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The Effects of Udder Types on Milk Production and Quality in Sheep

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Reviews

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ABSTRACT

The placement of the teats on the udder in sheep affects the amount of milk remaining in the udder during both udderfeeding and milking, and in parallel, the amount and quality of milk we will obtain is affected. Udder characteristics are controlled in terms of genetic and environmental factors. Udder cleaning, attachment of the udder to the body, placement of the teat, udder shape and teat size are the features commonly used in selection programs. For this reason, the relationship between udder characteristics and milk yield in sheep and its usability in genetic breeding have been the subject of many studies In this study, studies on the effects of udder types on milk yields and milk components were examined. In addition, it is thought that it will be beneficial to use the characteristics of udder types in addition to the yield records and pedigree information used in the breeding of dairy sheep.

Koyunlarda Meme Tiplerinin Süt Verimi ve Kalitesine Etkisi

Derleme

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Anahtar Kelimeler
Koyun
Meme özellikleri
Süt kalitesi
Süt verimi

ÖZ

Koyunlarda meme başlarının memeye yerleşimi gerek emzirmede gerekse sağımda memede kalan süt miktarını etkilemektedir, buna paralel olarak da elde edeceğimiz süt miktarı ve kalitesini etkilemektedir. Meme özellikleri genetik ve çevresel faktörler bakımından kontrol edilmektedir. Memenin vücuda bağlantısı, meme başının yerleşimi, meme başı büyüklüğü ve meme şekli seleksiyon programlarında yaygın olarak kullanılan özelliklerdir. Bu nedenle, koyunlarda meme özelliklerinin süt verimi ile ilişkisi ve bunun ıslahta kullanılabilirliği birçok çalışmaya konu olmuştur. Yapılan çalışmada meme tiplerinin süt verimlerine ve süt bileşenlerine etkileriyle ilgili araştırmalar incelenmiştir. Ayrıca sütçü koyunların ıslahında kullanılan verim kayıtları, pedigri bilgilerine ek olarak, meme tiplerine ait özelliklerin kullanılmasının yarar sağlayacağı düşünülmektedir.

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Introduction

There are some criteria that determine the milk yield of sheep. These are lactation milk yield, daily milk yield and maximum milk yield (Küçük, 1995). Although the most important

factor affecting milk yield and components is the breed of the animal (Dağ, 1996), milk composition; it can be affected by many factors such as season, feeding, lactation period, milking, region and disease (Altın and Çelikyürek, 1996).

In addition to the yield records and pedigree information used in the breeding of dairy sheep breeds by selection, the use of udder and teat characteristics has become an important issue in recent years. In general, the usefulness of including udder traits in a breeding program depends on the heritability and repetition rates of these traits, and the high genetic and phenotypic correlations between these traits and milk yield (Şeker and Bayraktar, 2001).

The udder sizes and udder type are important features in terms of being suitable for machine milking, less damage to the udder, saving labor in milking, allowing the milked animal to stay in the breeder for a longer period of time, and enabling the lambs to find and suck the udder easily after birth (Aktaş et al., 2012). In terms of lamb breeding, udder type in sheep is very important for sucking and has a direct effect on the development and viability of the lambs. The placement of the teats up and to the side may prevent the young lambs from reaching the udder and if not taken care of, it can cause the lamb to die of starvation by depleting its strength in the search for the udder. This situation is more common in multiple births, especially if the lambs are smaller. The fact that the teat is too big or too small to fit in the mouth of the lamb also poses a problem in sucking (Aktaş et al., 2012).

Dairy characters and udder morphology are the most important criteria determining suitability for machine milking (Altınçekiç and Koyuncu, 2011). The udder type and teat location affect the milk flow rate from the udder and the amount of milk remaining in the udder after milking. The probability of developing mastitis increases in udder types that are difficult to empty completely due to their shape (Dağ and Zülkadir, 2004). The ratio of the milk obtained from the mammary sinus to the total amount of milk obtained in a normal and after oxytocin injection is considered as a criterion in evaluating the suitability of the animals for machine milking (Marnet and McKusick, 2001).

