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Spread of moniesiosis pathogens in livestock in the Ganja-Gazakh Region of the Republic of Azerbaijan: Bio-ecological features

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Abstract. The paper analyses landscape and ecological features of moniesiosis pathogen transmission in livestock in the Ganja-Gazakh Region in different seasons and age groups. Since 2010, 957 sheep and 619 goats were tested for moniesiosis pathogens in different landscape/ecological areas of the region using K. I. Skryabin's full helminthological anatomisation method . Livestock protection from pathogens of invasion diseases, particularly helminthiasis, is of great scientific and practical importance since it is necessary to ensure sustainable development of livestock farming and to obtain environmentally friendly livestock produce.

Keywords: Azerbaijan, Ganja-Gazakh region, moniesiosis, helminth fauna, livestock, landscape/ecological areas, bio-ecological features

Биоэкологическая характеристика распространения мониезиоза у мелкого рогатого скота в Гянджа-Газахском регионе Азербайджанской Республики

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Аннотация. Ландшафтно-экологические особенности распространения возбудителей мониезиоза среди мелкого рогатого скота в Гянджа-Газахском регионе изучались с 2010 года по сезонам и разным возрастным группам животных. Исследования проводились в различных ландшафтно-экологических зонах региона методом полного гельминтологического вскрытия К. И. Скрябина. В целях обеспечения устойчивого развития животноводства региона, получения от него экологически чистой продукции животноводства, на возбудителей мониезиоза обследовано 957 голов овец и 619 коз. Защита мелкого рогатого скота от инвазионных возбудителей, особенно гельминтозов, имеет большое научное и практическое значение.

Ключевые слова: Азербайджан, Гянджа-Газахский регион, мониезиоз, гельминтофауна, мелкий рогатый скот, ландшафтно-экологические зоны, биоэкологические особенности

Introduction

The Ganja-Gazakh Region is very favourable for livestock farming due to its natural conditions that include large pastures in the plains along the right bank of the Kura River, large meadows in foothills and mountainous areas, abundant watery rivers, and natural springs.

Protection of livestock from invasive pathogens, especially helminthosis, is of great scientific and practical importance as it helps to ensure sustainable development of livestock farming and to obtain environmentally friendly livestock produce.

However, except for some small-scale research conducted in the 1960s and 1970s, the helminth fauna of livestock in the Ganja-Gazakh Region and bio-ecological features of its spread have not been studied until recently. Conducted 50–60 years ago, the existing studies are outdated and do not fully reflect the current situation (Asadov 1960; 1975).

The research of A. G. Mamedov and G. Ismailov provides some data about the spread of *M. expansa* and *M. benedeni* species in sheep in the Ganja-Gazakh Region (Ismailov 2012; Mamedov 1966).

Taking the above into account, we started the reported research in 2010 with an aim to investigate bio-ecological features of moniesiosis spread in livestock farms located in various landscape/ecological territories of the Ganja-Gazakh Region.

Material and methods

In the reported study, 957 sheep and 619 goats were analysed for moniesiosis in various landscape/ecological territories of the region using K. I. Skryabin's full helminthological anatomisation method (Boev et al. 1962).

Results and discussion

Two moniesiosis pathogens — *M. expansa* and *M. benedeni* — are widespread in sheep in the Ganja-Gazakh region (Table 1). High intensity of *M. expansa* invasion was recorded in the foothills (29.7%), in the mountainous area (24.4%), and relatively low infection levels in the plains (23.3%). Since sheep move from the plains to the foothills, intensity of invasion increases from 23.3% in the plains to 29.7% in the foothills and then drops from 29.7% in the foothills to 24.4% in the mountains.

Intensity of *M. expansa* infection increases from 1–2 individuals in the plains to 1–4 individuals in the foothills but decreases from 1–4 individuals in the foothills to 1–3 individuals in the mountainous area (Fig. 1).

