

**Возбудители нематодозов желудочно-кишечной системы овец
Абшеронского района Azerbaijan**

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Аннотация. Исследования проводили в 2015–2020 гг. в Абшеронском районе Azerbaijanской Республики в индивидуальных и фермерских овцеводческих хозяйствах. С помощью метода полного гельминтологического вскрытия было установлено, что такие нематоды, как *Trichocephalus ovis*, *Haemonchus contortus*, *Chabertia ovina* паразитируют в желудочно-кишечном тракте овец. Все три вида относятся к геогельминтам. Полному гельминтологическому обследованию подвергнута 771 павшая и забитая овца. В области степень инвазии (ЭИ) *Tr. ovis* составляет 43,2 %, интенсивность инвазии (ИИ) 1–53 особи, ЭИ *H. contortus* – 35,0 %, ИИ – 2–56 особей, ЭИ с *Ch. ovina* составляет 25,0 %, ИИ – 1–74 особи. Возбудители нематод широко распространены в вертикальных ландшафтно-экологических зонах с преобладанием горной зоны: *Tr. ovis* – 57,5 %, *Ch. ovina* – 39,8 %, *H. Contortu* – 32,7 %. Также было установлено, что гельминты в большей степени распространены в Хызинском районе области.

Ключевые слова: нематода; геогельминт; овца; инвазия; Абшеронский район.

Для цитирования: Агаева А. Н., Исаева К. К. Возбудители нематодозов желудочно-кишечной системы овец Абшеронского района Azerbaijan // Аграрный научный журнал. 2023. № 3. С. 103–110. [http: 10.28983/asj.y2023i3pp103-110](http://10.28983/asj.y2023i3pp103-110).

VETERINARY MEDICINE AND ZOOTECHNICS

Original article

**Nematodiasis causative agents of the gastrointestinal system of sheep
in the Absheron region of Azerbaijan**

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Summary. The research was performed in the Absheron region of the Azerbaijan Republic on private and farmer sheep farms from 2015 to 2020. The complete helminthological dissection method revealed that nematodes such as *Trichocephalus ovis*, *Haemonchus contortus*, and *Chabertia ovina* parasitize the gastrointestinal system of sheep. All 3 species belong to geohelminths. 771 dead and slaughtered sheep were examined by complete helminthological dissection. In the region, the extensiveness of invasion (EI) with *Tr. ovis* was 43.2 %, the intensity of invasion (II) was 1-53 samples, the EI with *H. contortus* was 35.0 %, the EI was 2-56 samples, the IE with *Ch. ovina* was 25.0 %, II was 1-74 samples. Nematodiasis causative agents were found to be widely distributed in vertical landscape-ecological zones with the predominance of the mountainous zone: *Tr. ovis* 57.5 %, *Ch. ovina* 39.8 %, *H. contortus* 32.7 %. It was also observed that helminths were more widespread in the Khizi district of the region.

Keywords: nematode; geohelminth, sheep; invasion; Absheron region.

For citation: Aghayeva A. N., Isayeva K. K. Nematodiasis causative agents of the gastrointestinal system of sheep in the Absheron region of Azerbaijan. Agrarnyy nauchnyy zhurnal = Agrarian Scientific Journal. 2023;(3):103–110. (In Russ.). [http: 10.28983/asj.y2023i3pp103-110](http://10.28983/asj.y2023i3pp103-110).

Introduction. Nowadays, when most areas of agriculture are intensively and comprehensively developed, stable development of domestic small cattle, obtaining ecologically clean animal products is in the main action plan of the Republic of Azerbaijan, and State Programs and Orders have been





adopted in this direction. Therefore, protecting domestic ruminants from invasive agents, especially helminths, has both scientific and practical importance in order to fulfill the provisions outlined in the State Programs and Orders. It is very important to protect the animals in livestock farms from causative agents of helminthiasis, to carry out effective measures to combat diseases, to determine the sources of spread of these parasites in farms and nature, and the environmental factors affecting their spread. Helminths, as a component of the biocenosis, play a significant role in its dynamics, but they cause also significant obstacles to the normal development, reproductive capacity, reproduction, and productivity by entering the body of the main and intermediate hosts through various biocenotic ways and parasitizing various organs and tissues [7].

