# **REPUBLIC OF AZERBAIJAN**

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# ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

# STUDY OF BASIC HELMINTHOSIS OF SMALL CATTLE AND SPECIES COMPOSITION OF THEIR AGENTS IN THE SOUTHERN ZONE OF AZERBAIJAN

Speciality: 2429.01- Parasitology

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#### **INTRODUCTION**

**Relevance of the topic and degree of development**. In accordance with the law signed by the President of the Republic of Azerbaijan on 31 May 2005 on veterinary medicine, which orders to create a collection of pathogens of parasitic diseases, we set ourselves the task of identifying the species composition of the pathogens of helminthiases, parasitic sheep in southern Azerbaijan.

Helminthoses of sheep are causing significant economic damage to sheep production in the southern zone of Azerbaijan. The geographical conditions of southern areas have a great influence on the contamination of sheep by helminthiasis. Conventional anthelminth measures do not always give a preventive and healing effect, as they are carried out without the epizootic features of the infestation. There is no doubt that the protection of sheep from helminths, which are causing considerable economic damage to the region's economies, is an important source of increased numbers and productivity. For the scientific and sound planning and implementation of anti-helminth measures in this case can not do without a detailed study of the species composition of helminths, identification of their distribution and clarification of the features of each helminth in each natural and climatic zone.

Certain work is being carried out in the Republic of Azerbaijan to study helminths and helminthos of domestic and wild ruminants. The works of A.M. Petrov<sup>1</sup>, M.K. Javadov<sup>2</sup>, D.N. Antipin<sup>3</sup>, A.D. Gaibov<sup>4</sup>, S.M. Asadov<sup>5</sup>, and others.

<sup>&</sup>lt;sup>1</sup> Петров, А.М. Гельминтофауна крупного рогатого скота, буйволов и зебу в Азербайджане / А.М. Петров, М.К. Джавадов, Т. Скарбилович // Труды АзНИВИ, – Баку: – 1935. сб. № 2, – с.519.

<sup>&</sup>lt;sup>2</sup> Джавадов, М.К. Гельминтофауна овец и коз в Азербайджане // – Баку: Труды АзНИВИ, – 1935. сб.№ 2. – с. 30-34.

<sup>&</sup>lt;sup>3</sup> Антипин, Д.Н. Пастбищная профилактика гельминтозов сельхоз. Животных // - Москва: Ветеринария, - 1947. № 1, - с. 38-40.

<sup>&</sup>lt;sup>4</sup> Гаибов, А.Д. Изучение географического распространения главнейших гельмитозов сельскохозяйственных животных Нахичеванской АССР // - Баку: Труды гельминтологического отдела Аз.НИВИ, - 1939. - с. 142-145.

Prior to our research, there was no detailed study of sheep helminth fauna, nor was it distributed in the southern zone by anyone. A.G. Samedov<sup>6</sup> in the Lankaran region studied the extent of distribution of only zoonotic helminthiases (finnosis, cenurosis, echinococcosis) in cattle and small ruminants. Therefore, we set ourselves the task of studying seasonal and age dynamics of major helminthos and their pathogenic species in sheep in southern Azerbaijan.

**Object and subject of research.** The object of the study is sheep (Jaro) kept in sheep farms in the southern zone. The subject of the study is to study the species composition and distribution of helminthiasis pathogens (trematodes, cestodes and nematodes) parasitizing various organs of small livestock in the southern zone.

#### Purpose and tasks of the resarch.

1. To investigate the epidemiology of small-bodied helminths and determine the species composition of their pathogens in different southern zones. To create a collection of helminth pathogens in the southern zone of Azerbaijan;

2. Find out the extent and intensity of invasion, establish the main helminthiases;

3. To clarify the age and seasonal dynamics of animal helminthiasis in the lowland and foothill zones;

4. Develop a calendar of activities and effective measures to combat the main helminthiases in the southern zone.

**Research methods.** Studies on helminth fauna and seasonal dynamics of the main helminths of local sheep breed were carried out in Masalli and Astara district by the following methods:

1. Complete helminthological dissection of sheep according to the method of Academic K.I. Skryabin;<sup>7</sup>

<sup>&</sup>lt;sup>5</sup> Асадов, С.М. Гельминтофауна жвачных животных СССР и ее экологогеографический анализ / С.М. Асадов. - Баку: - 1960. - 511 с.

<sup>&</sup>lt;sup>6</sup> Самедов, А.Г. Зоонозные гельминтозы (финноз, эхинококкоз, ценуроз) с/х животных в Ленкоранской зоне / автореферат дис. кандидата ветеринарных наук. / - Баку, 1968. - 22 с.

<sup>&</sup>lt;sup>7</sup> ГОСТ Р 54627 – 2011 Животные сельскохозяйственные жвачные. Методы лабораторной диагностики гельминтов // Разработан Государственным

2. İncomplete helminthological examination individual organs of slaughtered, slaughtered and dead sheep;

3. Selective helminth-coprological studies directly on sheep farms.

Coprological studies were conducted using the following methods: of sequential washing, Fulleborn, Berman and Weida.

Detailed study of the morphology of nematodes was carried out using microscopes of the brand Biolam, Motik. Provided drawings and photos of the nematodes with a complement of morphological structure.

### The main provisions presented for defense:

1. Identification of major helminthos sheep in the southern zone of Azerbaijan, can prevent mass animal deaths, will allow to improve the health of sheep farms from major helminthos, as well as improve the quality of products;

2. A comparative study of the morphological structure of different helminth species and the identification of the main causes of variability in the morphological structure of pathogens are important for determining the species composition of helminths;

3. The study of age and seasonal dynamics of sheep helminths is important for carrying out preventive treatment activities in southern farms;

4. The identification of the causes of widespread zoonotic helminths, echinococcosis and tenicospores and cerebral cysticercosis in the area can prevent large-scale disease spread among small livestock, domestic animals and humans;

5. Effective treatment in sheep farms can be achieved by studying the effectiveness of the drugs;

6. Development of comprehensive treatment and prevention measures against helminthiasis, is a promising direction for the provision of assistance to veterinary surgeons in companies carrying out scheduled therapeutic work on scientific grounds.

