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COMPARATIVE ANALYSIS OF THE DISTRIBUTION OF THE MAIN HELMINTHIASIS CAUSATIVE AGENTS IN THE ABSHERON PENINSULA AND KHIZI REGION

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СРАВНИТЕЛЬНЫЙ АНАЛИЗ РАСПРОСТРАНЕНИЯ ОСНОВНЫХ ВОЗБУДИТЕЛЕЙ ГЕЛЬМИНТОЗОВ НА АПШЕРОНСКОМ ПОЛУОСТРОВЕ И ХЫЗИНСКОМ РАЙОНЕ

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Abstract. The research was conducted on sheep farms located in the Absheron region in 2015-2020. The major helminth fauna in sheep in the private and farmer farms of the Absheron region was found to consist of helminth species: *Fasciola hepatica*, *F. gigantica*, *Dicrocoelium lanceatum*, *Paramphistomum cervi*, *Moniezia expansa*, *M. benedeni*, *Taenia hydatigena*, *T. ovis*, *Multiceps multiceps*, *Echinococcus granulosus*, *Protostrongylus hobmaieri*, *P. kochi*, *P. railleti*, *Muellerius capillaris*, *Trichocephalus ovis*, *Chabertia ovina*, *Haemonchus contortus*, *Dictyocaulus filaria*. The extensiveness and intensity of the distribution of the 18 main helminths detected in the region by the complete helminthological dissection method in 19 research areas (14 in the Absheron peninsula: Zire, Hovsan, Mashtagha, Mehdiabad, Gobu, Sulutepe, Z. Taghiyev, Fatmayi, Novkhani, Mammadli, Khirdalan, Jeyranbatan, Mushvigabad, Guzdek; 5 in the Khizi region: Yeni Yashma, Shorabad, Altiaghaj, Gizilgazma, Tudar) are described in tables. Higher invasion levels were identified for *T. ovis* (43.2%, 1-53 samples), *E. granulosus* (39.2%, 1-18 samples), *H. contortus* (35.0%, 2-56 samples), and they were considered the dominant helminth species of the region. Based on the complete helminthological dissection, in the Absheron peninsula, IE was 17.7% and II was 1-64 samples, and in the Khizi district, IE was 29.0% and II was 1-83 samples. Thus, complete helminthological examination methods allowed us to conclude that the infection rate in the Khizi region is higher than in the Absheron Peninsula. This makes it necessary for farmers and veterinarians to start veterinary sanitary measures, both prophylactic and treatment measures against helminths in the Khizi district.

Аннотация. Исследования проводились на овцеводческих фермах, расположенных в Апшеронском районе в 2015–2020 годах. Основная гельминтофауна овец в частных и фермерских хозяйствах региона Апшерон состоит из следующих видов гельминтов: *Fasciola hepatica*, *F. gigantica*, *Dicrocoelium lanceatum*, *Paramphistomum cervi*, *Moniezia expansa*, *M. benedeni*, *Taenia hydatigena*, *T. ovis*, *Multiceps multiceps*, *Echinococcus granulosus*, *Protostrongylus hobmaieri*, *P. kochi*, *P. railleti*, *Muellerius capillaris*, *Trichocephalus ovis*, *Chabertia ovina*, *Haemonchus contortus*, *Dictyocaulus filaria*. Приводятся сведения об экстенсивности и интенсивности распространения 18 основных гельминтов, выявленных в регионе методом полного гельминтологического вскрытия на 19 участках исследований (14 на Апшеронском полуострове: Зире, Говсан, Маштага, Мехдибад, Гобу, Сулутепе, З. Тагиев,