In the last 20 years, both social and economic conditions have changed in the country due to the transition to a market economy, and many small peasant farms based on private ownership have been established. Along with many advantages, these farms also have some disadvantages. Most of such farms do not have qualified specialists (zootechnician, veterinarian, etc.). In this case, timely treatment of animals and proper preventive measures against pests, diseases, and especially helminths are not carried out. Various problems have also arisen in the irrigation systems, pastures, areas around the barns, etc. In recent years, meat sale points have been operating in large cities and settlements. In many cases, animals are slaughtered and meat is sold under conditions where veterinary and sanitary requirements are not met. All of these factors have led to the spread and growth of various causative agents of helminthiasis in the areas where private and farmer farms are located. Issues such as the helminth fauna of ruminants fed in such farms, the identification of newly formed disease foci and the implementation of effective control measures against them have not been sufficiently studied until recently with some minor exceptions. Currently, the transformation of pasture lands into agricultural lands, some problems arising in the irrigation systems, the expansion of the tourism and catering network, etc. also affect the spread of helminthiasis agents [3]. Besides, in recent years, global climate change has been taking place on our planet, which is one of the abiotic factors affecting the spread of helminth eggs, larvae, and intermediate hosts.

Thus, the study of the bio-ecological features of the helminth fauna and the main helminths of sheep is relevant in the background of the current environmental conditions in Absheron, which is a densely populated region where sheep farming is developed, and there is a special need for it in a period when animal husbandry is being developed and attention is being paid to the obtaining of high-quality, clean food products [8].

The scientific novelty of the research was the study of the species composition, intensity, and extensiveness of the main helminthiasis agents of sheep in private and farmer farms in the Absheron region for the first time in the last 20 years. *Trichocephalus ovis*, *Chabertia ovina*, and *Haemonchus contortus* were found to be the main causative agents of gastrointestinal system diseases in sheep.

For the first time, both the extensiveness and intensity of the invasion were found to be higher in the Khizi district, which belongs to the mountainous belt of the Absheron region.

These data will get the attention of farmers, veterinarians, and veterinary-sanitary measures and ensure both preventive and treatment measures against helminths in the sheep farms located in the Khizi district of the Absheron region.

The main goal of the research was to determine the areas where helminthiasis agents are widespread in the Absheron region, the extensiveness and intensity of the invasion, the identification of dominant species, and the distribution of helminths in different altitude zones and seasons.

Materials and Methods. During 2015–2020, expeditions to research sites were organized and samples were collected at different times to study the causative agents of helminthiasis in sheep in the Absheron region. For this purpose, in 19 villages and settlements of the region (Zira, Hovsan, Mashtagha, Mehdiabad, Gobu, Sulutepe, Z. Taghiyev, Fatmayi, Novkhani, Mammadli, Khirdalan, Jeyranbatan, Mushvigabad, Guzdak in the Absheron peninsula; Yeni Yashma, Shorabad, Altiaghaj, Gizilgazma, Tudar in the Khizi region) in private and farmer sheep farms and slaughterhouses, researches were conducted and the consent of entrepreneurs was obtained for this purpose. A total of 771 sheep were examined for helminthiasis agents by the method of complete helminthological dissection, including 79 sheep in Zira, 55 in Hovsan, 84 in Novkhani, 36 in Gobu, 20 in Mushvigabad, 42 in Mashtagha, 48 in Fatmayi, 29 in



Mammadli, 21 in Jeyranbatan, 33 in Sulutepe, 24 in Guzdak, 20 in Mehdiabad, 69 in the Zeynalabdin Taghiyev settlement, 17 in Khirdalan, 12 in Shorabad, 29 in Yeni Yashma, 62 in Kizilgazma, 48 in Tudar, and 43 in Altiaghaj [6].

During the study, altitude zones, number of sheep on farms, storage conditions, the influence of biotic and abiotic factors of the environment, seasons of the year, and biological characteristics were taken into account.

To study the distribution of helminths in the region by altitude belts, studies were conducted in three characteristic landscape-ecological zones of the Absheron region - plain, foothill, and mountainous zones. The 19 villages and settlements where research was conducted are located as follows: in the plain zone - Zira, Hovsan, Mashtagha, Mammadli, Khirdalan, Jeyranbatan, Z. Taghiyev; in the foothill zone - Mehdiabad, Gobu, Sulutepe, Fatmayi, Novkhani, Mushvigabad, Guzdek, Yeni Yashma, Shorabad; in the mountainous zone - Altiaghaj, Gizilgazma, Tudar. The results obtained by the complete helminthological dissection method of K. I. Skryabin were analyzed by grouping them into plain (303 animals), foothill (315 animals), and mountainous (153 animals) zones. It should be noted that this grouping is consistent with that of leading experts in other relevant fields (geographers, soil scientists, botanists, and zoologists).

Besides, in order to study the distribution of helminths according to the seasons of the year, the results we obtained from the complete helminthological dissection of 771 slaughtered and dead sheep were divided into spring (175 animals), summer (183 animals), autumn (194 animals), and winter (219 animals) groups [1].