The research results show that intensity of *M. benedeni* invasion increases from 10.8% in the plains to 17.8% in the foothills. As the territory rises from the foothills to the mountainous area, this value drops from 17.8% to 12.3%. Intensity of *M. benedeni* infection in sheep increases by 1–2 individuals in the foothills compared to the plains and by 1–3 indi-

Table 1

Spread of moniesiosis pathogens in sheep in different landscape/ecological territories

Таблица 1

Распространение возбудителей мониезиоза среди овец в ландшафтно-экологических зонах

Landscape-ecological territories	Investigated	*M. expansa*			*M. benedeni*		
		Infected	Extent of invasion, %	Invasion intensity (individual)	Infected	Extent of invasion, %	Invasion intensity (individual)
Plains	304	71	23.3	1–3	33	10.8	1–2
Foothills	337	100	29.7	1–4	60	17.8	2–4
Mountainous	316	77	24.4	1–2	39	12.3	1–3
Total	957	348	36.4	1–4	132	13.8	1–4

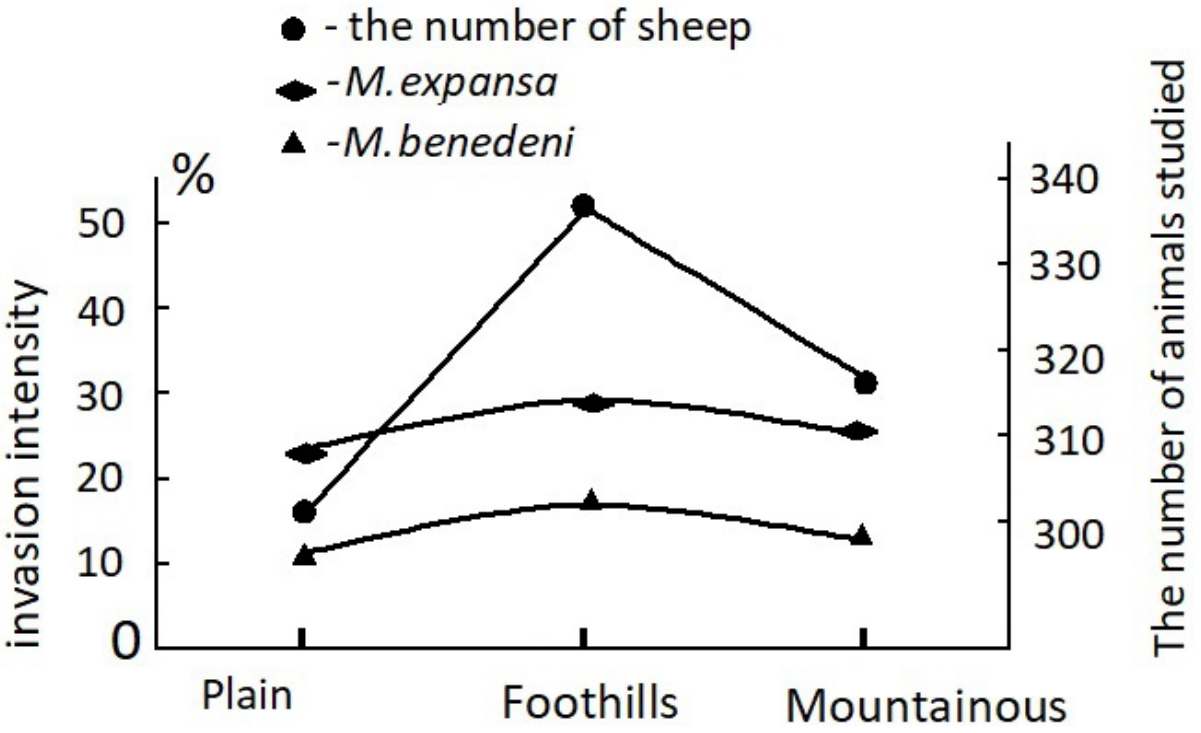

Fig. 1. Spread of moniesiosis pathogens in sheep in different landscape/ecological territories
Рис. 1. Распространение возбудителей мониезиоза среди овец в ландшафтно-экологических зонах

viduals in the mountainous area compared to the foothills.

In order to investigate how moniesiosis pathogens spread in goats in the Ganja-Gazakh Region, 619 goats were studied in various landscape/ecological territories using K. I. Skryabin's full helminthological anatomisation method (Table 2).

Table 2 shows that intensity of *M. expansa* invasion in goats increases from 11.8% in the plains to 14.3% in the foothills. This value then drops from 14.3% in the foothills to 13.0% in the mountainous area. Invasion intensity in goats was 1–2 individuals in the plains and foothills and 1–3 individuals in the mountainous area.