In dairy farming, it would be more accurate to consider type characteristics that show a high correlation with milk yield in the selection to increase milk yield, resistance to mastitis, and suitability for machine milking (Aktaş et al., 2012). The placement of the teats on the udder affects the amount of milk remaining in the udder, both during suckling and milking. Udder characteristics are controlled in terms of genetic and environmental factors. Attachment of the udder to the body, placement of the teat, teat size and udder shape are the features commonly used in selection programs. For this reason, the relationship between udder characteristics and milk yield in sheep and its usability in genetic breeding have been

the subject of many studies (Legarra and Ugarte, 2005; Iniguez et al., 2009; Kominakis et al., 2009).

Epstein (1985) stated that there are six different udder types in Awassi sheep and the rate of milk flow from the udder largely depends on the shape of the udder. The researcher stated that the milk flow in udders with drooping and side-facing teats is smooth and insufficient compared to udders with downward-facing teats.

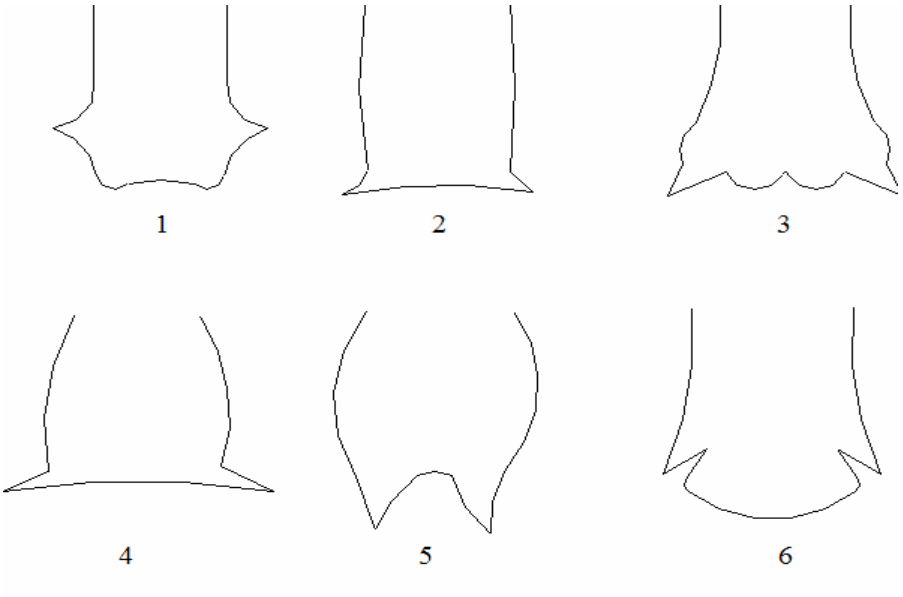

Figure 1. Udder types in sheep (Epstein, 1985)

Cylindrical teat, teats up and sideways

Cylindrical teat, teats down and oblique

Pear-shaped udder, teats down and oblique

Pear-shaped udder, teats down and horizontal

Udder with large, down and vertical teats

Udder with teats up and tilted

In the review, researches on udder characteristics, milk yields and milk components were examined.

Studies on Udder Types in Sheep

Positive correlation between daily and lactation milk yields and udder circumference, udder volume, distance between teats, udder width, length and depth (Labussiere et al., 1981)

in sheep with larger udders have higher milk yield (Labussiere et al., 1981) is stated. In a study conducted by Kızılay (1983), there are high positive correlations ($P<0.05$, $P<0.01$) between udder height, width, depth and circumference and milk yield. Correlations remain at negative and low levels when it comes to phenotypic characteristics of teats has been reported.

In the study, the udder types and udder characteristics in Anatolian Merino sheep, it was found that the first lactation were significantly affected by the udder type, the height of the udder, the anterior height of the udder, the length of the right teat ($P<0.05$) and the distance between the teats ($P<0.001$). It was determined that lactation milk yield was significantly affected by udder type ($P<0.05$), and the effect of udder type on milk components was insignificant (Doğan et al., 2013).

