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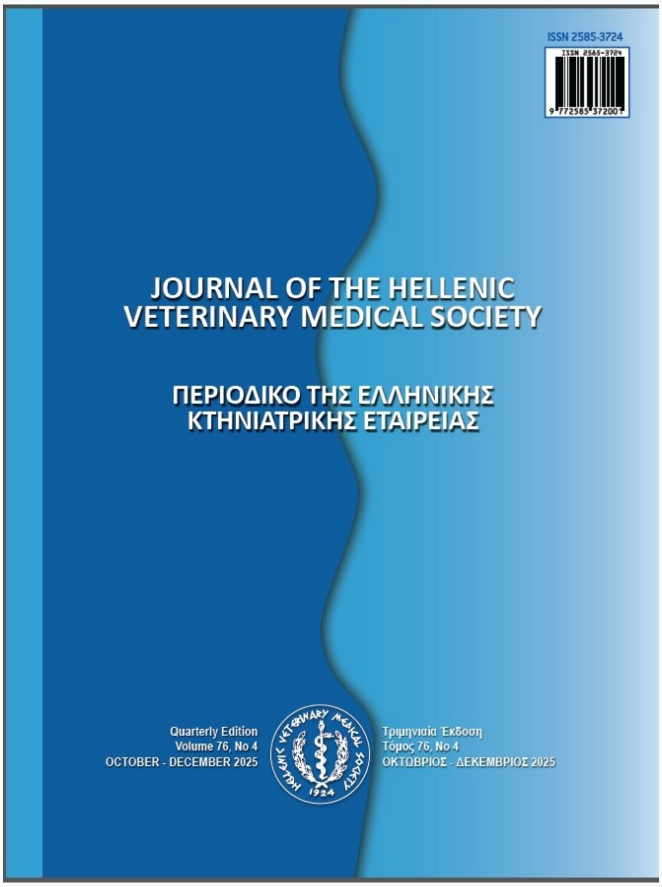


# A Comparison of milk yield and lamb performance in awassi sheep with different feeding strategies

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Research article
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# Comparison of milk yield and lamb performance in Awassi sheep with different feeding strategies

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**ABSTRACT:** The purpose of the study was to compare two feeding strategies (pasture and intensive) on lamb performance and milk yields of Awassi sheep. This study was conducted on a private farm in Ereğli (Konya) region. A total of 2182 ewes and 2554 lambs were examined. The ewes and their lambs were divided into two groups: pasture (P) and intensive (I). The pasture group was grazed in the naturel forage until birth (between April and November), raised intensively from birth until weaning, and then grazed in the pasture after weaning. No additional feed was given while in the pasture. The intensive group was cared for and fed under intensive conditions. The effect of pasture and intensive feeding on lactation milk yield was insignificant ($p > 0.05$), while the effect of birth type and lactation number was significant ($p < 0.05$). In the pasture group (175.64 days), the lactation period was higher ($p < 0.05$). The daily milk yield of the ewes was higher in the intensive group to pasture (1.04±0.1-0.96±0.1) ($p < 0.05$). While the birth weights of lambs whose dams were fed on pasture and intensive feed were similar ($p > 0.05$), weaning weights were higher in the intensive group (21.31±0.12-20.98±0.11) ($p < 0.05$). In the study, it was observed that feeding ewes on pasture extended the lactation period but did not affect lactation milk yield. The study also determined that intensive feeding enhances the daily milk yield. The weight at birth of lambs that received the same care and nutrition and whose mothers were fed intensely on pasture was found to be similar; however, the weight at the weaning of the lambs was greater when the dams received intensive feeding.

***Keyword:*** Ewes milk; Awassi; pasture; intensive feeding

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## INTRODUCTION

Sheep farming plays a vital role in global animal husbandry. Meat, milk, fleece, and manure are the main yields of sheep. While some of these products are used for human nutrition, some are used as goods, and some are used as fertilizer in agricultural production. In this respect, sheep farming is gaining more and more importance every day (İnal et al., 2021). Sheep consume high amounts of roughage and can turn poor pasture conditions into productivity (Hassan and Karslı, 2022). It is a productive and economical livestock subsection since it spends a significant part of its nutrition on pasture, converts poor pasture resources into productivity, has a shorter gestation period than cattle, and has a higher multiple gestation rate (Akçapınar, 2000).

Meat and milk obtained from sheep are important nutritional sources for human nutrition. Animal products are indispensable elements in human nutrition thanks to the fatty acids, immunoglobulins, and non-immune proteins. Sheep milk is one of these products. The human intestine converts milk proteins into bioactive peptides that have antioxidative, antimicrobial, antihypertensive, immunomodulatory, and antithrombotic effects. In addition, thanks to prebiotics and probiotics, it is possible to ensure a healthy life and reduce the risk of disease (Ünal et al., 2008; Mohapatra et al. 2019).