As for *M. benedeni* infection, intensity of invasion increases from 8.0% in the plains to 11.5% in the foothills. This value drops to 9.8% in the mountainous area. Invasion intensity was 1–2 individuals in the plains and the foothills and 1–3 individuals in the mountainous area.

Thus, 36.4% of *M. expansa* and 13.8% of *M. benedeni* species were detected in sheep in the Ganja-Gazakh Region.

Table 2

Spread of moniesiosis pathogens in goats

Таблица 2

Распространение мониезиоза у коз

Landscape/ ecological territories	Investigated	*M. expansa*			*M. benedeni*		
		Infected	Extent of invasion, %	Invasion intensity (individual)	Infected	Extent of invasion, %	Invasion intensity (individual)
Plains	152	18	11.8	1–3	12	8.0	1–2
Foothills	244	35	14.3	1–2	28	11.5	1–2
Mountainous	223	29	13.0	1–2	22	9.8	1–3
Total	619	82	13.2	1–3	62	10.0	1–3

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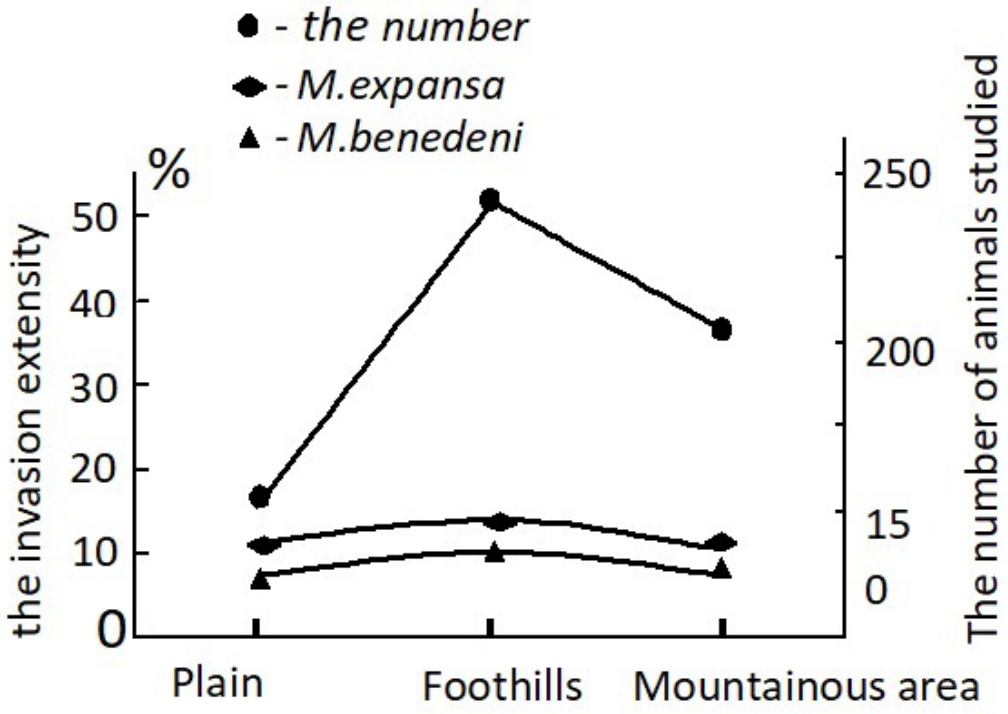

Fig. 2. Spread of moniesiosis pathogens in goats in different landscape/ecological territories
Рис. 2. Распространение возбудителей мониезиоза коз по ландшафтно-экологическим зонам

As for goats, 13.0% of *M. expansa* and 10.0% of *M. benedeni* infections were detected. Invasion intensity was 1–2 individuals in the plains and foothills and relatively high intensity of 1–3 individuals was observed in the mountainous area (Fig. 2).

Moniesiosis infection was also studied in different age groups of livestock (Table 3).

Table 3 shows high extent of invasion in lambs aged up to 6 months (22.8%), in sheep aged from 6 to 12 months (21.2%), and in sheep aged from 12 to 24 months (20.4%).