Фатмаи, Новханы, Мамедлы, Хырдалан, Джейранбатан, Мушвигабад, Гуздек; 5 в Хызинском районе: Ени Яшма, Шорабад, Алтыгадж, Гызылгазма, Тудар). Более высокие уровни инвазии были выявлены для *T. ovis* (43,2%, 1–53 образца), *E. granulosus* (39,2%, 1–18 образцов), *H. contortus* (35,0%, 2–56 образцов) и они были признаны доминирующими видами гельминтов региона. По данным методом полного гельминтологического обследования на Апшеронском п-ове ЭИ составила 17,7%, ИИ — 1–64 образцов, а в Хызинском р-не ЭИ составила 29,0%, ИИ — 1–83 образцов. Сделан вывод о том, что уровень инвазированности в Хызинском р-не выше, чем на Апшеронском п-ове. Это обуславливает необходимость для фермеров и ветеринаров начать ветеринарно-санитарные мероприятия, как профилактические, так и лечебные, против гельминтов в Хызинском районе.

Keywords: major helminth fauna, *Ovis aries*, Khizi, Absheron Peninsula.

Ключевые слова: основная гельминтофауна, домашняя овца, Хызы, Апшеронский полуостров.

In modern times, when most areas of agriculture are intensified and comprehensively developed, the main action plan of our state has always been to implement the sustainable development of agricultural animals, as well as small horned domestic animals, to obtain ecologically clean animal products. State Programs and Orders have been adopted in this direction. Therefore, it is scientifically and practically important to protect ruminant animals from causative agents of infectious and invasive diseases, especially helminths, in order to comply with the provisions of the State Program and Orders.

It is very important to improve the health of animals fed on livestock farms against helminthiasis, to take effective control measures against diseases, to identify the sources of the spread of these parasites on farms and in nature, and the environmental factors that affect the spread. As a component of the biocenosis, helminths not only play an important role in its dynamics, they enter organisms of primary and intermediate hosts in various biocenotic ways, significantly inhibit their normal development, reproductive ability, reproduction, and productivity by parasitizing various organs and tissues [1, 2].

The object of the study was sheep (*Ovis aries*) fed on private and farmer sheep farms in the Absheron region. The goal of the study was to give the bioecological characteristics of the main helminths that parasitize sheep in the area and to carry out preventive control measures against them.

The major helminth fauna in sheep in the private and farmer farms of the Absheron region was found to consist of 18 helminth species (4 of them are geohelminths and 14 are biohelminths), with 4 species belonging to trematodes, 6 species cestodes, and 8 species — nematodes. Trematodes: *Fasciola hepatica*, *F. gigantica*, *Dicrocoelium lanceatum*, *Paramphistomum cervi*; Cestodes: *Moniezia expansa*, *M. benedeni*, *Taeni hydatigena*, *T. ovis*, *Multiceps multiceps*, *Echinococcus granulosus*; Nematodes: *Protostrongylus hobmaieri*, *P. kochi*, *P. railleti*, *Mullerius capillaris*, geohelminths — *Trichocephalus ovis*, *Chabertia ovina*, *Haemonchus contortus*, *Dictyocaulus filaria*.

Material and methods of research

To study the distribution of the main causative agents of sheep helminthiasis in different landscape-ecological zones of the Absheron region, the location and grazing areas of private farms engaged in sheep breeding in different villages and settlements, the number of sheep, etc. were determined in 2015-2020.

The permission of entrepreneurs was received to conduct research in farms. Complete helminthological dissection were performed with samples collected from these farms, helminths were collected and preserved [3].

Research results

In this research work, we have conducted a comparative analysis of the prevalence of main causative agents of helminthiasis in the Absheron Peninsula and Khizi region.

The extensiveness and intensity of the distribution of the 18 main helminths detected in the region by the complete helminthological dissection method in 19 research areas (14 in the Absheron peninsula — Zire, Hovsan, Mashtagha, Mehdiabad, Gobu, Sulutepe, Z. Taghiyev, Fatmayi, Novkhani, Mammadli, Khirdalan, Jeyranbatan, Mushvigabad, Guzdek; 5 in the Khizi region- Yeni Yashma, Shorabad, Altiaghaj, Gizilgazma, Tudar) are described in Tables 1 and 2.