Sheep milk is consumed as fresh or as yoghurt and cheese. In this way, it provides significant income to the rural economy. However, sheep's milk is mainly consumed as cheese, thanks to its potential to create a natural, unique, and local product (Bencini et al., 2010; Milani and Wendorf, 2011). Many of Türkiye's famous cheeses (Şavak Tulum cheese, Divle Obruk cheese, Kargı Tulum cheese) are made from sheep's milk. This feature arises from the special chemical and organoleptic structure of sheep milk. It is also consumed as yoghurt along with cheese (Bencini, 2002; Ceyhan et al., 2022). The production season of sheep milk is important. The birth season of sheep generally happens in winter and early spring. Therefore, in this period, as the pasture begins to develop and is at its richest state in the spring, the milk yield and quality are also affected positively (Karslı et al. 2003; Gül et al., 2020).

Sheep milk yield is affected by many genetic and non-genetic factors (age, health, etc.). The breed can be considered one of the most important factors affecting daily and total lactation milk yield in sheep. Milk yield increases with age, and studies show that the highest milk yield is around 5 years of age (Bolcalı et al., 2019; Al-Qasimi et al., 2020, Güngör et al., 2022). The sheep population is around 44 million in Türkiye (TUİK, 2023). Approximately 90% of the sheep population consists of domestic genetic resources. Awassi sheep are generally raised in the southern regions, and it is a breed that is superior in milk yield (Yakan et al., 2012). Awassi sheep are a local gene resource that can adapt to harsh climatic conditions, can give milk yield in hot weather, and are resistant to some diseases and parasites (Akçapınar, 2000; İnal et al., 2021; Al-Hamdani et al. 2023; Ceyhan and Kozaklı, 2023). While annual sheep milk production is 10.42 million tons in the world, this figure is around 1.1 million tons in Türkiye. Lactation milk yield of Awassi sheep is between 101.63 - 244.39 L, daily milk yield is between 350.94 g - 950.0 g, and lactation period is between 104.86 - 232.72 days (Kaygısız and Dağ, 2017; Aloueedat et al., 2019; Al-Qasimi et al., 2020; Ceyhan et al., 2022; Abdullah, 2023). While daily milk yield is 408.50 g in winter, it is 633.0 g in spring, 311.69 g in singleton ewes and 390.19 g in twins, 357.96 g in male lambs and 343.92 g in female lambs, 816 g in intensive feeding and 878 g in pasture (Ceyhan et al., 2022; Al-Hamdani et al., 2023; Abdullah, 2023). Sheep milk and products vary depending on the breed of the sheep, lactation stage, management system, and nutrition of the sheep (Bencini et al., 2010; Milani and Wendorf, 2011; Mohapatra et al., 2019).

Awassi lamb birth live weight was stated to be between 3.71 - 4.15 kg, 4.34 - 5.08 in a single birth, 3.53 - 4.10 kg in twins, 3.85 - 4.75 kg in males, 3.54 - 4.47 kg in females; also, the weaning live weight was stated respectively; 16.39 - 19.99 kg, 16.48 - 29.52 kg, 16.58 - 28.80 kg, 16.58 – 29.88 kg and 16.21 – 28.44 kg (Dikmen et al., 2007; Elia, 2018; Biçer et al., 2019; Al-Momani, et al., 2020; İnal et al., 2021; Şahin, 2022; Abdullah, 2023).

Sheep milk production is generally based on the pasture in Türkiye and the world. There is not enough data on sheep milk production with intensive feeding systems. This study hypothesizes that milk yield and lamb performance of Awassi sheep, fed with concentrated feed, may be better. The study aimed to examine the milk yield and lamb development of Awassi sheep fed on only pasture and intensely fed.

## MATERIAL AND METHOD

The study was carried out in 2022 – 2023 at Memuta Sheep Farm in Konya, Ereğli (37.83766434041547, 34.177388411761434). The average temperature of the region is 11.9 °C, the average precipitation is 325.3 mm, it is dry in summer, and the temperature is generally below 0 °C in winter (MGM, 2024). The experiment was designed by change over design (Huhtanen and Hetta, 2012). The first-year ewes were grazed in the pasture and the second year fed intensively. The total 2182 Awassi sheep (average 60 kg BW and 1-5 parity) and 2554 lambs included the study. Animals were divided into two groups: pasture (P; n= 1104) and intensive (I; n= 1078). Also, lambs were divided into two groups also (P, n= 1249; I, n= 1305). All animals remained in the box with their lambs for an average of 3 days after birth, and then they were taken to group feeding. Animals and their lambs were fed intensively for an average of 60 days after birth. After the weaning, the dams went out to pasture and no additional feeding was given in the P group. The pasture is artificial and belongs to the farm. The animals were grazed between 9:00 am and 8:00 pm. The intensive group was fed on the farm after the lambs were weaned. For this purpose, the intensive group was fed with TMR, which is a mixture of 50% roughage and 50% concentrate. Corn silage, alfalfa hay, and wheat straw were used as roughage, and concentrate feed. Lambs consumed *ad libitum* starter and alfalfa hay in addition to milk from the age of one week in both groups. All lambs also consumed *ad libitum* water. Synchronization was not carried out in dams for pregnancy. After the lambs were weaned, a free-range ram (2-4 years old) was added to the herd. The 1 ram was left for 20 ewes for mating program. Rams selected for mothers' lactation milk yield and phenotypic characteristics. For the mating and pregnant animals were separated after monthly ultrasonography (USG) checks. Rams and ewes were kept together until pregnancy. In this way, births took place on the farm all year round.

