

Ecological and Faunistic Features of Helminths in Cattle in Uzbekistan

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Abstract

This article involves the fauna and ecological features of helminths of cattle in various biocenoses of Uzbekistan. Based on many years of our own research and analysis of literature data, 71 species of helminths were identified in cattle of Uzbekistan, of which 12 species belong to the class of cestodes, 12 species to trematodes and 47 species to nematodes. Of the 71 species of helminths identified in cattle of the Republic, 1 species (*Stephanofilaria assamensis*) was noted by us for the first time in the CIS and 11 species (*Moniezia alba*, *Trichocephalus globulosa*, *Bunostomum trigonocephalum*, *Camelostrongylus mentulatus*, *Cooperia punctate*, *C. pectinata*, *Grosspiculagia occidentalis*, *Nematodirus abnormalis*, *N. spathiger*, *Stephanofilaria assamensis*, *Thelazia skrjabini*) in Uzbekistan. Among the identified parasitic worms of cattle in Uzbekistan, 37 species develop in a direct way, i.e. they develop without the participation of intermediate hosts. The remaining 34 species of helminths develop with the participation of intermediate and additional hosts. Their intermediate and additional hosts are freshwater and land mollusks, oribatid mites, grasshoppers, ants, dipterous insects, predatory mammals, and humans. Also, it was determined that of the 71 species of helminths *Paramphistomum ichikawai*, *Taeniarhynchus saginatus*, *Trichocephalus globulosa*, *Aonchotheca bovis*, *Thelazia rhodesi*, *Th. gulosa*, *Th. skrjabini*, *Th. Petrovi*, *Onchocerca lienalis*, *Stephanofilaria stilesi* and *S. assamensis* parasitize only cattle. Under the conditions of Uzbekistan, the total infection of cattle with helminths is 94.3%. At the same time, in some regions of Uzbekistan, infection of cattle with trematodes ranges from -34.0 to 66.6%, cestodes from 17.6 to 45.1% and nematodes from 70.0 % to 93.5 %. Among the widespread helminthiasis of cattle that adversely affect their productivity are monieziosis, fascioliasis, paramphistomidiasis, trichuriasis, hemonchosis, parabroneimiasis, thelaziosis, stephanofilariasis and other helminthiasis.

Keywords: Helminth, Cestodes, Trematodes, Nematodes, Intermediate Hosts, Helminthiasis, Invasion, Prevention.

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ACTUALITY OF THE THEME

Relevance of the topic. Cattle breeding plays a major role in increasing the production of meat and other high-quality food products. However, an increase in livestock and an increase in the milk and meat productivity of animals is often hindered by various parasitic diseases, including helminthiasis, which continue to cause enormous economic damage to the national economy of the country (they reduce the productivity of animals and often cause their death). In addition, some helminthiasis (bovis cysticercosis, echinococcosis) are helminthoses and pose a constant danger of infecting people.

The degree of distribution of helminths of ungulates, including cattle of Uzbekistan, is directly dependent on the climatic and geographical conditions of pasture areas and external factors (temperature, humidity, etc.) that inhibit or contribute to the development and preservation of invasive elements in the environment.

Consequently, the extraordinary diversity of the natural and climatic conditions of Uzbekistan, of course, leaves its mark on the formation and distribution of the fauna of helminths of ungulates, including cattle, as well as on their circulation

in the biogeocenoses of this region.

Many foreign [1,2,3,4,5] and domestic [6,7,8,9,10,11,12,13, 14,15,16, etc.] scientists have conducted studies on the study of faunistic complexes, distribution, ecology of helminthes and epizootology of the main helminthiasis in cattle.

Despite numerous studies and publications on the helminthes of cattle in Uzbekistan (a significant part of which was collected by the author), these materials need additional analysis and generalization.

Based on this, the study of the ecological and faunal characteristics of helminthes of cattle in various conditions of Uzbekistan is of great theoretical and practical importance.

PURPOSE OF THE STUDY

The purpose of this study is to summarize and analyze the results of our long-term research and literature data on the fauna, distribution and ecological features of helminthes in cattle in various regions of Uzbekistan.

The objects of research are helminths-parasites of cattle of Uzbekistan, earthworms, terrestrial and freshwater mollusks, insects-intermediate and additional hosts of parasites.

