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Research Article

The Effects of Pasture Characteristics and Seasonal Differences on Sheep Foot Diseases: A Field Study on the Kars and Iğdır Regions - Turkey [1] [2]

Vedat BARAN [1] Sadık YAYLA [1] Engin KILIÇ [1]
İsa ÖZAYDIN [1] Özgür AKSOY [1] Celal Şahin ERMUTLU [1]

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[1] Kafkas University, Faculty of Veterinary Medicine, Department of Surgery, TR-36100 Kars - TURKEY

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Abstract

With this study, in which the incidences of diseases seen in sheep feet raised in the Kars and Iğdır regions were evaluated clinically and radiologically according to two different seasons, a total of 8.000 sheep were examined in the pasture (n=4230) and pen/stall (n=3770) seasons; problems were detected in 1.080 (25.51%) of them in the pasture season and 520 (13.76%) of them in the pen/stall season. It was determined that the herd in general suffered primarily from horn and hoof deformations in the pasture season with 17.70% and in the pen/stall season with 11.78%. Osteophyte formations and rotation were detected in the phalangeal bones of 20 of the sheep, and osteolysis was detected in the third phalanx of 8 of the sheep. In the aforementioned seasons, the rate of foot rot was 2.83% and 0.82% respectively. It was detected that according to the breed of sheep, 54.69% of the foot problems were seen in Akkaraman, 39.81% in Morkaraman, 1.43% in Tujin, and 4.07% in other sheep breeds (Merino, Kıvırcık). In addition, it was concluded that animal owners do not have sufficient knowledge concerning foot and hoof care, or do not care much about this issue. In conclusion, it was determined that the most important foot problem for sheep raised in the Kars and Iğdır regions is hoof deformation, and it was concluded that this could largely be avoided with simple precautions.

Keywords: *Sheep, Kars, Iğdır, Foot diseases, Hoof deformation*

Mera Özellikleri ve Dönemsel Farklılıkların Koyun Ayak Hastalıkları Üzerine Etkileri: Kars ve Iğdır Yöresine Ait Saha Çalışması

Özet

Kars ve Iğdır Yöresinde yetiştirilen koyunlarda görülen ayak hastalıklarının klinik, radyolojik olarak değerlendiği ve farklı iki döneme göre insidensinin belirlendiği bu çalışmada, mera (n=4230) ve ağıl/ahır döneminde (n=3770) toplam 8.000 koyun muayene edilmiş olup; bunlardan mera döneminde 1.080 (%25.51), ağıl/ahır döneminde ise 520 (%13.76)'sinde problem saptanmıştır.Sürü genelinde boynuz tırnak deformasyonlarının mera döneminde %17.70, ağıl/ahır döneminde ise %11.78 ile ilk sırayı aldığı tespit edildi. Koyunlardan 20'sinde phalangeal kemiklerde osteofitik üremeler ve rotasyon, 8'inde ise üçüncü phalanksta osteoliz saptandı. Aynı dönemler içinde piyeten oranı sırasıyla %2.83 ve %0.82 olarak saptandı. Koyun ırklarına göre ayak problemlerinin %54.69'unun Akkaraman; %39.81'inin Morkaraman; %1.43'ünün Tuj, %4.07'sinin diğer (Merinos, Kıvırcık) koyun ırklarında görüldüğü tespit edildi. Ayrıca hayvan sahiplerinin ayak ve tırnak bakımı konusunda yeterince bilgi sahibi olmadıkları ya da konuyu fazla önemsemedikleri kanaatine varıldı. Sonuç olarak, Kars ve Iğdır yöresinde yetiştirilen koyunlar için en önemli ayak probleminin tırnak deformasyonlarının olduğu saptanmış olup, bunların basit önlemlerle önemli ölçüde önlenebileceği sonucuna varılmıştır.

Anahtar sözcükler: *Koyun, Kars, Iğdır,Ayak hastalığı,Tırnak deformasyonu*

İletişim (Correspondence)
+90 474 2426807/5230
verybady@hotmail.com

INTRODUCTION

Sheep and goat farming play an important role in meeting the need for safe, affordable and easy to access [1] animal protein required for an adequate and balanced diet. The fact that most of the milk, wool/cashmere and skins needed by industries is obtained from these animals has made sheep and goat farming an important sector in our country, as well as in the world [1-5]. Despite certain negative factors, the fact that it is sustainable has allowed it to keep its place in the agricultural economy throughout history.

Sheep foot diseases, which directly impact profitability due to the negative impact on animal welfare, pose a significant threat [6-11]. Because sheep have such a high tolerance of pain, as long as they do not have extreme foot lesions, they will not limp [9,12,13]. Thus, the fact that there is no limping does not mean there are no foot/hoof problems in the herd [14-17].