Starting from the 4$^{th}$ day after birth, the ewes were milked once a day with an automatic milking system, at 09:00 am, and were left for lambs suckling between 2:00 pm and 02:00 am. After the lambs were weaned (60 days average), the ewes were milked twice a day with an automatic milking system, at 09:00 am and 9:00 pm, and their daily milk yield was recorded. Milk yield until the weaning period was calculated by multiplying the amount of milk obtained in the first double milking by the number of days (ICAR, 2018). Subsequent milk yields and lactation periods were determined based on real-time. The ewes were dryed when their milk yield dropped below 100 ml. The lactation milk yield, lactation period and daily milk yield data of the ewes and birth weight and weaning weight of lambs were analyzed according to the least-squares method. For the birth weight and weaning live weight, the following equation was used:

$$[Yi = \mu + aj + bk + cl + dm + eijklm] \quad (1)$$

where Yi is the=live weight, μ is the =overall mean, aj is the =feeding type, bk is the =birth type, cl is the =sex, dm is the =mother lactation number, and eijklm is the =error.

For the milk yield, lactation period and daily milk yield of the ewes, the following equation was used:

$$[Yi = \mu + aj + bk + cl + dm + eijk] \quad (2)$$

where Yi=lactation milk yield, lactation period and daily milk yield, μ =the overall mean, aj = feeding type, bk =birth type, cl =lactation number, dm =birth month and eijklm =error.

The Tukey test was used to compare groups with significant differences and $p < 0.05$. was considered a significant difference. The Minitab (2006) software program was utilized for the statistical analyses.

The pasture was a private artificial pasture belonging to the farm. The pasture was a mixture of 6 forages of approximately 30 ha (Ryegrass), spelled brome (Bromus inermis), reed fescue (Festuca arundinacea Schreb), white clover (Trifoliumrepens L.), clover (Medicago sativa L.) and sainfoin (Onobrychis sativa). The pasture was divided equally into 9 sections and the animals were grazed in rotation. The animals were sheltered in a semi-open area in the evenings.

Dry matter (DM), crude protein (CP), and ash analyses in the roughage and concentrate feed samples consumed by the animals were analysed according to AOAC (1990). Neutral detergent fiber (NDF) and acid detergent fiber (ADF) analyses were performed according to Van Soest and Robertson (1979). The TMR composition, concentrated feed content, chemical composition, and calculated ration consumed by the animals are given in Table 1.

## RESULTS

The lactation milk yields, lactation period and daily milk yield of the ewes according to feeding type, birth type, and lactation number of dams are given in Table 2. Both the pasture and intensive groups were not significantly different in terms of lactation milk

**Table 1.** TMR composition, chemical composition and content of ration.

| | Corn Silage (kg) | Alfalfa Hay (kg) | | Wheat Straw (kg) | Concentrate (kg) | |
|---|---|---|---|---|---|---|
| TMR 1 | - | 0.90 | | 0.40 | 1.40 | |
| TMR 2 | 0.60 | 1.20 | | 0.38 | 1.30 | |
| **Chemical Composition (%)** | | | | | | |
| | DM | Ash | | CP | NDF | ADF |
| Corn Silage | 28.12 | 6.02 | | 7.8 | 55.42 | 36.14 |
| Alfalfa Hay | 87.45 | 9.12 | | 13.86 | 35.24 | 26.92 |
| Wheat Straw | 94.12 | 8.06 | | 3.91 | 75.16 | 46.24 |
| Sheep Concentrate | 91.54 | 4.26 | | 16.64 | 20.16 | 8.92 |
| Starter | 92.03 | 9.86 | | 18.69 | 18.25 | 6.12 |
| **Concentrate Content (%)** | | | | | | |
| | Barley | Maize | CSM | SSM | SBM | |
| Sheep Concentrate* | 25.0 | 33.90 | 17.0 | 6.0 | 10.6 | |
| Starter** | 15.0 | 43.47 | 6.0 | 3.75 | 24.58 | |
| **Calculated Nutrient** | | | | | | |
| | DM % | CP % | | Ash % | ME Mcal/kg | |
| Sheep Concentrate | 90.02 | 17.49 | | 5.18 | 2.49 | |
| Starter | 90.23 | 19.07 | | 7.76 | 2.62 | |