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**Scientific novelty.** For the first time, the species composition of pathogens of helminthos sheep in the southern zone of Azerbaijan was studied. 57 species of helminthos pathogens were identified, 4 of them are trematodes, 7 cestodes and 46 nematodes.

The seasonal and age dynamics of sheep helminthos in the two main belts of the southern zone were studied for the first time.

For the first time, we have created a collection of pathogens of sheep helminthiasis in the southern zone of Azerbaijan.

In the course of a thorough study of the morphological structure of the collected specimens, we have found clearly distinctive signs (absence of some organs on the previously mentioned images of the helminthologist - artist) of some pathogens.

No other images of helminth have been found in the sources that differ from the original descriptions by all known researchers: Y.Goody and others.

For the first time, the distinctive features of morphological structures of 5 species of helminths were determined, their missing organs were added, and a complete image of the pathogens was presented: *Chabertia ovina* from the family Strongylidae, *Bunostomum trigonacephalum* and *Bunostomum phlebotomum* of the family Ancylostomatidae, *Oesophagostomum columbianum* and *Oesophagostomum venulosum* of the family Trichoneulomatidae.

The morphological variability of the spicular vaginal membrane in *Trichocephalus ovis* and *Trichocephalus skrjabini* was first studied. The distal end of the spiculus vaginal membrane in *T. ovis*, *T. skrjabini* varies in shape depending on the degree of protrusion or elongation. In the microscopy of the individual organs of *T. skrjabini*, a flask-like membrane in the form of a light bulb, a vase and a pomegranate bone was noted.

For the first time, a plan of preventive measures was developed to prevent the spread of the main pathogens of helminthiasis parasites in various organs of small cattle in the southern zone of Azerbaijan.

**Theoretical and practical value of the work.** Our studies have made it possible to identify the extent of distribution of the main helminths (fasciolosis, dicroceliosis, echinococcosis, monesiasis, dictyocaulosis, nematodirosis, trichocephalus, etc.) in different belts

of the southern zone. The prevalence of pathogens in sheep farms in the southern zone indicates the need to include routine treatment and preventive measures to eliminate these diseases. The studies carried out have made it possible to develop a system of measures aimed at improving the health of sheep farms from major helminths, and improving the quality of products and the efficiency of sheep farming in the region. Based on the data obtained from the studies, practical proposals have been developed. The results of the study can be a valuable reference for higher and secondary schools. The use of the drug in high-efficiency households will certainly bear fruit in the fight against helminth in the future.

**Approbation and application**. The results and main provisions of the study were reported at meetings of scientists councils of scientific-research veterinary institute, in annual reports of laboratories of parasitology, as well as tested at a scientific seminar in Azerbaijan and international conferences, published in the form of abstracts and articles:

1. International Scientific and Practical Conference, entitled Problems of ensuring food security of the Independent Azerbaijan State and improving competitiveness of the agricultural sector (Baku, July 2018);

2. Science and Medicine: Theory and Practice of the ANS SibAk XII international Scientific-Practical Conference (Novosibirsk, July, 2019).

The name of the institution in which the thesis work was carried out. The studies were carried out in the laboratory of parasitology of the Scientific Research Veterinary Institute under the Ministry of Agriculture of Azerbaijan.

The structure and extent of the dissertation. Dissertation work in volume (179884) of signs consists of introduction (10163 symbols), I chapter (26523 symbols), II chapter (5269 symbols), III chapter (67176 symbols), IV chapter (35257 symbols), V chapter (9432 symbols), VI chapter (12065 symbols), conclusion (5686), results (5290 symbols), practical proposals (3023 symbols) and 183 list of literature including Azerbaijani, Russian and English languages. Illustrated with 31 figures, 11 graphs and 19 tables.

### **CHAPTER I. LITERATURE REVIEW**

This chapter provides a brief description of the natureclimatic conditions of the southern zone. Referring to literary sources, topography, land cover, high-altitude landscapes, vegetation group, climatic indicators and other features were noted.<sup>8</sup>

The literature review summarizes and analyzes data on the development of helminthology and the study of the helminth fauna of domestic and wild ruminants, including sheep and goats in different zones of Azerbaijan. The results of studies carried out in Dagestan, Uzbekistan, Tajikistan and Kyrgyzstan, where the natural and climatic conditions are somewhat similar to those of the southern zone, are given. The data on the infection of sheep and goats in various grazing conditions by foreign researchers conducted, in particular, in England, Australia, Western Europe, etc.

# CHAPTER II. MATERIALS AND METHODS OF THE RESEARCH

In order to study the helminth fauna of sheep, our research was conducted during 2015-2019. The work was carried out in slaughterhouses and sheep farms of the southern zone (mountain, pre-mountain and lowland areas). No helminths were found in the mountain area. Therefore, we did not note the results of the analyses. It should be noted that animals in the sheep farms of Masalli and Astara district were examined at slaughter points. Studies to study helminthos fauna and seasonal dynamics of the main helminthos of local breed of sheep, were conducted in Masalli and Astara districts by the methods indicated below:

1. Complete helminthological opening of sheep by the method of academic K.I. Skrjabin;

<sup>&</sup>lt;sup>8</sup> Azərbaycan Respublikasının coğrafiyası /Red.hey.R.M.Məmmədli və b. - Bakı: Regional Coğrafiya, III Cild, - 2015. - 400 s.

2. Incomplete helminthological study of individual organs of slaughtered and fallen sheep;

3. Selective helminto-coprological studies directly in sheepbreeding farms;

To study the species composition of helminths, 20 head of local sheep were cut in various farms of Masalli and Astara districts. The internal organs of 20 heads of sheep, which were subjected to a complete helminthological autopsy, were delivered from Mahmuduvar Gy1z1lagaj (Masalli), Tangerud, Shahagadzhi, Kijaba and others (Astara) sheep farms. The complete helminthological examination of the animals was carried out directly in the above-mentioned sheep farms of the southern zone.