The factors affecting sheep foot diseases and the incidence rate of the disease may differ according to region. The main reasons for this are the characteristics of climate [18-20], nutrition [21,22], caretaking and the pasture on which they are grazed, brought about by varying geographical conditions [18,23]. Varying results have been obtained from studies done on the role of regional differences in the occurrence of sheep foot diseases. In a study carried out on 10.327 sheep in the Afyon region [24], it was detected that the foot disease incidence rate was 2.62%, and 66.44% of the lesions were in the springtime and 33.94% were in autumn. In studies carried out by different researchers in the Burdur [25], Konya [26] and Elazığ [2] regions, foot diseases found in sheep were determined to be at the corresponding rates of 16.30%, 19.9% and 20.26%.

No widespread studies were found which focus on sheep foot diseases in the Kars and Iğdır regions, provinces where most of the country's pasture-fed animals are raised. The aim of this study was to determine the incidence rate of sheep foot diseases according to two different seasons, and classify the lesions in a comprehensive manner. In addition, an attempt has been made to determine the effects of climate and environmental conditions on the occurrence and variation of foot diseases.

MATERIAL and METHODS

The study was carried out on a total of 8.000 sheep of different breed, gender and age (ages 1-4 year), raised in the central district and surrounding villages of the Kars and Iğdır provinces/Turkey.

Four pre-planned trips were made to the regions between June 2012 and July 2013, during both the pasture season (the middle and end of the season) and the pen/stall season (the middle and end of the season). First, the number of animals in each herd was noted, as well as their age, breed, type of shelter and nutrition, and caretaking environments. In addition, a specific method of examination was developed, so that the sheep in the herd could be inspected. Animals which were limping or which had abnormalities in their foot regions were identified. The problems were determined by conducting systematic foot examinations on each of the animals in question. The information for each animal found to have a problem was noted on special forms, and the forms were collectively evaluated at the end of each visit. Also, all of the data that was collected was statistically evaluated using X^2 test. The foot regions of sheep with extreme hoof deformation and severe limping were X-rayed. A portable 50mA 100kV X-ray unit was used for this purpose.

At the end of each pasture season, soil samples were taken from each pasture area for pH analysis using a specific sampling method.

Using a pre-defined method [27], distilled water was added to the bottles in which there was 100 g of soil each, and the bottles were shaken using a horizontal shaking machine (180 rpm) for 2 h. The pH values of the solutions were measured at room temperature using a pH meter.

RESULTS

It was determined that of the 8.000 sheep examined in both seasons, 50% were of the Akkaraman breed, 37.50% were Morkaraman, 2.50% were Tuj and 10% were of other breeds such as Merino and Kıvırcık. Foot lesions were detected in 1.080 of the sheep examined in the pasture season and 520 of the sheep examined in the pen/stall season. It was understood that the existing problems were not a high priority for the owners and caretakers of the animals.

Statistical and acquired results according to the seasons are shown in *Table 1*. It is apparent from the table that different foot lesions were detected in a total of 1.600 (20%) of the 8.000 sheep. The *Paries ungulae* growing too long and curving over the top of the *Solae ungulae*, as well as the growth in which both the beak and corkscrew hoof disorders occur together were the most common horn and hoof deformations (74.70%). It was determined that the deformations took place more in the front feet/hooves as opposed to the hind *(Table 2)*. It was understood that the animal owners were not knowledgeable concerning foot care and hoof trimming, and that in isolated cases of limping, instead of consulting a veterinarian or trimming the hooves, the owners preferred to kill the animal. Of the 1.600 sheep spotted with foot lesions, it was determined that 54.69% were Akkaraman, 39.81% Morkaraman, 1.43% Tujin, and 4.07% were of other sheep breeds (Merino, Kıvırcık).

Table 1. *Distribution of foot diseases and hoof deformities according to the pasture and pen seasons*
Tablo 1. *Ayak hastalıkları ve tırnak deformitelerinin mera ve ağıl dönemine göre dağılımı*

