.753^{a}	157.67±13.209^{c}	263.96±17.574	**
75-120 days	214.00±19.015^{a}	253.47±18.155^{a}	115.33±9.239^{b}	194.27±12.612	**
75-135 days	202.73±18.201^{b}	253.93±18.243^{a}	106.27±8.014^{c}	187.64±12.745	**

**: P<0.01; *: P<0.05; a.b.c:Differences between the averages bearing the different letters in the same row are statistically significant.

the 75-135th day live weight gain from the values of the other studies. The reason why these values are determined differently from the other study values; may be due to pasture quality, feeding, and Morkaraman breed varietal differences.

CONCLUSION

As a result, while the live weights of lambs from the 75th day (beginning of the feeding regime) to the 135th day (end of the feeding regime) are similar in the 1st and 2nd groups, it is determined that the live weight of the 2nd group lambs are higher than the 1st group lambs and the 3rd group has lower rise ($p<0.01$) than the 1st and 2nd groups. The daily live weight gains of the 1stand 2nd groups show similarity between 75-105th days, the differences regarding the 90-105th days between 1st, 2nd, and 3rd groups,and the differences regarding the 105-120th and 120-135th periods among 1st, 2nd, and 3rd groups are found significant ($p<0.01$). In the light of these data, it is defined that the lambs of the 2nd group fed with the concentrated feed under intensive conditions grew (live weight. daily live weight gains) better than the lambs of the 1st group fed by grazing on the low-quality pastures + with milk and the lambs of the 3rd group fed only by grazing on the pastures. This study revealed not only the insufficiency of the lamb feeding on the low-quality pastures but also the inadequacy of the growth of the lambs sucking mothers fed on the low-quality pastures and the lambs grazing on these pastures as well. As a result, it is concluded that the concentrated feed under intensive conditions is more efficient for lamb growth; however,feeding the lamb and dam grazing on pasture should be supported by supplementary feeding.

CONFLICT OF INTEREST

There is no declared conflict of interest.

REFERENCES

Aksakal V, Macit M (2008) A comparison in terms of growth traits of Awassi and Morkaraman lambs raised under different conditions I. Growth traits of Morkaraman and Awassi lambs unlimited suckling and weaned at 75 days of age. Erzincan University Graduate School of Natural and Applied SciencesJournal, 1(2), 121-133.

Arslan M, Yılmaz O, Ateş CT (2003) Morkaraman and Corriedale x Morkaraman (F1) growth in lambs. YüzüncüYıl University Faculty of Veterinary Journal, 14(1),46-49.

Aytekin İ, Karabacak A, Keskin İ (2015) Fattening performance, slaughter and carcass characteristics of Akkaraman lambs. Selçuk of Agricultural Sciences Journal, 2(1), 1-9.

Bhatt RS, Sahoo A, Sankhyan SK, Meena MC (2018) Growth performance and economics of pre-weaner lambs fed gelatinized and nongelatinized milk replacer. Indian J. Anim. Sci., 86, 76-80.

Bingöl E, AygünT (2014) The growth and developing traits of Karakaş ewes in Hakkari. Iğdır Univ. J. Inst. Sci. and Tech. 4(3), 65-73.

Boğa M, Seçer A (2015) Presenting of Suggestions and Identifying of problems examining the technicalof Akkaraman Sheep Breeding in Camardi town of Nigde City. Turkish Journal of Scientific Reviews, 8(2), 38-42.

Bozgüllü Ö, Macit M (2022) Determination of performance characteristics of Morkaraman lambs grazed on pasture. Palandöken Journal of Animal Science, Technology and Economics, 1(1), 25-32.

Çulha E (2019) Ekstansif koşullarda ivesi, merinos ve sakız ırkı kuzularda bazı büyüme özelliklerinin belirlenmesi. Yüksek Lisans Tezi, Burdur Mehmet Akif Ersoy Üniversitesi, Sağlık Bilimleri Enstitüsü, Burdur.

Erensoy K (2022) Effects of feedıng wıth dıfferent roughage ratıos on fattenıng performance ın the post-weanıng perıod ın lambs.Master of Science Thesis, Bursa Uludağ University Graduate School of Natural and Applied Sciences Department of Animal Science, Bursa, Turkey.

Esenbuğa N, Dayıoğlu H (2002) Effects of some environmental factors on growth traits of Awassi and Redkaraman lambs. Turkish Journal of Veterinary Animal Science, 26(1), 145-150.

Kaymakçı M (2013). İleri koyun yetiştiriciliği Genişletilmiş Dördüncü Baskı, Bornova- İzmir 2013. Meta Basım Matbaacılık Hizmetleri.