Table 1 presents the number of causative agents of helminthiasis in the Absheron peninsula based on the complete helminthological dissection method: *F. hepatica* 12.7% (2-64 samples), *F. gigantica* 9.8% (2-42 samples), *D. lanceatum* 19.8% (3-51 samples), *P. cervi* 4.5% (3-25 samples), *M. expansa* 13.3% (1-9 samples), *M. benedeni* 13.4% (1-5 samples), *T. hydatigena* 13.4% (1-24 samples), *T. ovis* 7.6% (1-8 samples), *M. multiceps* 1.4% (1-2 samples), *E. granulosus* 36.8% (1-14 samples), *Tr. ovis* 39.8% (1-38 samples), *Ch. ovina* 22.1% (1-51 samples), *H. contortus* 28.9% (2-53 samples), *P. hobmaieri* 10.5% (1-16 samples), *P. kochi* 27.4% (2-25 samples), *P. railleti* 16.2% (1-18 samples), *D. filaria* 27.0% (2-3 samples), *M. capillaris* 14.6% (1-19 samples).

The number of helminthiasis pathogens in the Khizi region is given in Table 2: *F. hepatica* 18.7% (2-83 samples), *F. gigantica* 18.1% (6-63 samples), *D. lanceatum* 30.7% (3-63 samples), *P. cervi* 14.0% (6-39 samples), *M. expansa* 30.6% (2-15 samples), *M. benedeni* 26.6% (1-8 samples), *T. hydatigena* 16.2% (1-34 samples), *T. ovis* 32.6% (1-19 samples), *M. multiceps* 3.0% (1-2 samples), *E. granulosus* 38.0% (1-18 samples), *Tr. ovis* 47.6% (2-53 samples), *Ch. ovina* 32.2% (1-74 samples), *H. contortus* 43.2% (5-56 samples), *P. hobmaieri* 22.8% (4-31 samples), *P. kochi* 37.3% (5-44 samples), *P. railleti* 38.9% (1-54 samples), *D. filaria* 32.9% (2-36 samples), *M. capillaris* 34.4% (2-34 samples).

Besides, based on a complete helminthological dissection, the average extensiveness and final intensity of the invasion of the main helminths in the villages and settlements of the region were calculated. Thus, in the Absheron peninsula, in Zire 11.6% (2-51 samples), Hovsan 11.1% (1-34 samples), Mashtagha 13.5% (1-43 samples), Mehdiabad 19.7% (1-31 samples), Gobu 22.7% (1-35 samples), Sulutepe 10.8% (1-46 samples), Z.Taghiyev 18.2% (1-37 samples), Fatmayi 17.8% (1-38 samples), Novkhani 14.9% (1-48 samples), Mammadli 15.1% (1-34 samples), Khirdalan 21.5% (2-39 samples), Jeyranbatan 28.0% (1-63 samples), Mushvigabad 20.6% (1-64 samples), Guzdek 22.7% (1-23 samples) (Table 1).

The following results were obtained in the Khizi region: in Shorabad 21.3% (1-38 samples), Yeni Yashma 12.2% (1-36 samples), Altiaghaj 36.3% (1-54 samples), Tudar 38.0% (1-68 samples), Gizilgazma 36.1% (1-83 samples) (Table 2).

Thus, the infection was found to be higher in Jeyranbatan, Gobu, and Guzdek settlements of the Absheron Peninsula, in Tudar and Altiaghaj villages of the Khizi region.

As seen in Tables 1 and 2, based on the Method of complete helminthological dissection, the average extensiveness of invasion for main helminths was 17.7% (1-64 samples) in the Absheron Peninsula and 29.0% (1-83 samples) in the Khizi region [4, 5].