Season	Foot Diseases						Hoof Deformities								Other		Total	
	Sinusitis Interdigitalis		Foot Rot		Foot Abscess		Beak/Sharp Hoof		Corkscrew Hoof		Scissor-Shaped Hoof		Fractured/Broken Hoof		Interdigital Dermatitis etc.			
	n (%)	Statistics	n (%)	Statistics	n (%)	Statistics	n (%)	Statistics	n (%)	Statistics	n (%)	Statistics	n (%)	Statistics	n (%)	Statistics	n (%)	Statistics
Pasture season (April-December)	20 (0.47)	X^2: 1.70 P>0.05 OR: 1.78 %95 CI: 0.79-4.09	120 (2.83)	X^2: 42.60 P<0.001 OR: 3.50 %95 CI: 2.30-5.30	110 (2.60)	X^2: 52 P<0.001 OR: 5 %95 CI: 3.90-8.30	452 (10.68)	X^2: 24 P<0.001 OR: 1.40 %95 CI 1.30-1.70	91 (2.15)	X^2:15.50 P<0.001 OR: 2 %95 CI 1.40-3.0	20 (0.47)	X^2:001 P>0.05 OR:0.99 %95 CI 0.50-1.90	187 (4.42)	X^2:15 P<0.001 OR:1.60 %95 CI 1.20-2.10	80 (1.89)	X^2: 39 P<0.001 OR: 5 %95 CI 2.90-9.50	1080/4230 (25.51)	X^2:170 P<0001 OR: 2.10 %95 CI 1.90-2.40
Pen season (December-April)	10 (0.26)		31 (0.82)		20 (0.53)		283 (7.50)		39 (1.03)		18 (0.47)		105 (2.78)		14 (0.37)		520/3770 (13.76)	
Total	30		151		130		735		130		38		292		94		1600/8000	

Table 2. *Distribution of detected foot diseases according to front and hind feet*
Tablo 2. *Saptanan ayak hastalıklarının ön ve arka ayaklara göre dağılımı*

Season	Feet	Number of Animals Infected	
		n	%
Pasture Season (April - December)	Front	784	72.50
	Hind	296	27.40
Pen Season (December - April)	Front	326	62.60
	Hind	194	37.30

During the radiographic examinations of 20 sheep with extreme hoof deformations and severe limping, osteophyte formations and rotation were detected in the phalangeal bones, and in 8 cases, osteolysis was detected in the *Phalanx tertia*.

It was noticed that the floors of the pens and stalls were mostly either concrete or dirt, and that the canals for urine and excrement were inadequate or did not exist at all. It was learned that every two to three months the accumulated feces were made into dried dung cakes, which are used for fuel.

It was understood that some herds were made to walk long distances during the pasture season due to insufficiency of vegetation. It was found that the sheep were forced to migrate to the high regions of Kars due to the especially hot summers in Iğdır. It was observed that these herds had a higher number of fractured and broken hooves. It was found that beak, corkscrew and scissor-shaped hoof deformations were more common in sheep which were grazed on pastures rich in vegetation or on prairies. It was noted that meeting the water demand for the sheep was especially difficult during the pasture season, and that mostly man-made ponds were utilized.

It was determined that all the pH values of the dirt samples were slightly alkaline (7.2-8.0).

DISCUSSION

In Kars and Iğdır provinces, where sheep herding is common, the animals spend two thirds of the year grazing on pastures. Because the physical circumstances in the winter allow for it, the sheep were fed outdoors (on snow or in pens) during the day and brought into the stalls in the evenings. It was noted that animal husbandry is done as a family business, and in both provinces the sheep taken to the pasture were joined with the sheep of other families in herds numbering between 1.000 and 2.000. It was concluded from the visits that neither the animal owners nor the shepherds knew much or cared much about foot/hoof diseases other than foot rot. It is apparent from studies carried out in other regions of Turkey that herders are generally like-minded regarding this issue [2,3,25,28].

Turkey has an important place among the world's countries in terms of its sheep population [3,5,22]. Just as the profitability of meat, milk and fleece production drops due to foot diseases, serious economic losses are also experienced due to premature births and culling animals from the herds [11,29-32]. It was observed that the general health of the animals visited, especially in the pen/stall season, was weak, and that the wool had fallen out from many different regions of their bodies. It was found that most of the sheep that had experienced wool loss were those with feet problems.

In order for the animals' feeding and shelter conditions to be evaluated correctly, visits were conducted twice each, once mid-season and once at the end of the season. It was found that it was quite common for sheep grazed on meadows to have extremely long growths of scissor-shaped and corkscrew hooves, and for a deformed hoof structure to occur in which the *Paries ungulea* grows extremely long and curves over the top of the *Solea ungulea*. It was found that it was relatively more common for herds grazed on arid land to have cases of foot abscess and fractured or broken hooves. Though it has been noted in studies focusing on the effects of environmental factors, including pastoral characteristics, on foot formations and diversity, that similar results have been observed, the fact that it is wrong to use meadows for sheep herding has not been stressed. It is very important that sheep, just like cattle, be grazed on land which allows for their hooves to be regularly worn down in order to prevent hoof deformations, as well as foot diseases caused by them, from occurring. Animals grazed on meadows do not have to walk far to feed, nor are their hooves properly worn down on the rich vegetation and soft soil. This explains the formation of an extra layer due to the *Paries ungulea* growing on top of the *Solea ungulea* in sheep grazed in such places.