In a study conducted by Yardımcı and Özbeyaz (2001) to examine the milk yield and udder characteristics of Akkaraman, Sakız x Akkaraman Fı crossbreds ewes at Lalahan Livestock Institute, it was determined that other udder characteristics, except the height of the udder from the ground and the teat length, decreased from peak yield towards the end of lactation. Udder characteristics except the height of udder from the floor and length of teat were decreased from the peak yield to the end of the lactation. The values of the height, width, depth, circumference and volume of udder for Akkaraman and Sakız x Akkaraman Fı crossbreds were 15.4, 13.4, 12.8, 47.7 cm and 1146.7 ml; 16.3, 14.2, 13.2, 50.1 cm and 1203.5 ml on the 60th day and 13.7, 11.8, 11.1, 41.5 cm and 533.8 ml; 14.2, 12.2, 11.4, 39.5 cm and 583.0 ml on the 150th day of lactation respectively. The values of the height of udder from the floor of Akkaraman and Sakız x Akkaraman Fı crossbreds were 30.3, 34.2 cm and 31.4, 34.3 cm on the 60th and 150th days (Yardımcı and Özbeyaz, 2001).

Kaygısız and Dağ (2017) investigated the effects of udder types and some environmental factors on milk yield in Elit Awassi sheep herd raised in Ceylanpınar agricultural enterprise. The udder types of sheep were determined using the scheme reported by Epstein. The rates of I, II, III, IV and VI udder types in the herd were determined as 31%, 1%, 42%, 3% and 23%, respectively. The general averages of lactation milk yield and lactation period were calculated as 244.39±73.04 l and 173.81±16.92 days, respectively. The effects of breast type, birth type, year and lactation order on lactation milk yield were found to be significant ($P<0.01$).

In a study conducted at Gökhöyük State Farm, the relationship between some udder characteristics of Bafra sheep and the growth, milk yield and milking characteristics of lambs was investigated. The sheep were randomly divided into three groups; Weight-Suckle-Weight

(WSW) group, Oxytocin plus Machine Milking (OMM) Group, Machinery Milking (MM) Group and monthly milk yield controls were made at the 42nd, 70th and 98th days of lactation. It was determined that the distance between the teat and the ground increased with the progression of lactation, while other features decreased. Phenotypic correlation coefficients between daily milk yield and lactation milk yield, udder depth, width and circumference were high and positive in OMM and MM groups; the distance between the teat and the ground was found high and negative ($p<0.05$, $p<0.01$, $p<0.001$).

Akgün and Koyuncu (2021) studied udder characteristics, linear udder scores and the relationship of these characteristics with each other in Kıvırcık sheep under breeding conditions. The effects of control periods and live weight of sheep were found to be significant ($P<0.05$, $P<0.01$) and the effect of birth type was found to be insignificant. Udder morphology characteristics of the traits including udder circumference, udder height, udder length, teat distance, teat width and teat length values were measured as 37.2 cm, 17.1 cm, 22.8 cm, 16.5 cm, 18.8 mm and 27.3 mm respectively. Linear scores including teat placement, udder depth, degree of separation and degree of suspension of the udder were scored as 4.6, 8.0, 3.4 and 6.9, respectively.

In the study carried out in Akkaraman sheep in TIGEM Gözlü State Farm, milk yield, udder circumference, teat lengths, udder heights were determined and the relationships between them were determined. The relationships between lactation milk yield, lactation period ($p<0.01$) and udder circumference ($p<0,05$) were found to be statistically significant (Dağ, 2000).

In the research carried out to determine some yield characteristics of Acıpayam sheep raised in Ankara Bala State Farm, four udder types (Type 1, Type 2, Type 3 and Type 4) were detected. Their rates were 8.86, 59.49, 26.58 and 5.07 % respectively. Although Type 2 is the common udder type in the herd, the highest milk yield was obtained from Type 4 (Özbaşer and Akçapınar, 2011).

Lactation duration, lactation milk yield, daily average milk yield, udder circumference, teat length, udder height were determined in Tuj and Morkaraman sheep raised in Kafkas University Farm, and the relationships between these characteristics and milk yield were revealed. They found that the correlation coefficient between milk yield and udder circumference was significant ($P<0.001$) at the level of 0.494 for the tuj breed and significant at the level of 0.404 for the morkaraman breed ($P<0.05$). High positive correlations ($P<0.01$-0.001) were calculated in terms of udder circumference and anterior and posterior udder height in Tuj and Morkaraman sheep. While low positive correlation values (0.799 and 0.237)

were determined for Tuj ewes between milk yield and udder anterior and posterior height, high positive correlations were found in morkaraman ewes. There was a significant difference between the two races (Tuj: 40.28 cm, Morkaraman: 43.11 cm) in terms of udder lobe circumference ($P<0.05$). Lactation times and lactation milk yields of Tuj and Morkaraman sheep were 131.7-137.0 days and 51.5-88.3 l, respectively ($P<0.01$). The results showed that Morkaraman ewes had larger udder sizes and higher milk yield than Tuj ewes (Kızılbayrak et al., 2005).