Table 3

Spread of moniesiosis pathogens in different age groups of livestock in the Ganja-Gazakh Region

Таблица 3

Распространение возбудителей мониезиоза среди мелкого рогатого скота по возрастным группам в Гянджа-Газахском регионе

Age groups	Sheep				Goats			
	Investigated	Infected	Extent of infection, %	Invasion intensity	Investigated	Infected	Extent of infection, %	Invasion intensity
Up to 6 months	127	29	22.8	1–2	170	21	12.3	1–2
6–12 months	170	36	21.2	1–4	109	14	12.8	1–3
1–2 years	230	47	20.4	2–5	189	25	13.2	1–2
2–4 years	260	37	14.2	1–3	162	12	7.8	1–1
4–5 years and older	170	15	8.8	1–3	156	11	6.8	1–1
Total:	957	165	17.2	1–7	619	83	13.4	1–3

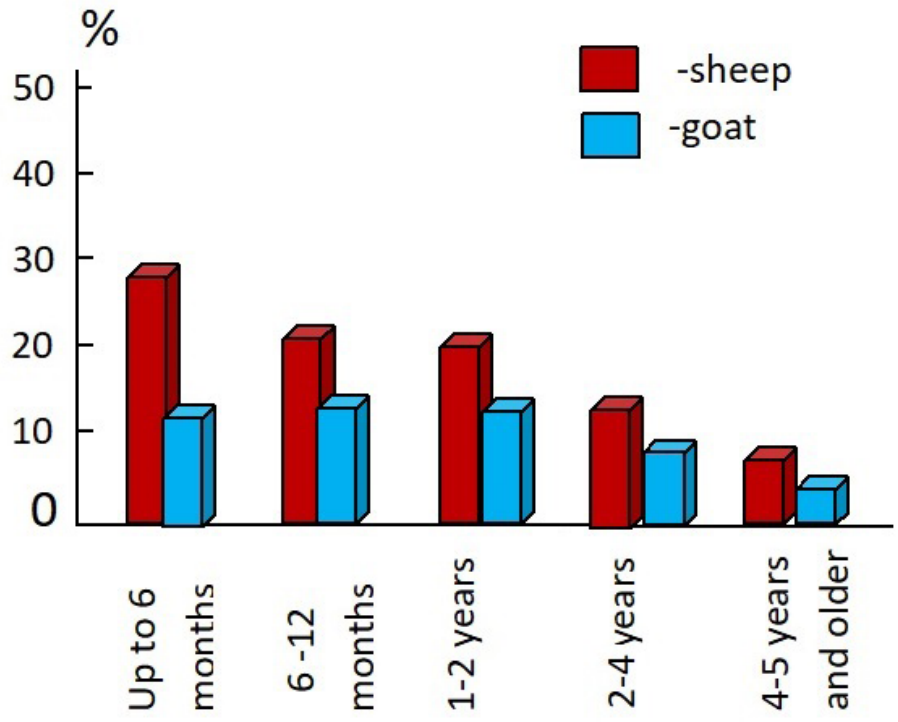

Fig. 3. Age-dependent dynamics of moniesiosis pathogens
Рис. 3. Возрастная динамика заражения мониезиями овец и коз

Relatively low infection rates were observed in sheep aged 2 to 4 years (14.2%) and in sheep aged 4 to 5 years and older (8.8%). High rates of moniesiosis infection were observed in the younger age groups — in sheep aged 6 to 24 months. Invasion intensity decreases from 14.2% to 8.8% as sheep get older.

In the Ganja-Gazakh Region, 619 goats of different age groups were tested for moniesiosis pathogens (Table 3).

Table 3 shows that 12.3% extent of infection was observed in kids aged up to 6 months, while lower figures (12.8%) were observed in goats aged from 6 to 12 months. Relatively weak extent of infection was observed in the older age groups — 1 to 2 years (13.2%), 2 to 4 years (7.8%), and 5 years and older (6.8%).

The study results show that the extent of infection increases from 21.4% in lambs aged up to 6 months to 23.0% in sheep aged 12 months due to their weak immunity to moniesiosis pathogens early in life. However, as sheep aged 1 to 4–5 years get older, their immunity to moniesiosis increases; therefore, the intensity of invasion decreases from 23.0% in sheep aged 1 year to 17.1% in sheep aged 4–5 years (Fig. 3).

