Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 4365 - 4373

Received 15 December 2020; Accepted 05 January 2021.

Ecological and Faunistic Analysis of Helminths of Sheep (Ovis Aries Dom.) and Goats (Carpa Hyrcus Dom.) in the Tashkent Oasis of Uzbekistan

[1]F.D.Akramova, [2]A.A.Rakhmanova, [1]U.A.Shakarbaev, [1]D.A.Azimov

[1]Institute of Zoology, Academy of Sciences of the Republic of Uzbekistan, Tashkent, Uzbekistan.

[2]National University of Uzbekistan,Tashkent,Uzbekistan.

E-mail: ushakarbaev@mail.ru

Abstract: Ecological and faunistic analysis of helminths of sheep (Ovisaries dom.) and goats (Carpahyrcusdom.) in the Tashkent oasis of Uzbekistan. Akramova, F. D., Rakhmanova, A. A., Shakarbaev, U. A., Azimov, D. A. – Some features of the helminthic fauna of sheep (Ovisaries dom.) and goats (Carpahyrcus dom.) were studied alongside the helminths' ecology and distribution in the Tashkent oasis of Uzbekistan. In total, 50 species of parasitic worms were identified in studied animals in the region; 9 species belong to the class Cestoda, the classTrematodawas represented by 7 species and 34 species were referred to Nematoda. 30 of the species were recorded in the Tashkent oasis for the first time. Original data on the quantitative and qualitative composition and structure of helminthic communities were provided.

Key words: helminths, fauna, distribution, ecology, Tashkent oasis, Uzbekistan.

Introduction

Studying the helminth fauna in various animal species in specific areas is one of the most important issues of helminthology. Essential from the theoretic aspect, it is also of great practical interest and serves a basis for the development of measures to deal with numerous diseases caused by parasitic worms, which damage people's health and impact the productivity of livestock breeding and plant growing (Skryabin, 1973).

The Tashkent oasis is a major livestock breeding region in Uzbekistan, where on the lowlands and in the foothills various strains of sheep and goats are bred for the meat, milk and wool. The animals are subject to parasitic diseases. According to statistical data (2021), the total number of sheep and goats is over 1.5 million head.

Until now the helminth fauna of sheep and goats in the Tashkent oasis have been studied less than in adjacent territories – Central and Eastern Uzbekistan and many parts of the north-eastern portion of the country. The available data on helminths of sheep and goats in the Tashkent oasis(Sultanov et al., 1975; Matchanov et al., 1984, 1989) are highly fragmentary and do not reflect the current state of the parasitic worm fauna in the studied animals.

Whereas sheep and goats play a key role in the socio-economic development of Uzbekistan,

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 4365 - 4373

Received 15 December 2020; Accepted 05 January 2021.

it is very important to make research into the helminth fauna and its distribution within the Tashkent oasis.

Materials and methods

Parasitic worms of sheep and goats collected by the authors within the oasis, whichcovers several administrative districts of Tashkent Province, were used as material for this work (Fig. 1). The research was conducted in 2018—2020. 143 individuals of each of the two animal species from various livestock farms in Tashkent Province were dissected following K. I. Skryabin'scomplete helminthological dissection method. Individual organs of 115 sheep and 85 goats were examined using the partial dissection method.Helminth species were identified with the help of guides and descriptions provided in the works of Uzbek and foreign researchers (Sultanov et al., 1975; Ivashkin et al., 1989; Anderson 2000; Azimov et al., 2015). Also, about 1,471 individuals of aquatic and terrestrial molluscs from natural biotopes of the lowlands, foothills and mountains of the region were collected and studied using common hydrobiological and malacological methods (Zhadin, 1952; Ginetsinskaya, 1966; Pazilov, Azimov, 2003). Temporary and permanent mounts and microscopes J10M0 МБС– 10 (stereoscopic), СК2-TR (inverted) and VZ – 2200 (binocular) were used to identify helminths and study their morphology.

Standard parasitological indicators, such as prevalence (%) and infection intensity (individuals No.), were used to estimate the rate of infection in animals.