TMR 1: TMR consumed by ewes until weaning, TMR 2: TMR consumed by intensively fed ewes after weaning. DM: Dry matter; CP: crude protein; NDF: neutral detergent fiber; ADF: acid detergent fiber, CSM: cotton seed meal; SSM: sunflower seed meal; SBM: soy bean meal.
*: Salt: % 0.8; di calcium phosphate (DCP): % 1.2; Yeast: % 1.5; Vit-Min: % 1.50; limestone: % 2.50.
**: Salt: %0.7; Yeast: % 1.0; Vit-Min: % 2.50; limestone: % 3.0.

**Table 2.** Mean and SEM of lactation milk yield according to feeding type, birth type and lactation numbers (L) in Awassi Sheep

| | n | LMY (L) | Lactation Period | DMY (L/day) |
|---|---|---|---|---|
| Pasture | 1104 | 176.09±2.37 | 175.64±1.43$^{a}$ | 0.96±0.01$^{b}$ |
| Intensive | 1078 | 179.16±2.33 | 167.63±1.22$^{b}$ | 1.04±0.01$^{a}$ |
| P | | 0.36 | 0.01 | 0.01 |
| Singleton | 1808 | 170.47±1.72$^{b}$ | 170.57±1.05$^{b}$ | 0.97±0.01$^{b}$ |
| Twins Birth | 374 | 211.46±4.59$^{a}$ | 176.88±2.21$^{a}$ | 1.17±0.02$^{a}$ |
| P | | 0.01 | 0.01 | 0.01 |
| 1. Lactation | 543 | 165.03±3.25$^{b}$ | 172.48±1.84$^{ab}$ | 0.90±0.01$^{c}$ |
| 2. Lactation | 494 | 181.47±3.73$^{a}$ | 176.74±2.10$^{a}$ | 0.99±0.02$^{b}$ |
| 3. Lactation | 449 | 182.66±3.61$^{a}$ | 172.96±2.18$^{ab}$ | 1.04±0.02$^{ab}$ |
| 4. Lactation | 293 | 177.15±4.36$^{ab}$ | 168.22±2.58$^{ab}$ | 1.05±0.02 |
| 5 and + Lactation | 403 | 184.27±3.79$^{a}$ | 165.72±1.97$^{b}$ | 1.09±0.02$^{a}$ |
| p | | 0.01 | 0.01 | 0.01 |
| Overall | 2182 | 177.62±1.66 | 171.67±0.95 | 1.00±0.01 |

LMY: Lactation milk yield, DMY: Daily milk yield.

yield. However, there was a significant effect of birth type and lactation number on milk yield. But feeding type, birth type and lactation number was effected to lactation period and daily milk yield of the ewes.

Table 3 shows the lactation milk yield, lactation period, and daily milk yield of the ewes according to their birth months. The lactation milk yield and lactation periods were similar according to birth months ($p>0.05$). But daily milk yield was higher on May than January and July ($p<0.05$).

Birth and weaning live weights of lambs in which the dams were fed in the pasture and intensively are given in Table 4. While the birth weight of pasture group was 4.49±0.02 kg, and intensive group was 4.51±0.02 kg ($p > 0.05$).

**Table 3.** Mean and SEM of lactation milk yield (L), lactation period (days) and daily milk yield of the ewes according to birth months (L).

| Month | n | LMY (L) | LP (day) | DMY (L/day) |
|---|---|---|---|---|
| January | 292 | 172.42±4.55 | 174.06±2.37 | 0.95±0.02$^{b}$ |
| February | 292 | 179.80±4.47 | 175.18±2.38 | 1.00±0.02$^{ab}$ |
| March | 199 | 172.34±5.29 | 169.95±3.13 | 0.98±0.02$^{b}$ |
| April | 290 | 166.35±4.16 | 163.15±2.65 | 0.99±0.02$^{ab}$ |
| May | 212 | 184.37±5.28 | 168.95±3.12 | 1.09±0.03$^{a}$ |
| June | 147 | 183.21±6.61 | 172.42±3.74 | 1.00±0.03$^{ab}$ |
| July | 95 | 173.24±8.45 | 172.70±4.92 | 0.94±0.03$^{b}$ |
| August | 69 | 175.02±9.64 | 172.76±6.24 | 0.95±0.04$^{ab}$ |
| September | 12 | 199.20±30.10 | 179.20±11.50 | 1.07±0.13$^{ab}$ |
| October | 347 | 184.38±4.67 | 171.90±2.46 | 1.04±0.02$^{ab}$ |
| November | 112 | 182.51±6.43 | 177.15±3.81 | 1.00±0.03$^{ab}$ |
| December | 115 | 180.81±6.63 | 176.98±4.22 | 1.02±0.03$^{ab}$ |
| p | | 0.162 | 0.069 | 0.001 |

LMY: Lactation milk yield; LP: lactation period; DMY: Daily milk yield.