Table 1
 DISTRIBUTION OF MAIN HELMINTHS ON RESEARCH AREAS IN THE ABSHERON PENINSULA (BASED ON THE METHOD OF COMPLETE HELMINTHOLOGICAL DISSECTION)

№	Helminth species	Nite		Kovsan		Mashatsha		Meldiabad		Gobu		Sultepe		Z'arbyler	
		IE	II	IE	II	IE	II	IE	II	IE	II	IE	II	IE	II
1	<i>F. hepatica</i>	9.0	11-51	9.1	8-27	14.3	2-43	15.0	9-18	16.7	14-35	15.1	7-46	7.2	13-21
2	<i>F. gigantica</i>	2.5	4-11	5.5	4-19	16.7	13-41	-	-	19.4	2-7	-	-	8.7	5-25
3	<i>D. lanceatum</i>	21.5	14-51	-	-	-	-	30.0	3-19	30.6	3-8	-	-	23.2	5-17
4	<i>P. cervi</i>	3.8	6-12	3.6	7-13	-	-	-	-	11.1	3-25	6.1	12-15	-	-
5	<i>M. expansa</i>	5.1	2-5	9.1	1-2	7.1	3-4	15.0	2-3	16.7	2-9	15.2	3-7	10.1	1-4
6	<i>M. benedini</i>	7.6	2-3	7.3	2-3	16.7	1-2	15.0	1-2	19.4	1-3	9.1	2-4	8.7	1-4
7	<i>T. hydaticana</i>	8.8	3-14	9.1	2-7	16.6	5-11	10.0	2-5	13.9	1-9	12.1	3-10	11.6	1-10
8	<i>T. ovis</i>	2.5	1	3.6	2-7	4.8	2-5	-	-	5.5	3	-	-	13.0	1-3
9	<i>M. multiceps</i>	-	-	-	-	-	-	-	-	5.5	2	-	-	2.8	1
10	<i>E. granulosus</i>	35.4	2-8	21.8	4-13	35.7	1-7	40.0	2-6	36.8	1-7	39.4	2-6	40.5	4-8
11	<i>T. ovis</i>	35.4	5-27	41.8	1-19	45.2	2-31	30.0	1-7	41.6	3-27	24.2	5-18	49.3	5-28
12	<i>Ch. ovina</i>	20.2	3-51	32.7	2-34	28.6	2-19	30.0	1-31	13.9	2-20	21.2	1-16	18.8	2-18
13	<i>H. contortus</i>	15.2	17-53	10.9	8-19	11.9	11-24	40.0	7-23	36.1	3-12	15.1	2-13	31.9	16-37
14	<i>P. hobmaieri</i>	2.5	2-3	5.4	2-3	2.4	2	15.0	1-8	11.1	3-14	-	-	7.2	2-8
15	<i>P. kochi</i>	3.8	2-3	3.6	2-3	2.4	2	45.0	2-13	50.0	2-19	-	-	34.8	4-11
16	<i>P. raillietii</i>	6.3	2-3	5.4	1-4	4.7	2-3	25.0	2-8	19.4	2-18	12.1	2-7	13.0	5-16
17	<i>D. filaria</i>	21.5	7-19	23.6	14-23	26.2	4-23	35.0	8-25	36.1	4-11	6.0	2-4	33.3	11-36
18	<i>M. capillaris</i>	7.6	1-3	7.3	2-3	9.5	3-7	10.0	4-6	25.0	5-13	18.2	4-15	13.0	3-11
	TOTAL	11.6	2-51	11.1	1-34	13.5	1-43	19.7	1-31	22.7	1-35	10.8	1-46	18.2	1-37