Figure 1.Map of Uzbekistan: areas where the material was collected

Results and discussion

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 4365 - 4373

Received 15 December 2020; Accepted 05 January 2021.

We established that the helminth fauna of sheep (Ovisaries dom.) and goats (Carpahyrcus dom.) in the Tashkent oasis was represented by 50 species, 9 of which were included in the class Cestoda, 7 were from the classTrematodaand34 species were referred to the class Nematoda(Table 1).

Table 1

Taxonomy and species composition of helminths of sheep and goats in the Tashkent oasis

Class	Species	Host	
		Sheep	Goat
Cestoda	Monieziaexpansa(Rud.,1810)	+	+
	Monieziabenedeni (Moniez, 1879)	+	+
	MonieziaautumnaliaKuznetsov, 1967	+	-
	Moniezia alba (Perrohcito, 1879)	+	-
	Thysanieziagiardi (Moniez, 1879)	+	+
	Taeniahytadigena (Pallas, 1766)*	+	+
	Multicepsmulticeps (Leske, 1786)*	+	+
	Multicepsgaigeri (Hall, 1916)*	-	+
	Echinococcusgranulosus (Batsch, 1786)*	+	+
Trematoda	Fasciolahepatica (L., 1758)	+	+
	Fasciolagigantica (Cobb., 1856)	+	+
	Paramphistomumichikawai Fukui, 1922	+	-
	Calicophoroncalicophorum (Fisschoeder, 1901)	+	-
	Gastrothylaxcruminifer (Creplin, 1847)	+	-
	Dicrocoeliumdendriticum (Rud., 1819)	+	+
	SchistosomaturkestanicumSkrjabin, 1913	+	-
Nematoda	TrichocephalusovisAbildgaard, 1795	+	-
	Trichocephalusskrjabini (Baskakov, 1924)	+	+
	Strongyloidespapillosus (Wedl, 1856)	+	-
	Bunostomumtrigonocephalum (Rud., 1808)	+	-
	Bunostomumphlebotomum (Rail., 1900)	+	-
	Chabertiaovina (Fabricius, 1788)	+	+
	OesophagostomumcolumbianumCurtice, 1890	+	-
	Oesophagostomumvenulosum (Rudolphi, 1809)	+	-

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 4365 - 4373

Received 15 December 2020; Accepted 05 January 2021.

	Trichostrongylusaxei (Cobbold., 1879)	+	+
	TrichostrongyluscapricolaRansom, 1907	+	+
	TrichostrongylusvitrinusLooss, 1905	+	-
	Grosspiculagiaaccidentalis (Ransom, 1907)	+	+
	Grosspiculagiabelockani (Assadov, 1954)	+	-
	Haemonchuscontortus (Rud., 1803)	+	+
	MarshallagiamarshalliRansom, 1907	+	+
	MarshallagiamongolicaSchumakovitsch, 1938	+	-
	NematodirusabnormalisMay, 1920	+	-
	NematodirushelvetianusMay, 1920	+	+
	NematodirusoiratianusRaewskaja, 1929	+	-
	NematodirusferganicaZimin, 1970	+	-
	Ostertagiaostertqgi (Stiles, 1892)	+	+
	Orloffiaorloffi (Sankin, 1930)	+	-
	Teladorsagiatrifurcata (Ransom, 1907)	+	-
	Teladorsagiacircumcincta (Stad., 1894)	+	+
	Dictyocaulusfilaria (Rud., 1809)	+	+
	Protostrongylusrufescens (Leuckart 1865)	+	+
	Protostrongylusraillieti (Schulz 1933)	+	-
	Cystocaulusocreatus (Railliet 1907)	+	-
	Muelleriuscapillaries (Mueller 1889)	+	-
	Spiculocaulusleuckarti (Orlow and Kutass, 1933)	+	+
	Skrjabinemaovis (Skrjabin 1915)	+	+
	ParabronemaskrjabiniRassowska, 1924	+	+
	Gongylonemapulchrum (Molin 1857)	+	+
	Setarialabiato-papillosa (Alessandrini, 1848)	+	+

Note: * - larval forms of Cestoda

All dissected individuals of sheep and goats proved infected with helminths, with 48 species of parasitic worms recorded in sheep and 28 in goats. The number of helminth species found in each individual of sheep varied from 10 to 18. In goats we recorded much lower numbers of worm species – from 3 to 7. As was stated above, the prevalence was 100%, while the intensity of infection varied between 3 and 385 individuals of worms.