The materials were initially processed at the sheep slaughtering stations, and further research was carried out in the laboratory of the Parasitology Department of the Veterinary Research Institute of the Ministry of Agriculture of Azerbaijan. The collected nematodes were kept in Barbagallo solution, and the species composition was determined in the laboratory. The identification of helminths was performed mainly according to the systematization of R.S. Shults and Y.V. Gvozdev [4, pp. 162–193; pp. 288–319; pp. 428–456]. When determining the species composition of helminths, Amscope, Motic microscopes, magnifiers, and a photo camera were used.

Results and Discussion. The research carried out in sheep farms in the Absheron region revealed nematodes such as *Trichocephalus ovis*, *Haemonchus contortus*, *Chabertia ovina* parasitizing the gastrointestinal system of sheep.

Trichocephalus ovis. Hosts: domesticated and wild ruminants. Localization: caecum, large intestine. Distribution area: widely distributed [2].

As a result of complete helminthological dissection of 771 sheep in the Absheron region, *Tr. ovis* helminths were found and collected from the caecum and the colon part of the large intestine, and it was found that the extensiveness of the invasion in the region was 43.2 %, and the intensity of the invasion was 1–53 samples (Table 1).

Tr. ovis is the species showing the highest infection rate among the helminths detected in the region.

As seen in Table 1, high percentages of infection with *Tr. ovis* were observed in the Absheron peninsula in the territories Jeyranbatan (66.7 %), Khirdalan (52.9 %), H.Z. Taghiyev (49.3 %), and slightly less in Guzdak (20.8 %) and Sulutepe (24.2 %). While in the Khizi district, high infections were found in the villages Gizilgazma (59.7 %), Tudar (58.3 %), and Altiaghaj (53.5 %). The high-intensity invasion was observed in Shorabad (2–38 samples), Mammadli (4–33 samples), and Jeyranbatan (8–34 samples), and slightly lower intensity in Mehdiabad (1–7 samples) and Mushvigabad (2–8 samples). It is clear that trichocephalosis causative agent is widespread on farms.

The results of the studies carried out in the research sites show that the distribution of the *Tr. ovis* species is influenced by abiotic factors (humidity, soil types, temperature, plant groups, etc.) as well as the veterinary-sanitary conditions of farms.

It was also found that the distribution of the *Tr. ovis* species has horizontal diversity as shown above, as well as vertical (altitude belts) diversity. The results of the study are given in Table 2.

According to Table 2, the *Tr. ovis* species is widely distributed in vertical landscape-ecological zones with the dominance of mountainous zone (EI 57.5%, II 2–53 samples). It is clear from the results of the research that more favorable conditions for the development of the species exist in the mountainous

**Distribution of the *Trichocephalus ovis* species among sheep in the Absheron region
(according to complete helminthological dissection)**

Research sites	Examined (number)	Infected (number)	Extensiveness of invasion (%)	Intensity of invasion (samples)
Zira	79	28	35.4	5-27
Hovsan	55	23	41.8	1-19
Mashtagha	42	19	45.2	2-31
Mammadli	29	9	31.0	4-33
Fatmayi	48	22	45.8	1-38
Novkhani	84	31	36.9	2-31
Mehdiabad	20	6	30.0	1-7
Khirdalan	17	9	52.9	6-29
Ceyranbatan	21	14	66.6	8-34
Z. Taghiyev	69	34	49.3	5-28
Yeni Yashma	29	12	41.4	2-36
Gobu	36	15	41.6	3-27
Sulutepe	33	8	24.2	5-18
Guzdek	24	5	20.8	3-17
Shorabad	12	3	25.0	2-38
Mushvigabad	20	7	35.0	2-8
Altiaghaj	43	23	53.5	5-38
Gizilgazma	62	37	59.7	2-53
Tudar	48	28	58.3	4-41
TOTAL:	771	333	43.2	1-53

Table 2

**Distribution of the *Tr. ovis* species among sheep by altitudinal belts
(according to complete helminthological dissection)**

Ecological zones	Examined (number)	Infected (number)	Extensiveness of invasion (%)	Intensity of invasion (samples)
Plain zone	303	125	41.2	1-36
Foothill zone	315	120	38.1	1-38
Mountainous zone	153	88	57.5	2-53
Total	771	333	43.2	1-53

zone. Thus, 43.2 % invasion with *Tr. ovis* was detected based on complete helminthological dissection in the study sites, which is the highest percentage of infection for this region.