Continuation of Table 1

№	Helminth species	Famrayi		Novxani		Marmadi		Klirdalan		Jeyranbatan		Mushvigabad		Guzdek		TOTAL	
		IE	II	IE	II	IE	II	IE	II	IE	II	IE	II	IE	II	IE	II
1	<i>F. hepatica</i>	14.6	15-38	5.9	7-48	10.3	8-34	-	-	28.6	24-63	15.0	23-64	16.7	10-21	12.7	2-64
2	<i>F. gigantica</i>	14.6	8-31	9.5	2-13	10.3	3-27	-	-	23.8	21-42	10.0	14-23	16.7	9-18	9.8	2-42
3	<i>D. lanceatum</i>	35.4	14-32	16.7	3-12	24.1	12-27	35.3	29-39	-	-	35.0	5-37	25.0	7-19	19.8	3-51
4	<i>P. cervi</i>	-	-	-	-	-	-	11.8	9-12	9.5	5-12	-	-	16.6	4-17	4.5	3-25
5	<i>M. expansa</i>	14.6	3-7	10.7	3-6	-	-	23.5	3-4	23.8	3-5	15.0	2-8	20.8	4-7	13.3	1-9
6	<i>M. beneditini</i>	14.6	1-3	6.0	2-3	6.9	1-3	29.4	2-5	28.6	2-4	10.0	2-5	8.3	2-5	13.4	1-5
7	<i>T. hydatigena</i>	16.6	5-11	13.1	2-24	17.2	3-7	11.7	5-10	19.0	2-23	20.0	3-8	8.3	1-12	13.4	1-24
8	<i>T. ovis</i>	-	-	2.4	1	6.9	3	11.8	2-4	19.0	3-8	20.0	2-4	16.7	2-3	7.6	1-8
9	<i>M. multiceps</i>	-	-	2.4	1	-	-	-	-	4.7	1	-	-	4.2	1	1.4	1-2
10	<i>E. granulosus</i>	45.8	1-9	40.5	3-14	34.5	2-11	35.3	2-13	47.6	5-12	25.0	1-5	37.5	4-10	36.8	1-14
11	<i>Tr. ovis</i>	45.8	1-38	36.9	2-31	31.0	4-33	52.9	6-29	66.7	8-34	35.0	2-8	20.8	3-17	39.8	1-38
12	<i>Cl. ovina</i>	12.5	3-9	17.8	2-43	13.8	1-14	17.6	2-8	33.3	4-37	15.0	1-11	33.3	5-24	22.1	1-51
13	<i>H. contortus</i>	29.2	6-23	33.3	18-35	27.6	13-27	29.4	11-20	57.1	19-34	25.0	2-9	41.6	8-23	28.9	2-53
14	<i>P. hobmaieri</i>	6.2	2-4	4.8	3-15	13.8	3-7	23.5	4-10	9.5	2-4	20.0	2-16	25.0	5-13	10.5	1-16
15	<i>P. kochi</i>	31.2	4-14	21.4	3-21	24.1	5-9	40.6	5-10	42.8	3-7	50.0	3-25	33.3	4-16	27.4	2-25
16	<i>P. railletii</i>	12.5	1-5	10.7	3-7	17.2	4-10	23.5	3-12	14.3	4-9	30.0	3-18	33.3	5-17	16.2	1-18
17	<i>D. filaria</i>	18.7	2-14	26.2	18-35	24.1	5-18	29.4	3-10	52.4	14-37	20.0	3-7	25.0	7-18	27.0	2-37
18	<i>M. capillaris</i>	8.3	1-2	9.5	3-6	10.3	3-5	11.8	3-5	23.8	4-8	25.0	2-5	25.0	3-19	14.6	1-19
	TOTAL	17.8	1-38	14.9	1-48	15.1	1-34	21.5	2-39	28.0	1-63	20.6	1-64	22.7	1-23	17.7	1-64

Table 2
 DISTRIBUTION OF MAIN HELMINTHS ON RESEARCH AREAS IN THE KHIZI REGION (BASED ON THE METHOD OF COMPLETE HELMINTHOLOGICAL DISSECTION)