The subject of the study is the fauna, biology and ecology of helminths of cattle in Uzbekistan.

MATERIALS AND RESEARCH METHODS

This work involves the materials of field and experimental studies, conducted over many years (1978-2019) in the laboratory of parasitology of the Institute of Zoology of the Academy of Sciences of the Republic of Uzbekistan and at the Department of Zoology and Anatomy of the Tashkent state pedagogical university named after Nizami.

The degree of infection of cattle with helminths was established by complete and incomplete helminthological dissections of animals, as well as their individual organs, according to the method of K.I. Scriabin [17]. 496 of heads of cattle were examined by the method of complete helminthological dissections. In addition, to study the epizootology of the causative agents of the main helminthiasis by the method of complete and incomplete helminthological dissections, about 9865 sets of individual organs of cattle were also studied at meat processing plants and slaughter sites of various livestock farms of the republic.

To detect sexually mature stephanophilaria and their larvae, after hair removal, deep scrapings of the affected skin areas (350 samples) were made from cattle according to known methods [18,19].

In a number of specialized livestock farms and industrial complexes of the republic, the lifetime infection of cattle with cestodes, trematodes and nematodes was established by the results of ovoscopic and larvosopic examination of fecal samples using known methods (according to the method of Fülleborn, Vaid, Berman-Orlov and sequential washing). At the same time, faeces from 1500 heads of cattle of different ages were studied.

Helminthological material from cattle was collected in five regions of Uzbekistan: North-Eastern (Tashkent, Syrdarya, Jizzakh regions), Eastern (Fergana, Andijan, Namangan), Central (Bukhara, Navoi regions), (Southern (Surkhandarya, Kashkadarya regions)), Northwestern (Khorezm region, Republic of Karakalpakstan). At the same time, animals were studied at meat processing plants and slaughterhouses in Andijan, Namangan, Fergana, Samarkand, Jizzakh, Syrdarya, Tashkent, Bukhara, Navoi, Kashkadarya, Surkhandarya, Khorezm regions and Republic of Karakalpakstan. The study of morphology and identification of parasites were carried out on temporary and permanent preparations in accordance with the determinants and descriptions given in the works of domestic and foreign researchers [20,21,22].

RESULTS AND DISCUSSION

According to the results of our long-term research and analysis of literature data, 71 species of helminths were

registered in cattle of Uzbekistan, of which 12 species belong to the class *Cestoda Rudolphi*, 1808 (*Moniezia expansa*, *M. benedeni*, *M. autumnalia*, *M. alba*, *Avitellina centripunctata*, *Thysaniezia giardi*, *Taenia hvdatigena* (larvae), *Taeniarhynchus saginatus* (larvae), *Multiceps multiceps* (larvae), *M. skrjabini* (larvae), *Echinococcus granulosus* (larvae), *Alveococcus multilocularis* (larvae), 12 species per class of *Trematoda Rudolphi*, 1808 (*Fasciola hepatica*, *F. gigantica*, *F. indica*, *Dicrocoelium dendriticum*, *Eurytrema pancreaticum*, *E. coelomaticum*, *Paramphistomum ichikawai*, *Calicophoron calicophorum*, *C. erschowi*, *Liorchis scotiae*, *Gastrothylax crumifera*, *Schistosoma turkestanicum*) и 47 species per class of *Nematoda Rudolphi*, 1808 (*Trichocephalus ovis*, *T. skrjabini*, *T. globulosa*, *Aonchotheca bovis*, *Strongyloides papillosus*, *Chabertia ovina*, *Bunostomum trigonocephalum*, *B. phlebotomum*, *Oesophagostomum venulosum*, *O. radiatum*, *O. columbianum*, *O. asperum*, *Dictyocaulus viviparus*, *Trichostrongylus axei*, *T. colubriformis*, *T. vitrinus*, *Camelostrongylus mentulatus*, *Cooperia oncophora*, *C. zurnabada*, *C. punctate*, *C. pectinata*, *Grosspiculagia occidentalis*, *Haemonchus contortus*, *H. placei*, *Marshallagia marshalli*, *M. mongolica*, *Nematodirus filicollis*, *N. abnormalis*, *N. helvetianus*, *N. oiratianus*, *N. spathiger*, *Ostertagia ostertagi*, *Skrjabinagia lyrata*, *Teladorsagia circumcincta*, *T. trifurcata*, *Skrjabinema ovis*, *Gongylonema pulchrum*, *Parabronema skrjabini*, *Onchocerca lienalis*, *O. gutturosa*, *Setaria labiatopapillosa*, *Stephanofilaria stiliesi*, *S. assamensis*, *Thelazia gulosa*, *Th. rhodesi*, *Th. Skrjabini* and etc.).