The data we have obtained show (Table 2) that sheep and goats in the lowlands of the

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 4365 - 4373

Received 15 December 2020; Accepted 05 January 2021.

Tashkent oasis were infected with the highest number of helminth species (50) and were followed by animals in the foothills (29). The lowest number of worm species was recorded in mountains (15), which is, probably, associated with the area's specific environment and situation.

Table 2

Distribution of helminth fauna of sheep and goats across the landscapes of the Tashkent oasis

No.	Family	Number of species in a group	Landscape type		
			Lowlands	Foothills	Mountains
1	Anoplocephalidae	4	4	2	1
2	Avitellinidae	4	4	4	-
3	Taeniidae	4	4	4	4
4	Fasciolidae	2	2	1	
5	Gastrothylacidae	1	1	-	-
6	Paramphistomidae	2	2	-	-
7	Dicrocoeliidae	1	1	1	1
8	Schistosomatidae	1	1	-	-
9	Trichocephalidae	2	2	1	-
10	Strongyloididae	1	1	-	-
11	Ancylostomidae	2	2	1	-
12	Chabertidae	3	3	1	1
13	Trichostrongylidae	13	13	7	2
14	Dictyocaulidae	1	1	1	1
15	Protostrongylidae	5	5	4	4
16	Syphacidae	1	1	-	-
17	Habronematidae	1	1	-	-
18	Gongylonematidae	1	1	1	-
19	Setariidae	1	1	1	-
	Total	**50**	**50**	**29**	**15**

Of the total number of helminth species (50) identified in the sheep and goats of the oasis, most are included in the class Cestoda and represent the generaMoniezia Blanchard, 1891 ThysanieziaSkrjabin, 1925; Taenia Linnaeus 1758; EchinococcusRudolphi, 1801;

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 4365 - 4373

Received 15 December 2020; Accepted 05 January 2021.

MulticepsGoeze, 1782; they had been recorded earlier(Sultanov et al., 1975; Matchanov et al., 1984, Azimov, 2015). Cestoda species we have identified are heteroxenous forms, their life cycles including intermediate and definitive hosts. Sheep and goats are definitive hosts for 46 helminth species and intermediate hosts for 4 species of worms from the familyTaeniidae.

The classTrematodais represented by 6 genera: Fasciola L., 1758; ParamphistomumFishoeder, 1901; CalicophoronNäsmark, 1937; Gastrothylax Poirier, 1883; DicrocoeliumDujardin, 1845; SchistosomaWainland, 1858. Parasites from these genera also develop using aquatic and terrestrial molluscs as intermediate hosts(Azimov et al., 2015).

The class Nematoda comprises the largest number of worm species parasitising the sheep and goats of the Tashkent oasis, with 34 species from 22 genera recorded in the studied area. They largely concentrate in the animals' digestive tracts and are represented byheteroxenous (8) and homoxenous (26) forms. Heteroxenous species use insects and molluscs as intermediate hosts (Azimov et al., 2015).

Dominating groups of helminths are from the families Anoplocephalidae,Taeniidae, Fasciolidae, Paramphistomidae, Dicrocoeliidae andProtosrongylidae.

Prevalence in sheep and goats in Kibray, Bostanlyk, Akhangaran, Piskentskogo, Parkent, Almalyk, Buka and Toytepa Districts reaches 100%, and the intensity of infection ranges from single to a hundred individuals. The study shows that animals from all age groups are infected with mixed forms (associations), which results in chronic diseases with potential grave consequences.