**Table 4.** Live weight of lambs according to dams nutrition type, gender and birth type (kg)

| | n | BW (kg) | n | WW (kg) |
|---|---|---|---|---|
| Pasture | 1249 | 4.49±0.02 | 875 | 20.98±0.11$^{b}$ |
| Intensive | 1305 | 4.51±0.02 | 958 | 21.31±0.12$^{a}$ |
| P | | 0.5 | | 0.04 |
| Singleton | 1808 | 4.67±0.02$^{a}$ | 1268 | 22.40±0.12$^{a}$ |
| Twins | 746 | 4.32±0.02$^{b}$ | 565 | 19.84±0.10$^{b}$ |
| p | | 0.01 | | 0.01 |
| Male | 1317 | 4.67±0.02$^{a}$ | 950 | 22.40±0.12$^{a}$ |
| Female | 1237 | 4.32±0.02$^{b}$ | 883 | 19.84±0.10$^{b}$ |
| p | | 0.01 | | 0.01 |
| 1. Lactation | 508 | 4.12±0.03$^{c}$ | 366 | 20.49±0.16$^{b}$ |
| 2. Lactation | 489 | 4.64±0.03$^{ab}$ | 348 | 21.76±0.18$^{a}$ |
| 3. Lactation | 471 | 4.61±0.03$^{ab}$ | 351 | 21.64±0.18$^{a}$ |
| 4. Lactation | 376 | 4.66±0.03$^{a}$ | 273 | 21.30±0.21$^{a}$ |
| 5. and + Lactation | 710 | 4.52±0.03$^{b}$ | 495 | 20.53±0.16$^{b}$ |
| p | | | | 0.01 |
| Overally | 2554 | 4.50±0.01 | 1833 | 21.12±0.08 |

BW: Birth weight; WW: weaning weight

## DISCUSSION

In the study, there was no difference between the pasture and intensively fed ewes in terms of lactation milk yield. Genetic and environmental factors are effective in increasing the lactation milk yield of the ewes. Since the origin of the herd was same, the genetic structure is thought to be similar. However, factors such as daily milk yield, lactation period, and the health status of animals affect lactation milk yield. These factors are thought to be similar or balanced with each other. In a study conducted in different years with the same animals on the same farm (Ceyhan et al., 2022), the lactation milk yield was reported as 204.61 L on pasture and 167.68 L fed on a concentrate basis. The lactation milk yield of intensively fed animals was similar to this study, but the pasture group was higher than in this study. It is thought that the difference is due to the variation of the year and pasture development. The lactation milk yield was higher than Biçer et al. (2019) and Al-Qasimi et al. (2020) and lower than the values reported by Üstüner and Oğan (2013) and Kaygısız and Dağ (2017). This situation is thought to be due to the genetic structure and nutritional differences of the animals. The lactation milk yield of the ewes of twin birth was higher than that of ewes single birth. This is to be expected. A sheep giving birth to twins is expected to produce more milk, but this should be supported by balanced feeding. In the study, since the dry matter consumption of the animals was close to the upper limits (NRC, 2007), the milk yield of the ewes giving birth to twins also increased. Kaygısız and Dağ (2017) reported the lactation milk yield of ewes giving birth to twins as 254.84 L and that of ewes giving birth to single as 241.01 L. Both values were higher than the study. This situation can be explained by the high genetic capacity of the animals (elite-selected animals). In the study, lactation milk yields of animals according to the lactation numbers; it was the highest (184.27 L) in five and above lactations and the lowest (165.03 L) in the first lactation. It is reported that the milk yield of ewes increases after the second lactation and decreases after the 4$^{th}$ and 6$^{th}$ lactations (Çörekci and Evrim, 2000); also, the lowest lactation milk yield is in the first lactation, and the highest is between the ages of 4 and 7 (Gabina et al., 1993). This situation agrees with the literature. Biçer et al. (2019) reported lactation milk yield as 89.7 L in the first lactation and 119.2 L in the second lactation. Üstüner and Oğan (2013) reported that the highest milk yield was obtained from 5-year-old ewes (208.4 L). Also, Kaygısız and Dağ (2017) obtained the highest milk yield from the 3$^{rd}$ lactation of animals (261.72 L). The lactation milk yield differences according to lactation numbers in the study coincide with the literature. The birth month did not affect lactation milk yield. Lactation milk yields of animals were found to be similar.