The infection of sheep with *Tr. ovis* was also studied according to the seasons of the year. Higher infection of sheep with *Tr. ovis* was observed in spring (60.8 %) and autumn (55.0 %), and relatively less in winter (32.0 %) and summer (30.0 %). It has been found that in some summer months, the temperature of the air and soil rises to 35-40 °C and sometimes higher, and in winter, due to the freezing of the soil, there are no favorable conditions for the development of *Tr. ovis* eggs, they do not develop and perish.

Because of this, both the intensity and extensiveness of the invasion relatively decline. While, in the spring and autumn seasons, the extensiveness and intensity of the invasion are higher compared to





other seasons due to the presence of optimal temperature in the air as well as the soil for the normal development of *Tr. ovis* eggs.

Thus, such high infection of sheep with trichocephalosis causative agent in the Absheron region indicates that the conditions of keeping and veterinary-sanitary measures in sheep farms are not at a satisfactory level. Therefore, managers of private and farmer farms should pay special attention to sheep trichocephalosis control measures and strengthen these activities.

Chabertia ovina. Hosts: sheep, goat, cattle, buffalo, zebu, camel, Dagestan tur, North-Caucasian tur, bezoar goat, gazelle, roe deer, chamois, and other wild ruminants. Localization: large intestine, rectum, and sometimes small intestine. Areas of distribution: widely distributed [10].

Ch. ovina was detected and collected in 273 out of 771 sheep examined by complete helminthological dissection. The total extensiveness of the invasion in the region was 25.0 %, and the intensity was 1-74 samples. On the Absheron peninsula, the highest percentage of the invasion was found in the settlements Jeyrabnbatan (EI 33.3 %), Guzdak (EI 33.3 %) and in the Khizi region, the highest parameter was registered in the villages Tudar (EI 43.7 %), Gizilgazma (EI 37.1 %), and Altiaghaj (EI 39.5 %) (Table 3).

The distribution of the *Ch. ovina* species was studied by altitude zones (Table 4).

As seen in the table, *Ch. ovina* was found in all landscape-ecological zones, with the predominance of the mountainous zone (EI 39.8 %, EI 1-74 samples). Thus, the results of the research showed that both the extensiveness and intensity of the *Ch. ovina* species were high in the mountainous zone of the Absheron region.

Table 3

**Distribution of the *Chabertia ovina* species in the Absheron region by research sites
(based on complete helminthological dissection)**

Research sites	Examined (number)	Infected (number)	Extensiveness of invasion (%)	Intensity of invasion (samples)
Zira	79	16	20,2	3-51
Hovsan	55	18	32,7	2-34
Mashtagha	42	12	28,6	2-19
Mammadli	29	4	13,8	1-14
Fatmayi	48	6	12,5	3-9
Novkhani	84	15	17,8	2-43
Mehdiabad	20	6	30,0	1-31
Khirdalan	17	3	17,6	2-8
Ceyranbatan	21	7	33,3	4-37
Z. Taghiyev	69	13	18,8	2-18
Yeni Yashma	29	7	24,1	3-28
Gobu	36	5	13,9	2-20
Sulutepe	33	7	21,2	1-16
Mushvigabad	20	3	15,0	1-11
Guzdek	24	8	33,3	5-24
Shorabad	12	2	16,6	1-7
Altiaghaj	43	17	39,5	7-54
Gizilgazma	62	23	37,1	4-63
Tudar	48	21	43,7	2-74
TOTAL:	771	193	25,0	1-74

**Distribution of the *Ch. ovina* species among sheep by landscape-ecological zones
(based on complete helminthological dissection)**

Ecological zones	Examined (number)	Infected (number)	Extensiveness of invasion (%)	Intensity of invasion (samples)
Plain zone	303	70	23,1	1-51
Foothill zone	315	62	19,7	1-43
Mountainous zone	153	61	39,8	1-74
Total	771	193	25,0	1-74

It should be noted that the optimal conditions for the development of the *Ch. ovina* species are the meadows around rivers, lakes, canals, and swampy areas, so the extensiveness and intensity of the invasion are high in such humid areas [5]. Such a favorable ecological environment for helminth exists in the Khizi district. Therefore, high infection rates were found in 3 villages belonging to Khizi located in the mountainous zone (Tudar, Kizyigazma, Altiaghaj) on research sites and altitudinal belts.

Haemonchus contortus. The main hosts are sheep, goats, cattle, buffalo, zebu, camels, roe deer, Dagestan tur, chamois, etc. This species has also been found in domestic pigs and humans. Localization: parasitizes in the abomasum and small intestines. Distribution: widely distributed [9].