Incomplete helminthological study of individual organs of slaughtered, slaughtered and killed animals was carried out in the slaughterhouses and in separate farms of Masalli and Astara districts. A total of 7530 individual sheep organs were studied. At the killing sites and directly in farms, the main attention was paid to the detection of of fasciolasis, dicroceliasis, paramphistom, echinococcis, coenurosis, anaplocephalates, hemonchus, dictiocaulesis, protostrongylides, gangilonema and trichocephalis. Additionally, 500 carcasses, liver and intestinal mesentery were examined at slaughter points for the detection of thin cervical cysticercus. The coprological studies were carried out using the methods of Furleborn, Berman and Weida.

In order to collect additional material on the study of infestation of sheep helminths, we carried out selective helmintocoprological studies in various sheep-breeding farms in Masalli and Astara regions. During helmintocoprological study, the extent of infection of animals with fascioliasis, dicroceliosis, moniesiasis, tizanisiasis, nematodyrosis, dictyocaulosis and trichocephalosis was determined. The coprological studies were carried out using the methods of sequential washing, Furlleborn, Berman and Waeida.

From the material of the complete helminthological autopsies and the study of the separate organs of sheep, 43,542 helminth specimens were collected. From the collected helminths of trematodes, sestodes were fixed in  $70^{\circ}$  alcohols, and nematodes (after determining males and females) in Barbagallo fluid for further investigation. Preliminary processing of helminths and determination of their species was carried out in the laboratory of parasitology of the Azerbaijan Veterinary Research Institute. Detailed study of the morphology of nematodes was carried out using microscopes of the brand Biolam, Motik. There are pictures and photos of the nematodes with morphological structure supplement. All drawings are made with the help of a drawing apparatus RA-4.

Helminths were placed on the glass, illuminated in 40% lactic acid and viewed under a microscope with magnification of the lens - 10, 40. For the measurement of microscopic objects, an eyepiece micrometer k7x and a lens 10 were used. In the descriptions of species all dimensions are given in mm.

# CHAPTER III. STUDY OF SHEEP HELMINTH PATHOGENS IN THE SOUTHERN ZONE OF AZERBAIJAN AND SYSTEMATIC REVIEW OF IDENTIFIED HELMINTHS

In order to study the species composition of helminthos pathogens, we conducted complete helminthological autopsies of fallen and forcibly killed animals by the method of academici K.I. Skryabin, in two, characteristic for lowland and pre-mountain climate, Sheep farming in the southern part of the Republic of Azerbaijan. Twenty sheep of different ages were dissected. From the material of complete helminthological autopsies and the study of sheep detachment organs, 57 species of helminths were found. Of these, 4 species of trematode, 7 species of tsetod and 46 species of nematode were identified.

In the course of a thorough study of the morphological structure of the collected specimens, we have found clearly distinctive signs (absence of some organs on the previously mentioned images of the helminthologist - artist) of some pathogens.

No other helminth images have been found in the sources

that are different from the original descriptions of all known researchers.

We established distinctive features in the morphological structure, and demonstrated more accurate images of additional organs of 5 species; *Chabertia* ovina from the *Strongylidae* family, *Bunostomum trigonocephalum* and *Bunostomum phlebotomum* from the *Ancylostomatidae* family.

The list of helminths found in sheep in the Masalli and Astara district is shown in the table (table 1).

The results of helminthotophorological studies in 15 sheep farms of the Astara and Masalli districts show that fasciolosis, dicroceliasis, monieziosis, dictyocaulosis and trichocephalosis are present in almost all farms studied by us. The table contains data on the total number of helminths found in each opened animal (table 2).

3.1. Study of the species composition of trematodes in sheep farms of the Astara and Masalli districts found in various animal organs

In sheep farms of Masalli and Astara district, 4 species of trematodes belonging to 3 genera and families consisting of 2 orders were found in sheep; *F. hepatica, F. gigantica, D. lanceatum, Paramphistomum sp.* 

*F. hepatica* was found in the liver of 9 (45%) sheep out of 20 opened. In addition, we recorded this tremor during liver autopsies directly at farms and slaughterhouses in both areas. The intensity of the infection ranged from 6 to 96 individuals. In the Boyana study of 2,826 livers, *F.hepatica.* pathogens were found in 54 livers, which is 1,9% of the extensivity.

*F.gigantica* was found in the liver of 7 (35%) out of 20 sheep. The intensity of infection ranged from 4 to 352.

Species D. lanceatum was found in the liver of 14 sheep (70%). The number of helminths in the sheep was from 10 to 266 specimens. In a study of 536 liver of slaughter sheep, the prevalence of dicroceliasis was 22,4%.

The species *Paramphistomum sp.* was found in 5 sheep (25%) out of 20, the intensity of infection varied from 12 to 45.

# Table 1.

№	№ Species helmints			sheeps		
		Number	E of I	I of I		
		of	(%)			
		infected				
		animal				
Ι	2	3	4	5		
1	Fasciola hepatica L., 1758	9	45	6-96		
2	Fasciola gigantica (Cobbold, 1856)	7	35	4-152		
3	Dicrocoelium lanceatum Stiles et Hassal, 1896	13	65	9-253		
4	Paramphistomum sp. Zeder, 1790	5	25	12-45		
5	Moniezia expansa (Rudolph, 1810) Blanchard, 1891	10	50	1-5		
6	Moniezia benedeni (Monies, 1879) Blanchard, 1891	9	45	1-3		
7	Avitellina centripunctata (Rivolta, 1874) Gough, 1911	2	10	3		
8	Thysaniezia giardi (Moniez, 1879)	5	25	2-4		
9	Taenia hydatigena (Pallas,1766) (Cysticercus tenuicollis)	3	15	4-11		
10	Echinococcus granulosus (Batsch, 1786)	6	30	4-26		
11	Coenurus cerebralis (Leske, 1780, Multiceps multiceps)	2	10	1		
12	Chabertia ovina (Fabricius, 1788) Railliet et Henry 1909	9	45	2-20		
13	Bunostomum trigonacephalum (Rudolphi, 1808), Railliet, 1902	5	25	2-18		
14	Bunostomum phlebotomum (Railliet, 1900), Railliet, 1902	7	35	1-12		
15	Oesophagostomum columbianum (Curtice, 1890) Stossich, 1899	7	35	4-12		
16	Oesophagostomum venulosum (Rodolphi, 1803) Railliet, 1898	11	55	4-19		

