

# Prevalence of Liver Trematodes in Sheep and Goats Slaughtered in the Siirt Province Slaughterhouse

## Siirt İli Mezbahasında Kesilen Koyun ve Keçilerde Karaciğer Trematodlarının Yaygınlığı

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### ABSTRACT

**Objective:** Liver trematodes are parasites that adversely affect animal health and cause reduced productivity in ruminants in endemic areas. This study was conducted to determine the prevalence of liver trematodes in sheep and goats slaughtered in Siirt, where small ruminant breeding is widely practiced.

**Methods:** This study was conducted between January 1 and May 15, 2025. Fecal samples collected from animals before slaughter at the Siirt province slaughterhouse were evaluated using the sedimentation method. In addition, the livers, bile ducts, and gallbladders of the slaughtered animals were examined macroscopically for adult parasites.

**Results:** At the slaughterhouse, fecal samples collected before slaughter *Fasciola* spp. in 14.4% of 195 sheep, and *Dicrocoelium dendriticum* (*D. dendriticum*) eggs in 4.1; in 237 goats, *Fasciola* spp. was found in 9.7% and *D. dendriticum* eggs in 3%. In the 195 sheep that underwent liver examination after slaughter, *Fasciola hepatica* (*F. hepatica*) was found in 22.1%, *D. dendriticum* was found in 9.7%; and in 237 goats, *F. hepatica* was found in 15.6% and *D. dendriticum* adults were found in 4.2%. No statistically significant difference was found between breeds and trematode positivity in sheep. Similarly, no significant difference was found between age groups and the frequency of trematode occurrence in sheep and goat.

**Conclusion:** In this study conducted in Siirt province, the liver fluke infection rates we determined in sheep and goats indicate the need to combat these parasites. To prevent productivity losses and deaths in animals due to this infection, those involved in livestock farming need to be informed about this issue. Furthermore, it is crucial that animals are periodically examined and treated before being released into pasture.

**Keywords:** *Fasciola hepatica*, *Dicrocoelium dendriticum*, sheep, goat, Siirt

### ÖZ

**Amaç:** Karaciğer trematodları, hayvan sağlığını olumsuz etkileyen parazitler olup endemik bölgelerde ruminantlarda verim düşüklüğüne neden olmaktadır. Bu çalışma, küçükbaş hayvan yetiştiriciliğinin yaygın olarak yapıldığı Siirt ilinde kesilen koyun ve keçilerde karaciğer trematodlarının yaygınlığını ortaya koymak amacıyla yapıldı.

**Yöntemler:** Bu çalışma 1 Ocak-15 Mayıs 2025 tarihleri arasında yürütüldü. Siirt ili mezbahasında, hayvanlardan kesim öncesi alınan dışkı örnekleri sedimantasyon yöntemi ile değerlendirildi. Ayrıca kesilen hayvanların karaciğerleri, safra kanalları ve safra keseleri erişkin parazitler yönünden makroskobik olarak incelendi.

**Bulgular:** Mezbahada kesim öncesi dışkı örnekleri alınan 195 koyunun %14,4'ünde *Fasciola* spp., %4,1'inde *Dicrocoelium dendriticum* (*D. dendriticum*) yumurtası, 237 keçinin %9,7'sinde *Fasciola* spp., %3'ünde ise *D. dendriticum* yumurtası saptandı. Kesim sonrası karaciğer muayenesi yapılan 195 koyunun %22,1'inde *Fasciola hepatica* (*F. hepatica*), %9,7'sinde *D. dendriticum*, 237 keçinin %15,6'sında *F. hepatica*, %4,2'sinde ise *D. dendriticum*'ün erişkinleri belirlendi. Koyunlarda ırklar ile trematod pozitifliği arasında istatistiksel olarak anlamlı bir fark bulunmadı. Koyun ve keçilerde yaş grupları ile trematoda rastlama sıklığı arasında da anlamlı bir fark saptanmadı.