As can be seen from the above materials, most types of helminths belong to the class of nematodes. We are inclined to explain the species diversity of cattle nematodes in Uzbekistan by the evolutionary adaptation of nematodes to various environmental conditions, which contribute to the development of parasites in all phases of their life cycles.

The ecological relationships of nematodes with definitive, intermediate, and additional hosts ultimately ensure the stable functioning of the "parasite-host" system and the circulation of invasion in nature. The circulation of these nematodes is carried out based on trophic and topical connections with the members of biogeocenoses.

Of the 71 species of helminths identified in cattle of the Republic, 1 species (*Stephanofilaria assamensis*) was noted by us for the first time in the CIS and 11 species (*Moniezia alba*, *Trichocephalus globulosa*, *Bunostomum trigonocephalum*, *Camelostrongylus mentulatus*, *Cooperia punctate*, *C. pectinata*, *Grosspiculagia occidentalis*, *Nematodirus abnormalis*, *N. spathiger*, *Stephanofilaria assamensis*, *Thelazia skrjabini*) were noted in Uzbekistan.

Among the identified parasitic worms of cattle in Uzbekistan, 37 species develop in a direct way, i.e. they develop without the participation of intermediate hosts. The remaining 34 species of helminths develop with the participation of intermediate and additional hosts. Their

intermediate and additional hosts are freshwater and land mollusks, grasshoppers, ants, diptera, oribatid mites, predatory mammals, and humans. Also, it was determined that of the 71 species of helminths such as *Paramphistomum ichikawai*, *Taeniarhynchus saginatus*, *Trichocephalus globulosa*, *Aonchotheca bovis*, *Thelazia rhodesi*, *Th. gulosa*, *Th. skrjabini*, *Th. Petrovi*, *Onchocerca lienalis*, *Stephanofilaria stilesi* and *S. assamensis* parasitize only in cattle.

Under the conditions of Uzbekistan, the total infection of cattle with helminths is 94.3%. At the same time, in some regions of Uzbekistan, infection of cattle with trematodes ranges from 34.0 to 66.6%, cestodes from 17.6 to 45.1% and nematodes from 70.0 to 93.5.

For the existence of helminths as a full-fledged component of biocenoses and for maintaining the invasive element of parasitic worms in nature, two important regulatory mechanisms are essential - the "susceptibility" of invertebrate animals-intermediate (additional) hosts to the causative agent of invasion and the effectiveness of its "transmission" to the final hosts-vertebrate animals. Intermediate hosts, by virtue of their own mobility, contribute to the spread of the parasite in space and, thanks to the ecological links that exist between them and the final hosts, contribute to its penetration into the body of the latter [23].

It is clear, that animals become infected with helminths mainly on pastures, the ecological conditions of which contribute to the emergence and circulation of pathogens of invasions. Uzbekistan also occupies a vast territory with pronounced landscape and geographical zones, which, of course, influence the formation of helminth fauna complexes.

Considering the structure of the fauna of helminthes of cattle, depending on the landscape and climatic conditions, we distinguish two helminth fauna complexes - plain and foothill-mountain (Table 1).