# List of helminths found in sheep in the southern zone of the Republic of Azerbaijan

Continued Tab			I Table 1
17 Oesophagostomum radiatum (Rodolphi, 1803) Railliet, 1898	3	15	1-5
18 Trichostrongylus colubriphormis (Giles, 1892)		65	10-48
19 Trichostrongylus capricola Ransom, 1907	10	50	6-32
20 Trichostrongylus probolurus (Railliet, 1896) Loos, 1905	8	40	7-43
21 Trichostrongylus axei (Cobbold, 1879) Railliet et Henry, 1909	12	60	4-77
22 Trichostrongylus vitrinus Looss, 1905	13	65	4-51
23 Trichostrongylus skrjabini Kalantarian, 1928	11	55	6-33
24 Trichostrongylus longispicularis Gordon, 1935	10	50	9-60
25 Ostertagia ostertagi (Stilles, 1892) Ransom, 1907	3	20	1-4
26 Ostertagia circumcincta (Stadelmann, 1894) Ransom, 1907	17	85	13-110
27 Ostertagia belockani Assadov, 1954		5	2
28 Ostertagia lasensis Assadov, 1953		10	1-14
29 Ostertagia trifurcata Ransom, 1907		55	10-128
30 Ostertagia occidentalis Ransom, 1907		35	1-66
31 Ostertagia trifida Guille, Marotel et Panisset, 1911		15	1-7
32 Ostertagia lyrata Sjoberg, 1926		25	9-116
33 Cooperia oncophora (Railliet, 1898) Ransom, 1907		20	2-91
34 Cooperia pectinata Ransom, 1907		10	1-2
35 Cooperia punctata (Linstow, 1956) Ransom, 1907		10	4-8
36 Cooperia zurnabada Antipin1931		10	1-2
37 Marshallagia dentispicularis Assadov, 1954		20	3-28
38 Marshalagia mongolica Schumakovitsch, 1938		55	5-39
39 Marshallagia marshalli (Ransom, 1907) Orlof, 1933		90	31-143

Continued Ta			Table 1
40 Haemonchus contortus (Rudolphi, 1803) Cobbolt 1898	12	60	5-365
41 Nematodirus spatiger (Railliet, 1896) Railliet et Henry, 1909	8	40	2-19
42 Nematodirus filicollis (Rudolphi, 1802) Ransom, 1907	5	25	4-14
43 Nematodirus andreevi Satubaldin, 1954	2	10	1-12
44 Nematodirus helvitianus May, 1920	7	35	3-553
45 Nematodirus oiratianus Rajewskaya, 1929	5	25	10-152
46 Nematodirus abnormalis May, 1920	9	45	1-25
47 Nematodirus schulzi Satubaldin et Andreeva, 1958		5	1-16
48 Nematodirus archari Sokolova, 1948		5	1
49 Dictyocaulus filaria (Rudophi, 1809) Railliet et Henry, 1907		75	8-75
50 Protostrongylus kochi (Schulz, Orloff et Kutass, 1935) Chitwood, 1938		15	2-6
51 Protostrongylus hobmaieri (Shuls, Orloff et Kutass, 1933) Cameron, 1934		10	3
52 Muellerius capillaris (Mueller, 1894) Cameron, 1927		10	4
53 Cystocaulus nigrescens (Lerke, 1911) Shulz, Orlof et Kutass, 1933		15	4-8
54 Skrcabinema ovis (Skrjabin, 1915) Werestschagin, 1926		5	2-6
55 Gongylonema pulchrum Molin, 1857		60	1-9
56 Trichocephalus skrjabini (Baskakov, 1924)		45	3-12
57 Trichocephalus ovis (Abildgaard, 1795)	16	80	6-35

#### Table 2

Distribution of helminthiasis of local sheep in slaughter centers of the Astara district

Organs	Helminthiasis	İnvestigated	Affected animals	(%)
Liver	Fascioliasis	536	44	8,2
	Dicroceliosis	536	120	22,4
	Echinococcosis	536	180	33,6
	Ehinococcosis	598	212	35,4
Lungs	Dictyocaulosis	113	32	28,3
	Protostrongilosis	113	28	24,7
	Çistokaulosis	50	15	30
Rennet	Hemonchosis	210	131	62,4
The spleen	Echinococcosis	256	4	1,5
The small intestine	Moniesiasis	523	102	23,3
	Tizaniasis	523	240	45,8
	Avitellinasis	523	35	6,6
The caecum	Trichocephalosis	436	188	43, 1
Eye	Telyaziasis	260	_	_
esophagus	Gongylonematosis	327	126	38,5

# **3.2.** Study of the species composition of cestodes in sheep farms of the Astara and Masalli districts, analysis of fluctuations in their intensity

Of the representatives of the class Cestoiden Rudolphi (1808), 7 species were found on the territory of the Astara and Masalli districts belonging to 6 genera, 3 families and 2 suborders; *Moniezia expansa*, *Moniezia benedeni*, *Avitellina centripunctata*, *Thysaniezia giardi*, *Cysticercus tenuicollis*, *Coenurus cerebralis*, *Echinococcus granulosus*.

# **3.3.** Sheep nematodes in sheep farms of the Astara and Masalli districts and some morphological features of their pathogens

We have registered 46 species of nematodes in sheep in the southern zone, which belong to 17 genera, 9 families, 4 suborders. It

should be noted that before our research, the species composition of helminths in the southern zone of the republic had not been studied by anyone. With complete helminthological autopsies, *Chabertia ovina* was found in the large intestine in 9 sheep (45%), in an amount of 2-20 specimens. *B. phlebotomum* was found in the small intestine in 7 sheep (35%) in an amount of 1-12 specimens. *O. venulosum* was found in the large intestine in 11 sheep out of 20 (55%) opened, at an intensity of 4 to 19 specimens. *O. columbianum* was found in the large intestine in 7 sheep out of 20 (35%) opened, at an intensity of 4 to 19 specimens.