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**Sonuç:** Siirt ilinde yürütülen bu çalışmada, koyun ve keçilerde belirlediğimiz karaciğer keleşleri enfeksiyon oranları bu parazitlerle mücadele edilmesi gerektiğini ortaya koymaktadır. Bu enfeksiyon nedeniyle hayvanlarda verim kayıplarını ve ölümleri önlemek için hayvancılıkta uğraşanların bu konuda bilgilendirilmesi gerekmektedir. Ayrıca hayvanların otlağa salınmadan önce periyodik olarak muayene edilip tedavi edilmesi önem arz etmektedir.

**Anahtar Kelimeler:** *Fasciola hepatica*, *Dicrocoelium dendriticum*, koyun, keçi, Siirt

## INTRODUCTION

Fascioliasis is a freshwater snail-borne, zoonotic, parasitic disease. The adult stage of *Fasciola* spp. infects the bile ducts in the livers of herbivorous mammals such as sheep, goats, and cattle (1-3).

During the migration of *Fasciola* spp. in the liver, inflammation, edema, hemorrhage, congestion, fibrosis, cholangitis and mechanical damage, and after the migration of adults into the bile ducts, impaired bile flow and related findings may be observed (2,4-6). The distribution of fasciolosis is dependent on the ecology of aquatic snail intermediate hosts that inhabit both tropical and temperate climatic zones (7).

*Dicrocoelium dendriticum* (*D. dendriticum*) usually inhabits the hepatobiliary tract and gallbladder of ruminants. This parasite is known to be less pathogenic than *Fasciola* species. Dicrocoeliosis is mostly prevalent in areas with dry pastures that favor the development of the intermediate hosts (5,8). The relevance of dicrocoeliosis is often underestimated due to its often-subclinical course in domestic ruminants, and because clinical signs can be masked by other parasitic infections (8).

Liver flukes cause economic losses due to reasons such as decrease in milk and meat production, unusable livers infested with parasites, abortion, increased mortality rates and the cost of control measures (4,9).

According to the 2025 data of the Turkish Statistical Institute, there were 786,415 sheep and 541,325 goats in Siirt province in 2024 (10). This study aimed to determine the prevalence of liver trematodes in slaughtered sheep and goats from Siirt province, where small ruminant farming is common.

## METHODS

Prior to the study, approval was obtained from the Van Yüzüncü Yıl University Animal Experiments Local Ethics Committee (decision number: E-27552122-604.01-622088, date: 10.12.2024). The study was conducted between January 1 and May 15, 2025, on 195 sheep (144 Akkaraman and 51 Morkaraman) and 237 Angora goats, all slaughtered at the Siirt provincial slaughterhouse. Age, breed, and gender information of all animals included in the study was recorded. The collected samples were evaluated at the Parasitology Research Laboratory, Department of Parasitology, Faculty of Medicine, Van Yüzüncü Yıl University.

### Parasitological Examination of Stool Samples

Collected stool samples were stored in a refrigerator at +4 °C until processing and were evaluated using the sedimentation method. The preparations were examined under a light microscope at 10x and 40x magnifications.

### Postmortem Examination

The livers, bile ducts, and gallbladders of the slaughtered animals were examined macroscopically. The liver was incised

perpendicular to the bile ducts to remove trematodes, and both the gallbladder and the collected parasites were taken to the laboratory for examination.

### Statistical Analysis

Descriptive statistics for the study variables were presented as numbers (n) and percentages (%). Differences in trematode positivity between animal species, breeds, and age groups were analyzed using the two-proportion Z test. A significance level of 5% was adopted, and all statistical analyses were performed using SPSS (IBM SPSS Statistics for Windows, Version 26.0) and Minitab (Version 17, Minitab Statistical Software LLC).

## RESULTS

In this study, fecal examination revealed *Fasciola* spp. in 14.4% of sheep and 9.7% of goats, and *D. dendriticum* in 4.1% of sheep and 3% of goats (Table 1). On macroscopic examination of the bile ducts and gallbladders, *Fasciola hepatica* (*F. hepatica*) adults were detected in 22.1% of sheep and 15.6% of goats, while *D. dendriticum* adults were detected in 9.7% of sheep and 4.2% of goats (Table 2). Fecal examination results showed no statistically significant difference between sheep and goats in trematode positivity (Table 1). Considering the results of postmortem organ examinations, a significant difference in *D. dendriticum* positivity between sheep and goats was observed ( $p=0.027$ ) (Table 2).