The lactation period of animals fed on pasture was significantly higher than those fed intensively. The lactation period was 175.64 days in the pasture and 167.63 days in the intensively fed condition. Insufficient nutrient consumption during the lactation period may reduce daily milk yield and lactation period. However, it is not appropriate to evaluate the sheep-feeding strategies based on cows. Although the information is compatible, it is necessary to consider the differences in the feeding strategies of dairy sheep (Cannas, 2004). Providing additional energy and protein sources to pasture-fed animals towards the end of lactation will increase milk yield and extend the lactation period (Sampelayo et al. 2007). Therefore, it is difficult to determine the consumpt of forage in the pasture during the lactation period. However, adequate energy intake in flushing has positive effects on pregnancy in ewes. The lactation period may be prolonged because the animals in the pasture cannot get enough energy; the pregnancy period is prolonged, and therefore the dry period is prolonged. Ceyhan et al. (2022) reported in their study that the lactation period of ewes fed on pasture was 232.72 days, and intensive feeding was 205.04 days. Both values were higher as compared to this study. It is thought that the difference is due to the year effect. The lactation period was higher than Al-Qasimi et al. (2020), and similar results were reported by Dikmen et al. (2007) and Kaygısız and Dağ (2017). Üstüner and Oğan (2013) reported that the effect of maternal age on the lactation period was the highest in 2-year-olds and lowest in 4-year-olds. This situation conflicts with the study. It is thought that the reason for this is due to nutrition. The month in which the animals gave birth did not affect the lactation period. Lactation periods of animals were similar in those giving birth in 12 months of the year.

Daily milk yield obtained in the study was higher in the pasture group. This may be due to animals grazing on pastures being fed enough and in a balanced manner regarding proteins, vitamins, and minerals. In the study conducted on the same farm (Ceyhan et al., 2022), the daily milk yield of animals on pasture was determined as 0.82 L, and that of intensively fed animals was 0.88 L. The values obtained in the study are higher than the values found by Ceyhan et al. (2022). It is thought that this difference may be due to the year effect. Daily milk yields were higher than those reported by Dikmen et al. (2007), Elia (2018), and Al-Hamdani et al. (2023); similar to the values reported by Al-Qasimi et al. (2020) and Aloueedat et al. (2019). Milk yield in sheep is affected by factors such as genetics, age, and nutrition. The discrepancy in the literature is thought to be due to genetics and nutrition. In the study, ewes that gave birth to twins had higher daily milk yield than ewes that gave birth to a single, and ewes with five or more lactations had higher daily milk yield than those in the first lactation. This situation coincides with the information that milk yield increases after the second lactation (Çörekci and Evrim, 2000). The daily milk yield was higher than the one reported by Abdullah et al. (2023) in single- and twin-birth ewes and also higher than in the first and fifth lactation ewes. This situation can be explained by the genetic structure of the animals. Daily milk yield varied depending on the months in which the animals gave birth. The highest daily milk yield was observed in animals giving birth in May (1.09 L), and the lowest was in animals giving birth in January (0.95 L), March (0.98 L), and July (0.94 L). It is thought that this is due to the extreme temperature differences during the day. The daily milk yield was higher than that reported by Al-Hamdani et al. (2023) in ewes giving birth in winter and spring. Likewise, the daily milk yield of the ewes milk in September, October, November, and December was lower than the results in the current study (Elia, 2018). This situation can be explained by the genetic capacity and nutritional differences of the animals.

Lambs born to dams that grazed on pasture had similar birth weights to those of lambs raised with intensive feeding. This situation showed that the maintenance and gain of animals fed on pasture and intensively were at an adequate level. The birth weight of single lambs was higher than that of twin lambs, male lambs were higher than female lambs, and lambs from fourth lactation animals were higher than lambs from first lactation animals. Lamb birth weight is affected by genotype, birth type, dam age, gender, and year of birth (Güngör et al., 2022). Dam age influenced the birth weight of the lamb. The highest birth weight of lambs was in the fourth lactation dams, and the lowest was in the first lactation dams. This situation is also as expected. In the literature, the birth live weight, according to birth type, gender, and maternal age, was similar to those reported by Elia (2018), Özbeyaz et al. (2018), Biçer et al. (2019), Al-Momani et al. (2020), İnal et al. (2021), and Abdullah (2023). In this study, lambs from intensively fed ewes had greater weaning live weights than lambs from ewes on pasture. Single-born lambs were higher than twins, males were higher than females, and second-lactation ewe lambs were higher than first-lactation ewe lambs. The amount of energy the ewes ingested during their pregnancy may have contributed to the elevated weaning weight of the lambs on the intensively fed ewes. It's anticipated that single lambs will have more than twins, male lambs more than female lambs, and multiparous ewe lambs more than single parous. The weaning live weight was similar in terms of overal, according to birth type, gender, and age of dam with Elia (2018), Biçer et al. (2019), Al-Momani et al. (2020), and Abdullah (2023). The weaning live weight reported by Inal et al. (2021) was higher than the results in the study, which is thought to be due to weaning at the age of 120 days.