Sheep in the southern zone are heavily infested with trichotrongilds. *Ostertagia circumcincta, Marshallagia marshalli* and *Nematodirus helvitianus* have been identified with high intensity. On the contrary, species from the genus *Cooperia - C. pectinata, C. punctata, Cooperia zurnabada* were found in single quantities.

*Trichostrongylus capricola* was found in 10 sheep (50%) of the 20 examined. The intensity of infection ranged from 16 to 360 cases.

*Trichostrongylus colubriformis* was found in 13 sheep (65%) during complete gelminthological autopsies of the small intestine. The intensity of infestation ranged from 25 to 1,110 specimens. This species is one of the most prevalent helminths.

*Trichostrongylus probolurus* was found in the small intestine and in the rump of 11 sheep (55%). The intensity of infection ranged from 5 to 301.

*Trichostrongylus vitrinus* was found in 9 sheep (45%) in the Sychogi and in the small intestine. The intensity of infection ranged from 12 to 195. It should be noted that in the small intestine of sheep, the species Trichostrongylus vitrinus was often found in the slaughterhouses of Masalli and Astara districts.

*Trichostrongylus longispicularis* was found in the small intestine of 2 sheep (10%) out of 20 examined, 7 cases.

In complete helminthological autopsies, this *Ostertagia ostertagi* was found in the intestine of 5 sheep (31.2%). The intensity of infection in sheep ranged from 3 to 111, with an average of 55.

In complete helminthological autopsies, the species Ostertagia circumcincta was found in the intestine of 11 sheep (55%). The

intensity of infection ranged from 12 to 1265.

*Ostertagia trifurcata* was found in the intestine of 12 sheep (60%). The intensity of infestation ranged from 9 to 167.

*Ostertagia ossidentalis* was found in the small intestinal department and in the scrotum of 8 sheep (50%) out of 20. The intensity of infection in sheep ranged from 1 to 79.

In complete helminthological autopsies this species of Ostertagia trifida was found by us in the small intestinal department of 3 sheep (15%). The intensity of the infection varied from 2 to 8 specimens.

This species of *Ostertagia lyrata* was detected in 5 sheep (25%). The intensity of infestation was low, with 7 to 15 cases.

*C.oncophora* was detected by us in the test of 4 sheep (20%). The intensity of the infection varied from 2 to 91 specimens.

The species *Cooperia pectinata* was found in 2 sheep (10%). The intensity of infection was not very high, fluctuating from 1 to 2 exes.

In complete helminthological autopsies of 20 heads of sheep this species of *Marshallagia marshalli* was found by us in the rump and in the small intestine department of all the opened animals. The intensity of the infection was high in all cases, as the number of helminths per sheep varied from 115 to 2779.

The species of *Marshallagia dentispicularis* was registered by us in the small intestine department of 6 sheep (30%). The intensity of infection in sheep varied from one to 13.

The species of *Marshallagia mongolica* was found in one sheep with 45 (5%) specimens. Microscopy of this species has revealed different forms of gelmin bursa. The image of helminth was drawn and individual organs were measured.

The species *H.contortus* was found in 10 (50%) out of 20 opened sheep. The intensity of infestation ranged from 4 to 95 specimens. In the sheep farms of Astara and Masalli districts 289 heads of fallen and forcibly slaughtered sheep were opened. Of these, 97 heads were found to have gonomecuses, which is 33.5%. The intensity of this species varied from 33 to 545 specimens. By means of complete helminthological autopsies, this species of Nematodirus

abnormalis nematodes was found in the small intestinal tract and in 5 - t sheep (25%). The intensity of infection varied between 5 and 1234.

At a complete helminthological autopsy, the species *Nematodirus helvetianus* was found in the intestine of 6 sheep (30%). The intensity of infection varied from 5 to 19.

The species *Nematodirus oiratianus* was found in the small intestine of 10 sheep (62.5%) and one goat (25%). The intensity of infection in sheep ranged from 13 to 439 specimens (an average of 74 cases), while only 12 specimens were found in goats.

In complete helminthological autopsies, *Nematodirus spatiger* was found in the intestine of 13 sheep (65%). The intensity of the infection varied from 9 to 404 cases.

Species *D. filaria* at full helminthological dissection of 20 heads of sheep we found in lungs of 16 sheep (80%).

The intensity of the invasion ranged from 9 to 404. In the southern zone of Azerbaijan we have found in local sheep 2 species of trichocephalus - *Trichocephalus ovis* and *Trichocephalus skrjabini*. *T. ovis* was discovered by us in 16 sheep (out of 20), which is 80%. The species *T.skrjabini* was found by us in 9 sheep out of 20 exposed to full helminthological autopsy, which is 45%.

### CHAPTER IV. SEASONAL AND AGE DYNAMICS OF THE MAIN HELMINTHOSIS OF SMALL CATTLE IN THE SOUTH ZONE OF AZERBAIJAN

#### 4.1. Seasonal dynamics of fascioliasis in small ruminants

Fascioliasis is most infected in adult sheep and young animals from one to two years of age. In young animals from one to two years in February, the extensiveness of the invasion is ascertained at 30.6%. In adult sheep, the peak of invasion occurs in October (50-53.2%), while the remaining months are declining. Analyzing all the data on revealing the spread of sheep fascioliasis in Masalli and Astara districts, it turns out that this invasion in farms located directly in the lowlands and the lower reaches of large rivers is one of the main helminthiases, which is widespread and in some years causes morbidity and death of animals. The prevalence of

fascioliasis in individual farms reaches 45-62.5% according to autopsy data, and 54% according to coprology.

#### 4.2. Seasonal dynamics of dicroceliosis in small ruminants

In young adults aged between one and two years, the lowest level of invasiveness is observed in the spring and summer months, between 22.4 and 27.5 per cent. In the autumn-winter months there is a high level of invasiveness - 56.8-67.2%. Among adult sheep, there is a relatively low level of infection (41.3-31 per cent) in spring-summer and a relatively high incidence (68.9-77.5 per cent) in autumn and early winter.