Table 1: Distribution of helminths in cattle by landscapes of Uzbekistan

Species of helminths	landscape	
	Flat	foothill mountain
1. <i>Moniezia benedenii</i>	++	+
2. <i>M. expansa</i>	++	+
3. <i>M. autumnalia</i>	+	+
4. <i>M. alba</i>	-	+
5. <i>Avitellina centripunctata</i>	++	+
6. <i>Thysaniezia giardi</i>	++	+
7. <i>Taenia hvdatigena</i> (larvae)	++	++
8. <i>Taeniarhynchus saginatus</i> (larvae)	++	++
9. <i>Multiceps multiceps</i> (larvae)	+	+
10. <i>M. skrjabini</i> (larvae)	+	+
11. <i>Echinococcus granulosus</i> (larvae)	++	++
12. <i>Alveococcus multilocularis</i> (larvae)	+	+
13. <i>Fasciola hepatica</i>	++	+
14. <i>F. gigantica</i>	++	+

15. <i>F. indica</i>	-	+
16. <i>Eurytrema pancreaticum</i>	+	+
17. <i>E. coelomaticum</i>	-	+
18. <i>Paramphistomum ichikawai</i>	+	+
19. <i>Calicophoron calicophorum</i>	++	+
20. <i>C. erschowi</i>	++	+
21. <i>Liorchis scotiae</i>	+	+
22. <i>Gastrothylax cruminifera</i>	++	+
23. <i>Dicrocoelium dendriticum</i>	+	++
24. <i>Schistosoma turkestanicum</i>	++	-
25. <i>Trichocephalus ovis</i>	+	++
26. <i>T. skrjabini</i>	++	++
27. <i>T. globulosa</i>	-	+
28. <i>Aonchotheca bovis</i>	+	+
29. <i>Strongyloides papillosus</i>	+	+
30. <i>Bunostomum trigonocephalum</i>	+	++
31. <i>B. phlebotomum</i>	+	++
32. <i>Chabertia ovina</i>	+	++
33. <i>Oesophagostomum venulosum</i>	++	++
34. <i>O. radiatum</i>	+	++
35. <i>O. columbianum</i>	+	+
36. <i>O. asperum</i>	+	-
37. <i>Dictyocaulus viviparus</i>	-	+
38. <i>Trichostrongylus axei</i>	+	++
39. <i>T. colubriformis</i>	+	++
40. <i>T. vitrines</i>	+	++
41. <i>Camelostomum mentulatus</i>	+	-
42. <i>Cooperia oncophora</i>	++	+
43. <i>C. punctata</i>	+	+
44. <i>C. pectinata</i>	+	+
45. <i>C. zurnabada</i>	+	+
46. <i>Grosspiculagia occidentalis</i>	+	++
47. <i>Haemonchus placei</i>	++	+
48. <i>H. contortus</i>	++	++
49. <i>Marshallagia marashalli</i>	++	++
50. <i>M. mongolica</i>	++	+
51. <i>Nematodirus helvetianus</i>	+	++
52. <i>N. abnormalis</i>	+	++
53. <i>Nematodirus filicollis</i>	-	+
54. <i>N. spathiger</i>	++	++
55. <i>N. oiratianus</i>	++	++
56. <i>Ostertagia ostertagi</i>	++	++
57. <i>Skrjabinagia lyrata</i>	-	+
58. <i>Teladorsagia circumcincta</i>	+	++
59. <i>T. trifurcata</i>	+	+
60. <i>Skrjabinema ovis</i>	++	+
61. <i>Gongylonema pulchrum</i>	++	++
62. <i>Parabronema skrjabini</i>	++	+
63. <i>Thelazia rhodesi</i>	++	+
64. <i>Thelazia gulosa</i>	++	+
65. <i>Th. skrjabini</i>	+	++
66. <i>Th. petrovi</i>	+	-
67. <i>Onchocerca lienalis</i>	+	+
68. <i>O. gutturosa</i>	++	-
69. <i>Setaria labiatopapillosa</i>	++	++
70. <i>Stephanofilaria stilesi</i>	++	++
71. <i>S. assamensis</i>	+	+
Bcero	64	66

Note: ++ characteristic; + meet insignificantly; - not marked.

An analysis of the geographical distribution of species and supraspecific taxa of helminthes of cattle in Uzbekistan indicates a high commonality of faunistic complexes of parasitic worms in animal plains and foothill-mountain zones. However, the faunal complexes of helminths and the biological groups of these landscapes differ significantly.

Most of the territory of Uzbekistan is a zone of plains (Kyzyl-Kum desert, Ustyurt plateau, Karshi, Surkhan-Sherabad, Jizzakh steppes), which has long served as a valuable pasture for transhumance. Insects that play the role of intermediate hosts of helminths are widely represented in this territory.