Adults of *F. hepatica* were detected by liver examination in 15 sheep and 14 goats, and adults of *D. dendriticum* were detected by liver examination in 11 sheep and 3 goats; no eggs were detected in the fecal samples (Table 1, Table 2).

Both *F. hepatica* and *D. dendriticum* adults were detected in three sheep and five goats. In sheep, *F. hepatica* was found at higher rates in the Akkaraman breed, whereas *D. dendriticum* was found at higher rates in the Morkaraman breed. No statistically significant difference was found between breeds and trematode positivity in sheep. Similarly, no significant difference in the frequency of trematode occurrence was found between age groups of sheep and goats (Table 3). Since most of the slaughtered sheep and goats were female, parasite positivity could not be compared statistically by gender.

**Table 1.** Trematode positivity determined by fecal examination in sheep and goats

Animal type	<i>Fasciola</i> spp.		<i>Dicrocoelium dendriticum</i>	
	Positive (%)	p-value	Positive (%)	p-value
Sheep (n=195)	28 (14.4)	0.141	8 (4.1)	0.522
Goat (n=237)	23 (9.7)		7 (3)	
<b>Total</b> (n=432)	51 (11.8)		15 (3.5)	

## DISCUSSION

*D. dendriticum* and *F. hepatica* are two of the well-known trematodes of the livestock worldwide including Türkiye (11). Liver trematode infections cause serious losses in livestock production. Also, it might adversely affect the development and live-weight gain of animals and damage the national economy by causing the loss of economically significant organs such as the liver (6,7).

In studies conducted on small ruminants worldwide and in Türkiye, the frequency of liver fluke infection was determined by fecal examination, post-slaughter organ examination, or serological methods.

Using fecal examination, Eke et al. (9) in Nigeria detected fascioliasis in 12.5% of sheep and 7.25% of goats; Cringoli et al. (12) in Italy detected fascioliasis in 4.1% of sheep and *D. dendriticum* in 52.3%; Alstedt et al. (8) in Germany detected fascioliasis in 2.7% of sheep and 5.6% of goats; *D. dendriticum* in 21.1% of sheep and 7% of goats. In Türkiye, using the same method, Gül and Günyaktı Kılınc (13) in Bingöl detected fascioliasis in 27% of sheep and 21% of goats; *D. dendriticum* in 14% of sheep and 12% of goats; and Denizhan (14) in Van city center and some districts detected fascioliasis in 15.63% of sheep. The results of our study were similar to the rate found in two studies determining the frequency of fascioliasis in sheep and goats (9,14).

By post-slaughter organ examination, Oljira et al. (7) detected *Fasciola* species in 20.7% of sheep and 1.6% of goats in Ethiopia; Ezatpour et al. (5) detected *Fasciola* species and *D. dendriticum* in 7.1% and 5.6% of sheep and 3.9% and 2.6% of goats in Iran, respectively; Kruchynenko et al. (15) detected *D. dendriticum* in 28.42% of sheep and 24.5% of goats in Ukraine. In the Thrace region of Türkiye, Gargılı et al. (16) detected *F. hepatica* in sheep as 3.99% and *D. dendriticum* as 23.52%; Pekağırbaş et al. (6) detected *F. hepatica* in sheep as 0.02% and *D. dendriticum* as 0.3% in Aydın; Kara et al. (11) detected *F. hepatica* in sheep as 4.42% and *D. dendriticum* as 3.85% in Malatya; Kaplan et al. (17) detected *F. hepatica* in sheep as 7.89% and *D. dendriticum* as 1.15% in Elazığ; *F.*

*hepatica* in goats as 5.64% and *D. dendriticum* as 0.47%. The rates determined in our study are similar to the frequency of *F. hepatica* detected in sheep in one study (7), in goats in another study (5), and *D. dendriticum* detected in sheep in another study (11).