# 4.3. Anocephalatoses. Seasonal dynamics of moniesiasis in small ruminants and the distribution of larval cestodes

According to our research, the causative agents of anocephalatosis in sheep in the southern part of Azerbaijan are: *Moniezia expansa, Moniezia benedeni, Avitellina centripunctata, Thysanieza giardi*. Of anocephalatoses in lambs, moniesiasis (63.3-68.3%) predominates, and in other age groups, tizaniasis (45.8%) is in first place, followed by moniesiasis (23.3%), and avitellinosis (6.6%).

In June, a high rate of loss of lambs by moniosis was found -68.3%. In the period from June to August, the incidence of moniesiasis is at a high level of 68.3%, 73.6% and 65.0%. From September to November, the incidence of moniesiasis in lambs falls from 16% to 7%. A secondary slight rise of the infection (35%) is observed in the winter months. Seasonal dynamics of moniesiasis in young from year to two years old is characterized by the fact that they have a slight increase in the infancy in spring (13.3%), summer (16.6%) and winter (11%). In adult sheep, the seasonal changes in moniesiasis were not observed.

The seasonal dynamics of moniesis in lambs in the foothills of the Massali and Astara districts is characterized by a relatively high incidence not only at the primary, but also at the repeated rise of the invasion. The data show that moniesiosis is more pronounced and more severe in settled sheep farming.

#### 4.4. Coenurosis

the species C. cerebralis was found by us in the brain of two

sheep out of 20 opened (10%). Reports of veterinarians in Astara and Masalli regions showed that coenurosis is recorded annually in the late autumn months, mainly in young sheep of 5-9 months of age. Our observations in the last 3 years in the southern zone show that every year in late autumn, 20-50 heads of sheep, clinically sick with coenurosis, are isolated from each farm. In the fall of 2016, in the Kizhaba and Gizilagadzh farms, where there were 41 heads of sheep of 7-9 months of age, we examined 37 clinically sick animals. In 23 cases, bubbles of *Coenurus cerebralis* of various sizes were found. 2015-2016 only veterinarians isolated about 2300 heads of sheep affected by brain coenurosis. Taking into account the reports of doctors, analyzes of veterinary reports and our own observations that the clinical manifestations of coenurosis in the southern part of Azerbaijan, mainly in the autumn months.

### 4.5. Echinococcosis

With a complete helmintocoprological study, echinococcosis in the liver was found to be 33.6%, in the lungs 35.4%. It should be noted that according to the data of the Masalli and Astara slaughter stations, every year 15-35% of slaughtered sheep are affected by echinococcosis. The main factors favouring the spread of echinococcosis, cysticercosis and cerusosis in sheep in the southern zone are: large number of dogs in oaths, insufficient animal health control, Unsatisfactory performance of the case of anti-helminth activities among the final owner (dogs).

In the southern part of the sheep farms, there are between 4 and 8 dogs per brigade. Deworming against intestinal cestodoses are carried out among a very small number of dogs, and not in all quarters. In households with a problem of echinococcosis, service dogs are not subjected to routine diagnostic deworming. There is little veterinary or sanitary supervision of the slaughter of sheep directly in sheep farms and settlements. This results in a high prevalence of echinococcosis among sheep.

4.6. Trichostrongylidoses. Dynamics of extensibility of nematodyrosis of small cattle depending on the season in Astara-Masalli district

The data obtained show how intensively the sheep are

infected with gastrointestinal nematodoses, including tricostrongilids. Among trichonstronglidoses, a special place is occupied by hemonhosis and nematodyasis. In haemonchus research, we found only one species - *Haemonchus contortus*. Of the trichonstrogylidosis nematodyrosis is one of the serious diseases of the lambs. At a complete helminthological autopsy we found 8 species of nematodes. The number of individual species in individual animals varies between 3-553 specimens.

Nematodirosis was first recorded in June with an extensive 3.4% in three-month-old lambs. In August-September there was an increase of 50-65.5 per cent. In November-December, there was an increase in the invasion, and extensiveness was 75.8-77.8%.

It should be noted that in the southern zone (Masali, Astara) sheep are infected with Trichostrongylidoses during the grazing season. The lambs under one year of age, before their transfer to pastureland, are protected from trichonstrogilus.

4.7. Dictyocaulosis. Seasonal and age dynamics of dictyocaulosis. of small cattle of Astara and Masalli district

When sheep are settled in the high foothills, dictyocaules are widespread. Mature in dictiocaulosis lambs are first detected in July-August. Then the extent of the invasion increases, in October reaches 62.9% of the invasive. In other age groups, infection rates are low all months.

4.8. Trichocephalosis Seasonal dynamics of trichocephalosis in small ruminants

The seasonal course of trichocephalosis in lambs is characterized by the fact that they have an increasing increase in invasion in the autumn-winter period. Other age groups of sheep have an insignificant high infestation rate. The degree of infection and seasonal dynamics of trichocephalosis in the farms of Masalli and Astara regions are similar. In the Mahmudovar and Tangerud farms, the peak of infestation in lambs occurs in September-December and February. The results of the research showed that the seasonal dynamics of trichocephalosis in lambs in the southern zone is characterized by unimodality (the rise of invasion begins from August to February) in sheep breeding in the high foothills.

#### CHAPTER V. QUANTITATIVE CHANGES IN EGGS OF HELMINTHS PARASITIZING IN SHEEP, DEPENDING ON THE SEASON IN THE SOUTHERN ZONE OF AZERBAIJAN

In order to study the seasonal dynamics of the release of eggs of sheep helminths, our research was carried out during 2016-2019. The identification of the dynamics of the release of eggs from the body of sheep of the local breed (Jaro) of the southern zone was carried out using scatological methods. Scatological methods were carried out monthly in animals of different age groups. Were obtained the results of statistical research data from different farms in the southern zone.

The study of the seasonal dynamics of egg release of fasciola, dicrocoeliosis, moniesiasis, nematodirus, dictyocaulus and trichocephalus was carried out in 4 sheep breeding farms in the southern zone - low and foothill. To capture the larvae of the dictyocaul, the method of Weid and Berman was used. The results of scatological studies carried out by us show that helminths in sheep are found in all farms of the southern zone. For the first time, we studied the dynamics of the release of helminth eggs from the body of sheep in the southern zone of Azerbaijan. According to scatology data, the level of isolation of dicrocelium eggs in young animals in August was  $10.00 \pm 3.73$  ind., In December 26.00  $\pm 12.27$  ind.