The same regularity was observed in goats. Infection rates decrease from 12.2% in goats aged up to 6 months to 13.4% in goats under

Table 4

Correlation between season and moniesiosis infection in sheep

Таблица 4

Сезонная динамика заражения овец мониезиями

Seasons	Number of animals studied	Infected	Extent of invasion, %	Invasion intensity
Spring	280	51	18.2	1–4
Summer	189	32	16.9	1–2
Autumn	350	66	18.8	1–5
Winter	138	16	11.6	1–1
Total	957	165	17.2	1–5

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Table 5

Correlation between season and spread of moniesiosis pathogens in goats

Таблица 5

Зависимость распространения возбудителей мониезиоза у коз от сезона года

Seasons	Number of animals studied	Infected	Extent of invasion, %	Invasion intensity
Spring	162	24	14.8	1–2
Summer	144	18	12.5	1–2
Autumn	176	29	16.5	1–3
Winter	137	12	8.7	1–1
Total	619	83	13.4	1–3

2 years old. The value then drops to 12.2% in the age group of 2 to 5 years and older.

The research results show that as animals get older the extent of infection and invasion intensity decreases.

Infection of sheep and goats in livestock farms with moniesiosis pathogens was also analysed in correlation with seasons. The analysis revealed moniesiosis pathogens in sheep in all seasons of the year, with more pronounced manifestation in spring and autumn (Table 4).

As shown in Table 4, high extent of invasion in sheep was observed in spring (18.2%) and autumn (18.8%), while relatively low figures were observed in summer (16.9%) and winter (11.6%). High intensity of invasion in sheep was also recorded in spring (1–4 individuals) and autumn (1–5 individuals) (Table 4).

As shown in Table 5, high extent of invasion in goats of the Ganja-Gazakh Region was observed in spring (14.8%) and autumn (16.5%), while in summer and winter infection rates were relatively low (12.5% and 8.7%, respectively). High invasion intensity of 1–3 individuals was observed in autumn, 1–2 individuals in spring and summer, and relatively weak infection of 1–1 individuals in winter. The peak of infection was recorded in autumn (Fig. 4).

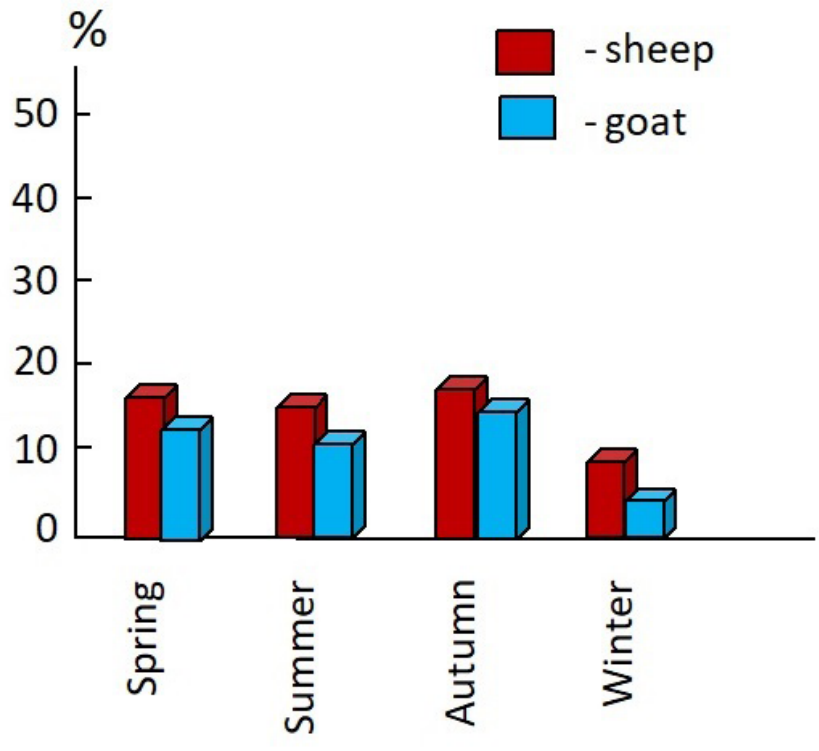

Fig. 4. Correlation between season and spread of moniesiosis pathogens in goats

Рис. 4. Зависимость распространения возбудителей мониезиоза от сезонов года

Thus, the results of the research show that high intensity of invasion in spring and autumn is due to the fact that grass becomes greener and soil mites migrate to it. Consequently, livestock consumes eggs and mites infected with moniesiosis together with grass, and infection occurs. In comparison, in summer and winter grass dries up and mites migrate to deeper layers of the soil, reducing both extent and intensity of infection.

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