Based on complete helminthological dissection, sheep were infected with *H. contortus* in the Absheron region. Thus, the areas of the Absheron region where the parasite had high extensiveness and intensity were identified: In the Jeyranbatan settlement of the Absheron peninsula (57.1 % and II 19-34 samples), in the villages of Gizilgazma (50.0 % and 8-44 samples), Shorabad (50.0 % and 5-21 samples), Tudar (47.9 % and II 22-56 samples) and Altiaghaj (44.2 % and II 18-37 samples) of the Khizi district. Historically, the high infection rate is related to the extensive development of sheep breeding in those areas and the presence of large pastures. These and other factors have led to widespread haemonchosis in the mentioned areas. Relatively low rates of invasion were recorded in the Sulutepa settlement (15.1 % EI and II 2-13 samples). Thus, according to complete helminthological dissection, the EI was 35.0 % and II was 2-56 samples in the region (Table 5).

The distribution of the *H. contortus* species in altitude zones was analyzed by the complete helminthological dissection method (Table 6).

As seen in the table, a high percentage of infection with *H. contortus* (47.4 %) was recorded in the mountainous zone and slightly less in the foothills (32.7 %) and plains (26.3 %). High intensity of invasion was also found in the mountainous zone (8-56 samples). The change in the extensiveness and intensity of the invasion with such a rising line on the altitude zones is attributed to the change of abiotic factors as well as the number of plant groups and animals, including ruminants in these areas.

The infection of sheep with haemonchosis agents was studied by the seasons of the year. A high percentage of infection was found in spring (55.4 %) and summer (45.3 %), and relatively low in autumn (21.6 %) and winter (22.4 %). Besides, high intensity of invasion was recorded in spring (3-56 samples) and summer (7-53 samples), and slightly less intensity in autumn (2-37 samples) and winter (4-31 samples).

The research revealed that the development of larvae that fell into the abomasum in autumn stops until spring. When favorable conditions are created in spring and the green grass cover is formed, the larvae develop quickly, reach sexual maturity and produce a large number of eggs. Therefore, at the beginning of spring, the sudden escalation of the disease occurs in farms that are more infected with haemonchosis, it covers almost the entire herd, and often sick animals die.

Conclusions.

1. Three nematode species parasitize the gastrointestinal system of sheep in private and farmer farms in the Absheron region (*Trichocephalus ovis*, *Haemonchus contortus*, *Chabertia ovina*).
2. The research by regions revealed the following invasion parameters: with *Tr. ovis* - EI 43.2%, II 1-53 samples, with *H. contortus* -EI 35.0 %, II 2-56 samples, with *Ch. ovina*-EI 25.0 %, II 1-74 samples.
3. The causative agents of nematodiasis are more widespread in the Khizi district of the region.



**Distribution of the species *Haemonchus contortus* in the Absheron region by research sites
(based on complete helminthological dissection)**

Research sites	Examined (number)	Infected (number)	Extensiveness of invasion (%)	Intensity of invasion (samples)
Zira	79	12	15,2	17-53
Hovsan	55	6	10,9	8-19
Mashtagha	42	5	11,9	11-24
Mammadli	29	8	27,6	13-27
Fatmayi	48	14	29,2	6-23
Novkhani	84	28	33,3	18-35
Mehdiabad	20	8	40,0	7-23
Khirdalan	17	5	29,4	11-20
Ceyranbatan	21	12	57,1	19-34
Z. Taghiyev	69	22	31,9	16-37
Yeni Yashma	29	7	24,1	5-17
Gobu	36	13	36,1	3-12
Sulutepe	33	5	15,1	2-13
Guzdek	24	10	41,6	8-23
Shorabad	12	6	50,0	5-21
Mushvigabad	20	5	25,0	2-9
Altiaghaj	43	19	44,2	18-37
Gizilgazma	62	31	50,0	8-44
Tudar	48	23	47,9	22-56
TOTAL:	771	270	35,0	2-56

Table 6

**Distribution of the *H. contorsus* species among sheep by altitude zones
(based on complete helminthological dissection)**

Ecological zones	Examined (number)	Infected (number)	Extensiveness of invasion (%)	Intensity of invasion (samples)
Plain zone	303	80	26,3	3-51
Foothill zone	315	103	32,7	2-35
Mountainous zone	153	73	47,4	8-56
Total	771	270	35,0	2-56

4. Among gastrointestinal nematodes, the dominant species is the helminth *Tr.ovis*.

5. The research by altitude zones and seasons showed that all three detected helminth species are more widespread in the mountainous zone in the spring season.



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The article was submitted 22.08.2022; approved after reviewing 06.09.2022; accepted for publication 30.09.2022.

Статья поступила в редакцию 22.08.2022; одобрена после рецензирования 06.09.2022; принята к публикации 30.09.2022.