The ways parasitic elements (eggs and larvae) use to penetrate into the organisms of the studied animals are diverse: ahelminth is taken together with food or water as mechanical impurity; larvae penetrate actively into the organism of a definitive host; larvae and eggs enter the definitive host, when the intermediate host feeds on the former (Kontrimovichus, 1969). Therefore, we think it appropriate to analyse ecological relations between sheep, goats and their helminths with other components of biodiversity in the studied region of Uzbekistan based on original (Table 3) and literary data (Shults, Gvozdev, 1972; Sultanov et al., 1975; Kabilov, 1983; Ivashkin et al., 1989; Kulmamatov et al., 1994; Anderson 2000; Azimov et al., 2015, 2019).

The results of the research show that aquatic and terrestrial molluscs were infected with Nematoda and Trematoda larvae that parasitised sheep and goats in the Tashkent oasis (Table 3).

Table 3

Natural rate of infection with Trematoda and Nematoda larvae in molluscs

Mollusc species	No. of examined individuals	Infected, %	Helminth larvae

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 4365 - 4373

Received 15 December 2020; Accepted 05 January 2021.

Lymnaeatruncatula	160	2.8	F. hepatica
Lymnaea auricularia	180	1.5 1.4	F.gigantica Sch.turkestanicum
Planorbisplanorbis	125	1.9 1.2	P.ichikawai C.calicophorum
Gyraulusehrenbergi	108	1.2	G.cruminifer
Vallonia costata	105	1.5	D.dendriticum P.rufescens
Pupilla muscorum	102	1.2	C.ocreatus
Pseudonapaeusalbiplicatus	105	1.2	M.capillaris
Bradybaenaphaezona	136	5.5	D. dendriticum
Leucozonellaruens	100	5.0	
Xeropicta candaharica	310	7.6 7.6 1.5 1.5	P. raillieti P. rufescens C. ocreatus M. capillaris

We identified cercariae of 6 Trematoda species in 573 individuals of aquatic molluscs from the families LymnaeidaeandPlanorbidae (Table 3). Prevalence in molluscs infected with larvae of various Trematoda species was between 1.2% and 2.8%. A similar situation was observed in terrestrial molluscs infected with helminth larvae. We examined 858 individuals of terrestrial molluscs from the families Vallonidae, Pupillidae, Buliminidae, Bradybaenidae and Hygromiidae and recorded cercariae ofD. dendriticumand larvae of 4 Nematoda species from the family Protostrongylidaeparasitising lungs. Prevalence in this group of molluscsinfected with larvae of the abovementioned helminthsranged from 1.2 to 7.6% (Table 3).

The analysis of original materials and literary data shows that the existing ecological links between helminths and their hosts are highly diverse and develop in time and space. The ways worms at various stages use to penetrate into their definitive hosts are highly diverse and include the hosts' food chains:

- Elements of helminths (eggs or larvae) are taken by the host (sheep or goat) with food or water as mechanical impurity. Actually, most species from all the three classes – Cestoda (9 species), Trematoda (6 species) andNematoda (29 species) – use this way.
- Nematoda larvae and Trematodacercariae penetrate actively into the host's organism. This method is used by cercariae of Sch. turkestanicum and larvae of Nematoda(S.papillosus,

B.trigonocephalum, B.phlebotomum), which enter through the host's skin.

- Larvae are transmitted from the intermediate host to the definitive host, when the former feeds on the latter. Larvae of nematodes S. labiatopapillosaand P. skrjabinialso use this way to reach their definitive host from the intermediate host (Diptera).

The sheep and goats of the Tashkent oasis are definitive hosts for 46 helminth species and intermediate hosts for 4 species – T.hydatigena, M. multiceps, M. gaigeriandE.granulosus. Larval stages of the abovementioned Cestoda species parasitise sheep and goats.

Thus, the helminth fauna of sheep and goats in the studied region is highly specific and diverse, which, probably, is the result of ecological characteristics of the Tashkent oasis.