In one serological study conducted in Türkiye, fascioliasis was detected at a rate of 49.43% in sheep in the center of Van and some of its districts (14). In another study, *F. hepatica* seropositivity was found at a rate of 7.5% in sheep and 14.14% in goats in Siirt province (3). In our study, the *F. hepatica* positivity detected by liver examination was higher than the rate detected in sheep in this serological study conducted in 2018, and was similar to the rate detected in goats. This situation indicates that the control of liver flukes in small ruminants in the region is inadequate.

The rates we found in our study differed significantly from those found globally and in Türkiye. We believe that this is due to differences in environmental conditions, intermediate host availability, and parasite control practices. Furthermore, the diagnostic methods may contribute to these differences.

In this study, no statistically significant difference in trematode positivity (positive result on liver examination) was found between breeds of sheep. However, comprehensive studies with larger numbers of animals are necessary to fully demonstrate the effect of breed on fascioliasis.

Several studies have statistically evaluated the relationship between age and trematode frequency. In one study, a significant difference was found in the frequency of *F. hepatica* and *D. dendriticum* in sheep and goats (5), in another study in the frequency of *D. dendriticum* in sheep and goats (15), and in three studies in the frequency of *Fasciola* in sheep (7,11,14). In one study (15), similar to our study, no statistically significant difference was found between age groups in terms of *D. dendriticum* positivity in sheep and goats.

In our study, the prevalence of liver flukes was determined by both fecal examination and postmortem organ examination. The markedly higher rate of trematode positivity detected by liver examination suggests that fecal examination is insufficient for diagnosing these parasites. Organ examination detects a higher positivity rate than stool analysis, possibly because trematodes do not regularly lay eggs, trematodes in the liver have not yet reached adulthood, and eggs are not found in every region of the stool even if the animal is positive.

Our study provides insight into the prevalence of liver fluke infection among sheep and goats in the Siirt region. However, studies involving a larger number of animals are needed in the region. Although the number of animals evaluated was limited, our results clearly demonstrate that liver fluke is a problem in small ruminants in the region.

**Table 2.** Trematode positivity in liver examination of sheep and goats

Animal type	<i>Fasciola hepatica</i>		<i>Dicrocoelium dendriticum</i>	
	Positive (%)	p-value	Positive (%)	p-value
Sheep (n=195)	43 (22.1)	0.089	19 (9.7)	0.027
Goat (n=237)	37 (15.6)		10 (4.2)	
Total (n=432)	80 (18.5)		29 (6.7)	

p<0.05 indicates significant differences

**Table 3.** Trematode positivity in bile ducts and gall bladders according to breed and age groups

Species		<i>Fasciola hepatica</i>		<i>Dicrocoelium dendriticum</i>		
		Number (%)	p-value	Number (%)	p-value	
Sheep	Breed	Akkaraman (144)	32 (22.2)	0.923	12 (8.3)	0.313
		Morkaraman (51)	11 (21.6)		7 (13.7)	
	Age	0-2 (54)	9 (16.7)	0.231	3 (5.6)	0.158
		>2 (141)	34 (24.1)		16 (11.3)	
Goat (Angora)	Age	0-2 (81)	12 (14.8)	0.806	2 (2.5)	0.281
		>2 (156)	25 (16)		8 (5.1)	

## CONCLUSION

In this study conducted in Siirt province, the liver fluke infection rates we determined in sheep and goats indicate the need to combat these parasites. To prevent productivity losses and deaths in animals due to this infection, those involved in livestock farming need to be informed about this issue. Furthermore, it is crucial that animals are periodically examined and treated before being released into pasture.

### \*Ethics

**Ethics Committee Approval:** Ethical approval for the study was obtained from Van Yüzüncü Yıl University Ethics Committee (decision number: E-27552122-604.01-622088, date: 10.12.2024).

**Informed Consent:** The study was conducted between January 1 and May 15, 2025, on 195 sheep (144 Akkaraman and 51 Morkaraman) and 237 Angora goats, all slaughtered at the Siirt provincial slaughterhouse.

### Footnotes

#### \*Authorship Contributions

Concept: M.A., H.Y., Design: M.Y., H.Y., Data Collection or Processing: M.A., M.Y., Analysis or Interpretation: Z.T.C., H.Y., Literature Search: M.A., Z.T.C., Writing: M.A.

**Conflict of Interest:** No conflict of interest was declared by the authors.

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