Koçak AF (2009) Lamb growing researches in Turkey. Master of Science Thesis, Namık Kemal University, Graduate School of Natural and Applied Sciences Department of Animal Sciences, Tekirdağ, Turkey.

Kor A, Dağ B, Kor D (2009) Lamb fattening systems in Turkey. Turkey Sheep Congress. 12-13 February 2009, 93-105.

Kopuzlu S, Sezgin E, Yüksel S, Özlütürk A, Biberoğlu O, Esenbuga N, Bilgin OC, Bayram M, Keskin M (2014) Phenotypic and genetic parameters for growth characteristics of morkaraman sheep. Journal of Applied Animal Research, 42(2),97-102.

Kopuzlu S, Sezgin E (2017) Some growth characteristics of Morkaraman, Morkaraman x Akkaraman and Romanov x Morkaraman (F1) crossbred lambs breeding in the Erzurum pasture. YüzüncüYıl University, Journal of Agriculture Sciences, 27(2), 259-267.

Koyuncu M, Akgün H (2018) Some Fertility Traits of Kıvırcık Sheep in Rural Farms, J. Anim. Prod., 2018, 59(1),33-40, DOI: 10.29185/hayuretim.406696

Küçük M, Bayram D, Yılmaz O (2002) A study on growth, fattening performance and carcass characteristics of Morkaraman and Kıvırcık x Morkaraman crosses (B1) lambs. Turk J. Vet. Anim. Sci., 26(6),1321-1327.

Laçin E, Aksoy AR (2003) Comparison of growth characteristics of Morkaraman and Tuj lambs in Kars region. Kafkas University, Journal of the Faculty of Veterinary Medicine, 9(1), 33-37.

Macit M, Yaprak M, Emsen H (1996). A comparison of fattening performance of Red-Karaman single-male lambs fed under different conditions. Atatürk University, Journal of Agriculture Faculty, 27(1), 213-225.

Odabaşıoğlu F, Ateş CT, Göktaş Y (1996) The effect of various ages weaning on growth of Morkaraman lambs. Yüzüncü Yıl University, Journal of Veterinary Faculty, 7(1-2), 8-13.

Özbey O, Akcan A (2001) Production performance of Morkaraman, Akkaraman and Awassi sheep under semi-intensive condition. II. Growth and survival rates of lambs.Journal of Veterinary Sciences, 17(1),57-66.

Özbey O, Akcan A (2003) Production characteristics of Morkaraman, Kıvırcık x Morkaraman (F1) and Chios x Morkaraman (F1) crossbred lambs. II. Fattening performance, slaughter and carcass characteristics. YüzüncüYıl University, Journal of Veterinary Faculty, 14(2), 35 - 41.

Öztürk Y, Küçük M, Karslı MA (2012) A Study on growth, slaughter and carcass traits of Morkaraman and Kıvırcık x Morkaraman (F1) lambs in semi-intensive condition. Kafkas University, Journal of the Faculty of Veterinary Medicine, 18(1), 1-6.

Pala F, Gülşen N(2021) Some lamb fattening studies in Turkey native sheep breeds. Journal of Bahri Dagdas Animal Research, 10(1), 87-102.

Richmond SE, Wemelsfelder F, de Heredia IB, Ruiz R, Canali E, Dwyer CM (2017) Evaluation of animal-based indicators to be used in a welfare assessment protocol for sheep. Frontiers in Veterinary Science, 4: 210.

Sezenler T, Soysal D, Yıldırır M, Yüksel MA, Ceyhan A, Yaman Y, Erdoğan İ, Karadağ O (2013) Influence of some environmental factors on litter size and lamb growth performance in Karacabey Merino sheep.Journal of Tekirdağ Agricultural Faculty, 10(1), 40-47.

Sezgin, E (2016) The national project on animal breeding in the hands of the people is final report of Morkaraman sheep race in Bingöl province. General Directorate of Agricultural Research and Policies. Proje No TAGEM/06/08/01/01-12mor2011-01.

Şireli H, Tekel N (2013). İvesi erkek kuzularının besi performansı ve karkas özelliklerine süt emme döneminde farklı büyütme sistemlerinin etkisi. Ank. Üniv. Tar. Bil. Der, 19, 63-70.

Türkyılmaz, D(2014) Determining the characteristics of reproduction, growth and slaughtering - carcass of Morkaraman and Romanov x Morakraman crossbreed lambs in Atatürk University research and application farm of agriculture faculty. Master of Science Thesis, Atatürk University, Graduate School of Natural and Applied Sciences Department of Animal Sciences, Erzurum, Turkey.

Üstüner H, Oğan MM (2013). Main productive performance of Awassi sheep in the central Anatolian region of turkey Turk J Vet Anim Sci, 37, 271-276.