Conclusion

The Tahkent oasis is the core of the north-eastern part of Uzbekistan, representing diverse natural landscapes – river valleys, different bodies of water, foothills and high mountains. The foothills are occupied by rainfed agricultural fields with cereal crops. Livestock breeding also takes an important place in these areas. Sheep and goats are the main types of animals bred in the lowlands, foothills and mountains, since they are best adapted to these conditions (Akramov et al., 1967). According to statistical data (1 January 2021), the total number of sheep and goats is over 1.5 head. They are subject to infection with ecto- and endoparasites. This is confirmed by the results of our research into the helminth fauna of sheep and goats in the Tashkent oasis.

We have established that the helminth fauna of sheep and goats in the studied oasis is represented by 50 species, 9 of which are from the class Cestoda, 7 belong to the classTrematodaand 34 to the class Nematoda. Representatives of the class Nematoda are the most numerous.

The qualitative and quantitative dispersal of helminths across landscapes is not equal. The largest number of species was recorded in the lowlands (50), which are followed by the foothills (29) and mountains (15).

The commonest species or groups of helminths are usually recorded in associations and cause grave diseases in the studied animals, which results in heavy damage to the economy of livestock farms.

The presented materials can be used to develop steps to control helminths in the livestock breeding farms of the studied region.

References

1. Азимов Д.А., Акрамова, Ф.Д., Шакарбоев Э.Б., и др. Шистосомоз животных. –Ташкент: Фан, 2019. – 320 с.
2. Азимов Д.А., Дадаев С.Д., Акрамова, Ф.Д., Сапаров К.А., Гельминты жвачных

животных Узбекистана. – Ташкент: Фан, 2015, - 224 с.

3. Акрамов З.М., Бабушкин Л.Н., Вахобов М.Г. и др. Узбекистан. – Москва, 1967. – 321.
4. Гинецинская Т.А. Трематоды, их жизненные циклы, биология и эволюция. –Л.: Наука, 1968. -411 с.
5. Жадин В.И. Моллюски пресных и солоноватых вод СССР. М – Л.: Наука, 1952. –Том 46. – 376 с.
6. Ивашкин В.М., Орипов А.О., Сонин М.Д. Определитель гельминтов мелкого рогатого скота. – Москва: Наука, 1989. – 255 с.
7. Кабилов Т.К. Гельминты позвоночных животных Узбекистана, развивающиеся с участием насекомых. – Ташкент: «Фан» Узб. ССР, 1983. – 128 с.
8. Контримавичус В. Л.Гельминтофаунакуньих и пути ее формирования. - М.: Наука, 1969. - 431 с.
9. Кулмаматов Э.Н., Исакова Д.Т., Азимов Д.А. Гельминты позвоночных горных экосистем Узбекистана. – Ташкент: Фан, 1994. – 152 с.
10. Матчанов Н.М., Дадаев С., Азимов Д.А., Зимин Ю.М., Гехтин В.И. Гельминты сельскохозяйственных животных // Экология паразитов животных северо-востока Узбекистана. – Ташкент: Фан, 1984. – 160 с.
11. Матчанов Н.М., Дадаев С., Кабилов Т.К. Сиддиков Б.Х. Гельминты животных пустынных биоценозов Узбекистана. – Ташкент: Фан, 1989. – 104 с.
12. Пазилов А., Азимов Д.А. Наземные моллюсков (Gastropoda, Pulmonata) Узбекистана и сопредельных территорий. – Ташкент: Фан, 2003. 316 с.
13. Скрябин К.И. Методы полных гельминтологических вскрытий позвоночных, включая человека. – М., Л.: Изд. МГУ, 1928. – 45 с.
14. Скрябин К.И. Предисловие. Гельминты птиц Якутии и сопредельных территорий. – Москва: Наука, 1973, - С. 5-6.
15. Султанов М.А., Азимов Д.А., Гехтин В.И., Муминов П.А. Гельминты домашних млекопитающих Узбекистана. – Ташкент: Фан, 1975. – 188 с.
16. Шульц Р.С., Гвоздев Е.В. Основы общей гельминтологии.– М.: Наука, 1972. – Том 2. – 516 с.
17. Anderson R.K. Nematode parasites of vertebrates: their development and transmission. - New York: CAB International, 2000. - 650 p.