The highest infestation with moniesia (*M.expansa*, *M.benedeni*) occurs in the late spring and summer months, and also partly in autumn, singularly in winter. Isolation of moniesia eggs from lambs in July was  $26.00 \pm 16.27$  ind. for 1 g of feces. The intensity of egg production decreased from the minimum in October to  $9.00 \pm 0.73$  ind.

In June, nematodiruses are isolated in lambs in the amount of  $8.00 \pm 3.82$  ind., In November  $24.00 \pm 12.18$  ind. for 1 g of feces. We have established dictiocaules in all surveyed sheepbreeding farms. The intensity of isolation of larvae in lambs is at a minimum in May and June ( $8.00 \pm 3.73$  ind.) And a maximum was noted in October ( $18.00 \pm 6.27$ ), November ( $23.00 \pm 11.27$ ), December (22.00  $\pm$  10.27). The level of isolation of eggs of trichocephalis (*T. ovis, T. skrjabini*) in lambs in August was 9.00  $\pm$  2.45 ind., In February 26.00  $\pm$  14.55 ind. Per 1 g of feces.

The results of our research show that the best conditions for the development of eggs and larvae of nematodes are created on wet pastures, existing wetlands and small streams. Sheep kept in such areas are much more likely to become infected with gastrointestinal nematodes than animals in low-lying grazing areas. In connection with the arrival of spring, with a change in the vegetation cover, we found the activation of excretion eggs in females. The results of the conducted research show that the intensity of egg secretion in young animals of the last year of birth increases in summer (June, July) and at the beginning of autumn. In adult sheep the intensity is much lower than in young, the largest egg secretion is observed in summer.

Thus, the intensity of release of eggs in spring, summer, autumn and winter seasons in helminths of different species is not uniform. As a result of the studies, we have come to the conclusion that the secretion of helminth eggs occurs all seasons. In the statistical treatment of a dynamic series of indicators, three rises of intensity of release of eggs in the southern zone were identified: in August, September and October, and from March to April there was a decrease of intensity.

### CHAPTER VI. COMPARATIVE STUDY OF THE EFFECTIVENESS OF NEW ANTHELMINTIC DRUGS IN SHEEP FARMS OF THE SOUTHERN ZONE

To date, the science has proposed a number of effective antihelmintics, some of which are successfully used in our country, as well as in foreign countries. Finding new antihelminth is of great practical importance.

The effectiveness of the drug Brovatriol and Albenol-100 in case of helminthiasis of animals was tested in the Gapychymakhla sheep-breeding farm in Astara region, on sheep of the local Jaro breed in 2018. It should be noted that for the first time in the

Absheron peninsula, as well as in the Guba and Shamakhi regions, S.I. Rustamov, F.Sh. Gurbanov (2014) studied the effectiveness of the new complex anthelmintic Brovatriol in sheep with mixed helminthiasis<sup>9</sup>. As a result, Brovatriol has shown high efficiency. Considering the effectiveness of the drug, for a comparatively second time, we decided to test the drug in local sheep in the southern zone of the Republic of Azerbaijan. During helmintocoprological studies of 80 sheep selected for the experiment, it was found that all animals are spontaneously infested with various types of trematodes, cestodes and nematodes. According to the results of helmintocoprological studies, the animals were divided into three groups. Sheep of the first group (n = 35) received Brovatriol at the rate of  $\frac{1}{2}$  tablet (3 g) per 23 - 25 kg of body weight, once; the second (n = 35) -Albenol-100 suspension at a dose of 1 ml per 20 kg of body weight in the morning, once without a preliminary starvation diet. Individuals of the third group (n = 10) served as control, they were not prescribed the drug. The effectiveness of Brovatriol and Albenol-100 in sheep helminthiasis was determined according to the data of helminthoscopic studies of fecal samples 10, 20, 30 days after the start of the experiment. 20 and 30 days after treatment, the lambs of the first group were free of trematodes, cestodes and nematodes. At the same time, the animals of the second group were free from nematodes of the gastrointestinal tract (100%) and slightly infested with fascioli (28.5%). Among the control individuals, contamination with these species of helminths increased.

Calculations were made to determine the economic damage caused by the main helminths of sheep. The main helminthiasis that causes the greatest economic damage to the southern zone is fasciolosis. Therefore, we studied the economic damage of acute fasciolosis.

<sup>&</sup>lt;sup>9</sup> Рустамова, С. И., Гурбанов, Ф.Ш. Испытание нового комплексного антигельминтика при асоцированных нематодозах овец // - Львов: Научной вестник ЛНУВМБТ имени С.3. Гжицького, - 2014, часть 1., № 3(60), - с. 296-299.

Table. 3

#### Therapeutic efficacy of Brovatriol and Albenol-100 in sheep helminthiasis according to Student's t-test

No	Number of	Accounting for efficiency			
512	animals	Theorem in the rol	efficiency		
1	35	Brovatriol	before treatment 7,085±1,589	after treatment 0,057±0,108 t-test =4,41. 4,41>2	
2	35	Albenol-100	before treatment 7,285±1,589	after treatment 0,771±0,925 t-test =3,65. 3,65>2	

The data obtained before and after the application of Bravotriol and Albenol-100 to animals were distributed by Students.In the statistical processing of the results obtained, the t-criterion of Studen for two samples was 0.76. Since 0.76<2, the two samples are identical (table 3).

#### RESULTS

1. In the southern zone of Azerbaijan, we found 57 species of helminths among local sheep, of which 4 species belong to trematodes, 7 - cestodes and 46 nematodes [10].