## CONCLUSION

The study found that while pasture and intensive feeding of Awassi sheep did not influence the amount of milk produced during lactation, intensevely feeding improved the amount of milk produced each day. It has been observed that the lactation period was higher in the pasture group. The daily milk yield of the ewes which gave birth in May was the highest. In terms of lamb performance, the live birth weight was not affected by the feeding type. However, weaning live weight was determined to be higher in the lambs of mothers fed intensively. It was concluded that the milk yield of Awassi sheep raised in the Konya region and in Türkiye conditions was similar to and above the world average and that there were no negative effects on the milking of the animals throughout the year.

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## DATA AVAILABILITY

Since the data is private business data, it can be accessed upon request from the correspond author.

## CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

## ETHIC STATEMENT

In the study, milk yield and live weight were monitored. The EU ethics committee decision is not required.

## AUTHOR CONTRIBUTION

The design, planning, execution, data collection, analysis and writing of the article were done by Hasan Hüseyin ŞENYÜZ.

## REFERENCES


Abdullah MF (2023) Study of milk yield and some of ıts chemical components and ıts relationship with lambs growth of Awassi sheep. Journal of Agrıcultural, Environmental and Veterinary Science 7(1):76-87. doi: 10.26389/AJSRP.J201022

Akçapınar H (2000) Koyun yetiştiriciliği. 2nd Edition. Ankara.

Al-Hamdani ARB, Al-Hamdani KH, Al-Farha AAB (2023) The influence of the lambing season on awassi sheep milk quality, milk productivity, and biochemical traits. In IOP Conference Series: Earth and Environmental Science. 1158, 1-12. doi:10.1088/1755-1315/1158/5/052017

Al-Momani AQ, Ata M, Al-Najjar KA (2020) Evaluation of weight and growth rates of Awassi sheep lambs. Asian Journal of Research in Animal and Veterinary Sciences 5(3):26-32.

Aloueedat MK, Obeidat BS, Awawdeh MS (2019) Effects of partial replacement of conventional with alternative feeds on nutrient intake, digestibility, milk yield and composition of Awassi ewes and lambs. Animals 9(9):684. doi:10.3390/ani9090684

Al-Qasimi HR, Mohammed Abbas S, Al-Khauzai A (2020) Effect of breed and some non-genetic factors on milk production and some proportions of its chemical components in two breeds of local sheep. Al-Qadisiyah Journal For Agriculture Sciences 10(1):227-231.

AOAC (1990) Official methods of analysis. Association of Official Analytical Chemists, Arlington, VA

Bencini R (2002) Factors affecting the clotting properties of sheep milk. Journal of the Science of Food and Agriculture 82(7):705-719. doi: 10.1002/jsfa.1101

Bencini R, Atzori AS, Nudda A, Battacone G, Pulina G (2010). Improving the quality and safety of sheep milk. Food Science Technolohgy and Nutrition 347-401. https://doi.org/10.1533/9781845699437.3.347

Biçer O, Keskin M, Gül S, Gündüz Z, Oflaz NZ, Behrem S (2019) Comparison of yield characteristics of brown and black headed Awassi sheep. Mustafa Kemal University Journal of Agricultural Sciences 24(1):58-61.

Bolacalı M, Öztürk Y, Yılmaz O, Küçük M, Karslı M.A (2019) Effect of non-genetic factors on the reproductive performance and milk yield characteristics of Hair goats. Kocatepe Veterinary Journal 12(1):52-61. doi: 10.30607/kvj.472839

Cannas A (2004) Feeding of lactating ewes. In Dairy sheep nutrition (pp. 79-108). Wallingford UK: CABI Publishing. https://doi.org/10.1079/9780851996813.0079

Ceyhan A, Kozaklı Ö (2023) The survival analysis of some environmental factors associated with lamb mortality in Awassi sheep. Tropical Animal Health and Production 55(6):409. https://doi.org/10.1007/s11250-023-03821-y

Ceyhan A, Avcı M, Tanrıkulu MM, Yılmaz B, Ul Hassan M (2022) The effect of different management systems on milk yield and milk quality in Awassi sheep. Archives Animal Breeding 65(4):407-416. https://doi.org/10.5194/aab-65-407-2022

Çörekçi GŞ, Evrim M (2000) Comparative studies on the production performances of Chios and Imroz breeds kept under semi-intensive conditionus II. Milk production, fleece yields and characteristics. Turkish Journal of Veterinary & Animal Sciences, 24(6), 545-552.

Dikmen S, Turkmen II, Ustuner H, Alpay F, Balci F, Petek M, Ogan M (2007) Effect of weaning system on lamb growth and commercial milk production of Awassi dairy sheep. Czech Journal of Animal Science 52(3):70-76.

Elia JV (2018) Some factors affecting milk production and its components and some growth traits of local Awassi sheep. J. of Research in Ecology 6(2):2169-2175.