It is observed that when hoof deformities, caused either by extreme growth or due to other reasons, are compared according to season, the lesions detected in the pasture season (25.51%) are nearly double the rate of those detected in pen/stall season (13.76%). For the same two categories in the same order, İzci et al.[28] reported their results as 12.80%-25.30% and Yadav et al.[33] reported their results as 9.31%-29.40%. When these results are considered, it is easy to see there is a clear discrepancy between the results of this study and the data of previous literature. Many environmental factors such as the layout, hygiene and floor of the stalls, as well as the physical characteristics of the pasture on which the animals are grazed, play an important role in the occurrence of foot diseases. On visits conducted during the middle and end of the pen/stall season, it was observed that the animals were fed outdoors during the day and brought into the stalls in the evening. It was found that the stalls are aired out during the day while the animals are outdoors. In addition, considering the fact that sheep farming is done as a family business, it is easy to imagine that during the pasture season the number of animals in a herd is extremely high with only one shepherd looking after them, and that the whole family takes care of the sheep in the stall season. It was also determined that the sheep are roughly examined upon entering the stall season, and that the sheep detected to have serious problems are disposed of.

Sağlıyan [2], detected a rate of 31.16% front and 68.84% hind foot lesions, İzci et al.[28] detected a rate of 23.40% front and 76.60% hind foot lesions, and Mahin [34] detected

39.50% front and 60.50% hind foot lesions. In this study, the rate of detection for front foot lesions during the pasture season was determined to be 72.50%, while the rate for hind foot lesions was found to be 27.40%. During the pen/stall season a rate of 62.6% was detected in front foot lesions and 37.30% in hind foot lesions. These results also show a difference between our findings and those of the aforementioned authors. Though it is not possible to reach a definite conclusion on the reasons behind the differences, the sheep belonging to the region in question satisfy their need for water mostly from ponds or rivers. When drinking water, the front hooves of animals often come into contact with water or mud. It is thought that this dampness plays a role in the fact that the front hooves of the animals given access to water at least twice a day remain softer compared to the hind hooves.

It has been noted that foot rot is one of the most important foot diseases with a rate of 10-21% in habitats with mild and rainy climate conditions and other environmental factors, and that it is infectious [4,26,31,35]. In this study, foot rot was detected at a rate of 2.83% in the pasture season and 0.82% at the end of the pen/stall season (P<0.001). The results of studies done throughout various provinces of the Eastern Anatolia Region, including the provinces of Kars and Iğdır, were found to be quite high with rates of 8.30%-19.89%. In one of two studies [6] conducted in and around Konya, a rate of 28.12% was detected, and in the other, the average of both seasons was determined to be 0.39%. Avki et al.[25], on the other hand, in their study done on sheep in the Burdur region, noted that they found foot rot to have a rate of 2.55%. It is apparent that with our average rate of both seasons at 1.83%, our results are different from those of other studies done throughout the provinces of the Eastern Anatolia Region. It is obvious that more detailed studies are needed in order to clarify the reasons for this discrepancy.

It has been noted that foot and hoof lesions are seen more often in domestic sheep breeds [25]. İzci et al.[28] have determined in their study done on sheep in the Konya region that foot diseases are more common among the breeds of Merino and Ivesi. Our study found that lesions are found relatively more often in the breed types Akkaraman (54.69%) and Morkaraman (39.81%). The fact that lesions are found relatively more often in the Akkaraman and Morkaraman breeds has been attributed, in our study, to the fact that both breeds are the region's most well-fed breeds.

It has been reported that the fact that the pH value of the soil is acidic directly affects the hoof and causes structural deformations in the horn and hoof quality, and thus also paves the way for many problems related to the foot [15,19,26]. It was determined in this study that all the pH values of the soil samples were slightly alkaline (7.2-8.0). In this regard, it cannot be said definitively whether or not the soil of the region plays a role in the foot/hoof problems.

This study, in which the effects of caretaking, feeding and other environmental effects as well as the effects of seasonal difference on the occurrence and diversity of foot/hoof diseases were researched, has the distinction of being the first study done in our region. With this study it was concluded that the foot/hoof diseases of the sheep in the region were found to be at a higher rate in the pasture season, that the most widespread lesions were hoof deformations mostly in the front feet, that the rate of foot rot was very low compared to the average rates in both Turkey and throughout the world, that the animal owners were not knowledgeable in the areas of foot care and hoof trimming or that they did not care much about these issues [7,10,19].

In conclusion, though it does not seem possible to completely avoid foot diseases, which are the cause of important losses in sheep farming in many ways, it can be said that foot/hoof diseases can be significantly decreased by paying attention to practices such as herd management and the deliberate utilizing of pastures.

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