2. For the first time, full images of the five modified species have been obtained by carefully examining organs not previously identified by researchers - *Chabertia ovina* from the family Strongylidae, *Bunostomum trigonacephalum* and *Bunostomum phlebotomum* of the family *Ancylostomatidae*, *Oesophagostomum columbianum and Oesophagostomum venulosum* of the family Trichoneomatidae.) First shown *Ch.ovina* gubernaculum, spicules inside helminth *B. trigonacephalum*, dorsal rib, gubernaculum, various shapes of spicules inside the helminth and spicules that have gone beyond the edge of the bursa of *O. columbianum*, Shoulder-shaped paddle, spiculles inside and out of the bursa *O*. venulosum [4; 5].

3. In the southern part of the republic, only 2 species of trichocephalus were found - *T.ovis*, *T. skrjabini*. The results of the studies once again prove that the distal end of the membrane of the spicular vagina and the shape of the tip of the spicules is variable [8].

4. Statistical processing of a dynamic series of indicators revealed three increases in the intensity of egg production in the southern zone: in August, September and October, and a decrease in intensity was noted from March to April. The number of isolated eggs from the body of sheep have different degrees of productivity of individual parasites [7].

5. Fascioleosis are widespread in sheep farming. In individual farms, fascioleosis has an extensionality of 62.5% according to autopsy data, and 54% according to helminthocoprology. High infection of sheep fascioles observed from October to February [2].

6. Dicroseliosis of sheep is widespread and widespread, especially in the foothills (67.5-77.5%). In young adults from one to two years of age, the lowest level of invasiveness is observed in the spring and summer months (22.4-27.5 per cent). High infection rates were observed in the autumn-winter months (60.3-72.4 per cent). In lambs, sexually mature dicrocelia are first detected in September, at 6 months of age and up to 1 year of age (the extent of the invasion varies between 3.2-20.9%) [3].

7. Of anoplocephalatoses in lambs, moniesiasis prevails (73.3%). In older age groups, tizaniasis ranks first, followed by *moniesiasis* (16,6-23,3%) and avitellinosis (6.6%) [3].

8. Cysticercus tenuicollis (15%), Coenurus cerebralis (10%) and echinococcosis (30-65%) are common in the southern zone. The main factors favouring the spread of echinococcosis, cysticercosis and coenurosis in sheep in the southern zone are as follows: Insufficient sanitary control of slaughtering animals and absence or poor management of helminth control among dogs [9;10].

9. Sheep in the southern zone are highly invasive with.

Trichostrongylidae According to autopsies, the infection rate of sheep haemonchosis is up to 62.3%. The incidence of hemonchosis is observed in February-March.

Nematodirosis was first recorded in June with an extensive 3.4% in three-month-old lambs. In August-September there was an increase in morbidity by 50-65.5%. In November-December there was an increase in the invasion, extensivity was 75.8% [1;10].

10. The most extensions and intensification of dictyocaulosis in lambs occur between October and December. In general, sheep of all ages have high rates of dictyocaulosis infection in late autumn, winter and early spring [10].

11. Trichocephalosis is widely distributed in sheep farms in the southern zone of the Republic of Azerbaijan (Masalli-Astara). The level of excretion of trichocephalosis eggs (*T.ovis, T.skrjabini*) in lambs in August was  $9.00 \pm 2.45$  copies, in February 26.00  $\pm 14.55$  copies.per 1 g of feces. Seasonal dynamics of lamb tricephalesis in the sedentary sheep breeding of the high foothills is characterized by a single peak, with an increasing rise from August to February [7; 9; 10].

# PRACTICAL RECOMMENDATIONS

1. The treatment and prevention of major helminths should be planned annually. The most important epizoic findings in the southern zone are: fasciolasis, dicroceliosis, monieziasis, tizaniasis, cysticercosis tenuicolis, cenurosis, echinococcosis, trichostrongylidosis, hemonchosis, nematodirosis, dictyocaulosis, trichocephalosis.

2. Having identified the main helminths and studied their seasonal dynamics, we consider the following recommendations to be useful:

a) Preventive deworming of sheep of all ages against fasciolosis and dicroceliasis is advisable to be carried out once a year - in late autumn or early winter (after transfer to stable holding).

b) Preimaginal dehelmintization on moniosis and ticanniasis of the March lambs is carried out for the first time at the end of May, the second time at the end of June and the third time in July-August. In order to prevent late and early winter rise of moniosis and tyranniasis in young animals, as well as to eliminate the bearer tyniseiosis and moniosis in young animals and adults, it is advisable to perform deworming of sheep of all ages in October-November.

c) The clinical manifestation of the coenurosis in the southern zone is observed mainly in the autumn months. We consider it advisable to hold a special two-month period for the identification and concentration in one group of clinically critical sheep, with cutting them in the autumn months - exclusively under the conditions of a slaughterhouse or in farms under the control of veterinary doctors. Dogs are not allowed to feed Boen waste from infected animals for prevention purposes.

d) For echinococcosis of all service dogs it is necessary to undergo routine diagnostic deworming 4 times a year (every 3 months) with anti-helminthic drugs. Animal slaughter and autopsy veterinary control should be strengthened. For the purpose of prevention, dogs are prohibited from feeding internal organs of infected animals with echinococcal bubbles. Considering that echinococcosis is a zoonotic disease, we consider it advisable to improve the activities of veterinary structures in accordance with international standards and strengthen the work with the population.

e) The first deworming of lambs for nematoderosis should be carried out at the end of July and beginning of August, the second time after setting the sheep in stalls.

f) The first time lambs on dictyocaulosis, it is necessary to deworm a few days before driving to pastures; late September, early October. The second deworming in all age groups in case of sedentary sheep breeding should be carried out only after stall keeping - at the end of November and at the beginning of December. To prevent the clinical manifestation of dictyocaulosis, as well as mortality from it in late winter and early spring, it is necessary to deworm the young up to two years of age at the end of January.

g) Preventive deworming against trichocephalosis of lambs of the current year of birth should be carried out, the first time at the beginning of autumn, the second time at the beginning of winter.

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Acces

The defense of the dissertation will be held on 12 (une 2025 at  $10^{\circ\circ}$ ) at the meeting of the Dissertation Council BFD 1.09/1 of Supreme Attestation Commission under the President of the Republic of Azerbaijan operating at the Institute of Zoology of the Ministry of Science and Education of the Republic of Azerbaijan.

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