№	Helminth species	Yeni Yashma		Shorabad		Akiaghaj		Gizilgazma		Tudar		TOTAL	
		IE	II	IE	II	IE	II	IE	II	IE	II	IE	II
1	<i>F.hepatica</i>	-	-	-	-	30.2	10-47	33.9	2-83	29.2	17-68	18.7	2-83
2	<i>F.gigantica</i>	-	-	-	-	32.6	6-42	30.6	12-63	27.1	17-62	18.1	6-63
3	<i>D.lanceatum</i>	-	-	33.3	3-9	41.9	11-35	38.7	13-55	39.6	14-63	30.7	3-63
4	<i>P.cervi</i>	12.4	5-12	16.6	19-22	14.7	8-36	13.7	7-39	12.6	6-32	14.0	6-39
5	<i>M.expansa</i>	-	-	-	-	46.5	4-12	48.4	5-11	58.3	2-15	30.6	2-15
6	<i>M.benedini</i>	6.9	1-2	8.3	1	37.2	1-3	38.7	2-4	41.7	1-8	26.6	1-8
7	<i>T.hydatigena</i>	10.3	4-7	16.6	2-3	16.3	1-34	21.0	1-15	16.7	3-32	16.2	1-34
8	<i>T.ovis</i>	27.6	3-8	33.3	3-7	34.9	2-17	33.9	2-19	33.3	1-14	32.6	1-19
9	<i>M.multiceps</i>	3.4	1	-	-	4.6	2	4.8	1-2	2.1	1	3.0	1-2
10	<i>E.granulosus</i>	20.6	1-4	33.3	3-8	46.5	5-14	41.9	4-16	47.9	5-18	38.0	1-18
11	<i>Tr.ovis</i>	41.4	2-36	25.0	2-38	53.5	5-38	59.7	2-53	58.3	4-41	47.6	2-53
12	<i>Ch.ovina</i>	24.1	3-28	16.6	1-7	39.5	7-54	37.1	4-63	43.7	2-74	32.2	1-74
13	<i>H.contortus</i>	24.1	5-17	50.0	5-21	44.2	18-37	50.0	8-44	47.9	22-56	43.2	5-56
14	<i>P.hobmaieri</i>	-	-	16.6	4-9	37.2	7-19	29.0	6-24	31.2	4-31	22.8	4-31
15	<i>P.kochi</i>	-	-	41.6	5-22	48.8	9-44	48.3	8-37	47.9	12-30	37.3	5-44
16	<i>P.raillieti</i>	6.9	1-2	41.6	4-11	41.9	5-53	43.5	4-48	60.4	6-54	38.9	1-54
17	<i>D.filaria</i>	20.7	5-16	25.0	2-13	39.5	8-36	35.5	17-34	43.7	12-18	32.9	2-36
18	<i>M.capillaris</i>	20.7	2-7	25.0	4-7	44.2	7-34	40.3	5-28	41.7	4-32	34.4	2-34
	TOTAL	12.2	1-36	21.3	1-38	36.3	1-54	36.1	1-83	38.0	1-68	29.0	1-83



Conclusions

1. The major helminth fauna in sheep in the private and farmer farms of the Absheron region was found to consist of 18 helminth species (4 of them are geohelminths and 14 are biohelminths), with 4 species belonging to trematodes, 6 species – cestodes, and 8 species – nematodes. Trematodes: *Fasciola hepatica*, *F. gigantica*, *Dicrocoelium lanceatum*, *Paramphistomum cervi*; Cestodes: *Moniezia expansa*, *M. benedeni*, *Taeni hydatigena*, *T. ovis*, *Multiceps multiceps*, *Echinococcus granulosus*; Nematodes: *Protostrongylus hobmaieri*, *P. kochi*, *P. railleti*, *Mullerius capillaris*, geohelminths - *Trichocephalus ovis*, *Chabertia ovina*, *Haemonchus contortus*, *Dictyocaulus filaria*.

2. Higher invasion levels were identified for *Tr. ovis* (43.2%, 1-53 samples), *E. granulosus* (39.2%, 1-18 samples), *H. contortus* (35.0%, 2-56 samples), and they were considered the dominant helminth species of the region.

3. High invasion level with main helminths in the Absheron peninsula was found in Gobu (22.7%, 1-35 samples), Guzdek (22.7%, 1-23 samples), and Jeyranbatan (28.0%, 1-63 samples); In the Khizi region, it was observed in Gizilgazma (36.1%, 1-83 samples), Altiaghaj (36.3%, 1-54 samples), and Tudar (38.0%, 1-68 samples) villages.

4. Based on the complete helminthological dissection, in the Absheron peninsula, IE was 17.7% and II was 1-64 samples, and in the Khizi region, IE was 29.0% and II was 1-83 samples [6].

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