Gabiña D, Arrese F, Arranz J, De Heredia IB (1993) Average milk yields and environmental effects on Latxa sheep. Journal of Dairy Science 76(4):1191-1198.

Gül S, Keskin M, Biçer O, Gündüz Z, Behrem S (2020) Effects of different lambing season on some reproductive characteristics of ewes and growth performance of lambs in Awassi sheep. Lalahan Hayvancılık Araştırma Enstitüsü Dergisi 60(1): 32-36. http://doi.org/10.46897/lahaed.779729

Güngör ÖF, Ünal N, Özbeyaz C, Akçapınar H (2022) The effects of some factors on the time to first successful stand up and sucking of native lambs after parturition. Tropical Animal Health and Production 54(5):333. https://doi.org/10.1007/s11250-022-03333-1

Hassan MAS, Karslı MA (2022) The effects of some feed additives in nutrition of ruminant animals. International Journal of Veterinary and Animal Research 5(2):107-112. doi:10.5281/zenodo.7024597

Huhtanen P, Hetta M (2012). Comparison of feed intake and milk production responses in continuous and change-over design dairy cow experiments. Livestock Science 143(2-3):184-194. doi.org/10.1016/j.livsci.2011.09.012

ICAR (2018) Guidelines for performance recording in dairy sheep and dairy goats. Access date: 10.06.2024. https://www.icar.org/Guidelines/16-Dairy-Sheep-and-Goats.pdf

İnal Ş, Coşkun B, Dinç DA, Çam M (2021) Reproductive parameters of primiparous Awassi sheep and mortality rates of their lambs in steppe climates. Journal of Livestock Science (12):262-267. doi.10.33259/JLivestSci.2021.262-267

Karslı MA, Deniz S, Nursoy H, Denek N, Akdeniz H (2003) The effects of maturity on range quality and animal performance. Turk J Vet Anim Sci 27:117-124.

Kaygısız A, Dağ B (2017) Elit İvesi koyunlarında meme tipinin ve bazı çevre faktörlerinin süt verimine etkisi. KSÜ Doğa Bilimleri Dergisi 20(4):344-349. doi: 10.18016/ksudobil.285944

MGM (2024) National Temperature Statistics. Access date: 10.06.2024, https://www.mgm.gov.tr/veridegerlendirme/il-ve-ilceler-istatistik.aspx?k=H&m=KONYA

Milani FX, Wendorff WL (2011) Goat and sheep milk products in the United States (USA). Small Ruminant Research 101(1-3):134-139. doi.org/10.1016/j.smallrumres.2011.09.033

Minitab (2006) L.L.C. Minitab, Minitab. Inc., Versão.

Mohapatra A, Shinde AK, Singh R (2019) Sheep milk: A pertinent functional food. Small Ruminant Research 181: 6-11. https://doi.org/10.1016/j.smallrumres.2019.10.002

NRC (2007) National research council, committee on the nutrient requirements of small ruminants, board on agriculture, division on earth, & life studies. Nutrient requirements of small ruminants: sheep, goats, cervids, and new world camelids. The National Academies Press, Washington, D.C.

Özbeyaz C, Bilgiç ÖF, Kocakaya A, Ünal N (2018) Eskişehir de yetiştirici koşullarındaki ivesi koyunlarında bazı özelliklerin incelenmesi. Lalahan Hayvancılık Araştırma Enstitüsü Dergisi 58(1):1-6.

Sampelayo MS, Chilliard Y, Schmidely P, Boza J (2007) Influence of type of diet on the fat constituents of goat and sheep milk. Small Ruminant Research 68(1-2):42-63. doi:10.1016/j.smallrumres.2006.09.017

Şahin Ö (2022) Evaluation of some factors on birth and weaning weights in Awassi sheep by using GLM and CART analysis. Tropical Animal Health and Production 54(6):400. https://doi.org/10.1007/s11250-022-03405-2

TUİK (2023) National Livestock Statistics. Access date: 01.06.2024

Ünal N, Akçapınar H, Atasoy F, Yakan A, Uğurlu M (2008) Milk yield and milking traits measured with different methods in Bafra sheep. Revue de Médecine Vétérinaire 159(10):494-501.

Üstüner H, Oğan MM (2013) Main productive performance of Awassi sheep in the Central Anatolian Region of Turkey. Turkish Journal of Veterinary & Animal Sciences 37(3):271-276. . https://doi.org/10.3906/vet-1205-13

Van Soest P, Robertson J (1979) Systems of analysis for evaluating fibrous feeds Standardization of analytical methodology for feeds: proceedings. IDRC, Ottawa, ON, CA

Yakan A, Ünal N, Dalcı MT (2012) Ankara şartlarinda Akkaraman, Ivesi ve Kivircik irklarinda döl verimi, büyüme ve yaşama gücü. Lalahan Hayvancılık Araştırma Enstitüsü Dergisi 52(1):1-10.