In the study conducted by Dağ and Zülkadir (2004) in unbred Awassi sheep, the incidence of I. udder type was 74.18%, III. The rate of breast type was 7.04% and the most problematic in terms of mastitis was VI. reported the rate of breast type as 13.15%. Researchers reported that udder types II and IV could not be found in the herd. However, in Awassi herds with high milk yield, III. and II. It has been reported that breast types are encountered at the same rate (both 34%), while breast type I follows them with a rate of 28% (Epstein, 1985). In addition, there are four different udder types in the herd, the teats are high, the cylindrical udder facing the ground is the most common (74.18%) type, there is no difference between udder types in terms of milk yield, and the effect of udder type on the incidence of mastitis is very important ($P<0.01$). It has been reported that selection to be made against undesirable udder types will not lead to a decrease in milk yield.

Sheep that are not well-managed in sheep breeding and whose care-feeding conditions are not suitable can easily get mastitis. Mastitis causes a large number of somatic cells to migrate into the milk. The number of somatic cells in milk seriously affects the quality of milk and even requires the destruction of milk without use. A similar situation occurs in the case of mastitis. The ions that pass into the milk change the pH of the milk and the inflammations caused by lime open the door to pathogens. Therefore, polymorphonuclearneutrophils, macrophages and cytokines from the body's defense system pass to the udder and from there to the milk. When epithelial cells from the mammary gland are added to these cells, the somatic cell composition in milk is completed (Mbonwanayo, 2013). In order to determine the quality of milk, the number of somatic cells is checked. The increase in the number of somatic cells (SHS) in milk causes some changes in the composition of milk. Increasing somatic cell number decreases the proportions of milk lactose, casein and fat, while increasing chlorides, serum proteins, immunoglobins, sodium and milk pH.

The low quality of raw milk brings with it many problems. The number of somatic cells (SCC), the number of bacteria and the presence of antibacterial substances in the milk, fat,

protein, dry matter and pH cause changes in the structure of milk, negatively affecting the quality of raw milk and the machinability of milk. The poor or low quality of the milk obtained in terms of composition richness causes various negativities especially in the smell, taste and aroma of all dairy products such as butter, cheese, yoghurt, and as a result, undesirable problems arise in the quality of the products obtained from milk. Milk expressed from a healthy mammary gland contains a maximum of 200.000 SCC/ml (Reneau and Leuer, 2010; Sharma et al., 2011). If the milk taken from the mammary gland is more than 200.000 SCC/ml and if more than 400.000 SCC/ml is seen in the milk tank, the presence of mastitis in the herd is mentioned (Hillerton,1999). According to some other researchers, 500.000 SCC/ml in milk expressed from the mammary gland is accepted as the normal limit for drinking milk (Sharma et al., 2011). It is accepted that drinking milk and dairy products that are below 400,000 SCC/ml according to the standards of the European Union and below 500,000 SHS/ml according to the Turkish Food Codex do not harm human health.

Yüceer et al. (2015) examined milk yield and some quality characteristics of Chios X Akkaraman G1 sheep reared in extensive conditions in public hands. It was found that there was a high and positive relationship between daily milk yield and udder depth, width and distance. Negative phenotypic correlation coefficients were calculated between teats high and teat-ground distance.

Conclusion

The udder type and teat placement affect the milk flow rate from the udder and the amount of milk remaining in the udder after milking. This affects milk quality and milk yield. Therefore, it is important to use the udder and teat characteristics in addition to the yield records and pedigree information used in the breeding of dairy sheep breeds by selection. In addition, with the right selection, a significant progress can be made in the improvement of the herd in terms of both milk yield and udder types suitable for machine milking.

Statement of Conflict of Interest

Authors have declared no conflict of interest.

Author's Contributions

The contribution of the authors is equal.

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