The plain complex covers significant areas of irrigated agriculture, where the main agricultural and fodder crops are grown. In this complex, the overwhelming number of dairy, meat-and-dairy and meat cattle is concentrated.

The plain complex also includes river valleys richer in herbage. Studies have shown that the helminth fauna of plains cattle is represented by 64 species (Table 1), consisting of trematodes, cestodes, and nematodes. We are inclined to associate the richness of the helminth fauna of the plain complex with various elements of landscapes with their inhabitants participating in the circulation of parasitic worms. It should be noted that in the desert and semi-desert, mainly nematodes develop directly without the participation of an intermediate host. In the river valleys, trematodes are widely represented, in the development of which freshwater mollusks take part, as well as nematodes, in the life cycles of which numerous species of dipterous insects participate.

The main core of the helminth faunistic complex of cattle in the plain zone of Uzbekistan is 31 species (*Moniezia benedeni*, *M. expansa*, *Avitellina centripunctata*, *Thysaniezia giardia*, *Taenia hvdatigena* (larvae), *Taeniarhynchus saginatus* (larvae), *Echinococcus granulosus* (larvae), *Fasciola hepatica*, *F. gigantica*, *Calicophoron calicophorum*, *C. erschowi*, *Gastrothylax crumifera*, *Schistosoma turkestanicum*, *Trichocephalus skrjabini*, *Oesophagostomum venulosum*, *Cooperia oncophora*, *Haemonchus contortus*, *H. placei*, *Marshallagia marashalli*, *M. mongolica*, *Nematodirus spathiger*, *N. oiratianus*, *Ostertagia ostertagi*, *Skrjabinema ovis*, *Gongylonema pulchrum*, *Parabronema skrjabini*, *Thelazia rhodesi*, *Th. gulosa*, *Onchocerca gutturosa*, *Setaria labiatopapillosa*, *Stephanofilaria stilesi*).

There are no helminths from the cestode class - *Moniezia alba*, from the trematode class - *Fasciola indica*, *Eurytrema coelomaticu* and from the nematode class - *Trichocephalus globulosa*, *Dictyocaulus viviparus*, *Nematodirus filicollis*, *Skrjabinagia lyrata*, registered in the foothill-mountain complex. Here, mainly dry-resistant nematodes of the suborder *Strongylate*, *Trichocephelate*, *Spirurate* will dominate.

It should be noted that one of the leading factors determining the formation of biocenoses, including helmintofaunistic complexes, in the plain zone of the

republic is human economic activity. It is known that in recent decades the republic has carried out a grandiose work on the development and watering of lands, large reservoirs are being created, and the irrigation network is expanding. All this changes the appearance of biocenoses, which affects the formation of the fauna of helminths in cattle, i.e. the historically established host-parasite systems are disrupted. As a result, there is a change in the qualitative and quantitative composition of helminths. The dominance of some groups of helminths and the disappearance of others is noted.

Thus, with the commissioning of the South Surkhan reservoir in the south of Uzbekistan, the Amu-Bukhara canal in the Bukhara and Navoi regions, the development and watering of the Hungry Steppe in the northeastern part of the republic, conditions were created for the development of various invertebrates, in particular, freshwater mollusks (*Lymnaea*, *Planorbis*, *Gyraulus*, *Anisis*, etc.) and dipterous insects (*Musca*, *Lyperozia*, *Stomoxus*, *Aedes*, etc.), the associated helminths of the genera *Fasciola*, *Calicophoron*, *Gastrothylax*, *Liorchis*, *Schistosoma*, *Parabronema*, *Setaria*, *Stephanofilaria*, *Onchocerca* and etc.), which caused epizootic outbreaks of trematodosis and nematodosis among susceptible animals [24,25].

The foothill-mountain zone occupies 24.5% of the territory of Uzbekistan, and these zones, as pastures, will significantly exceed the plain ones in terms of productivity. The main place here is occupied by herbs. These are excellent pastures for all kinds of farm animals. In the foothill-mountain zone, with its significantly indented relief, high humidity and lush vegetation, animal husbandry is developed, mainly meat-dairy and meat-wool directions (cattle, sheep of fat-tailed and meat-wool breeds, goats, horses).

As can be seen from the above, the natural and economic conditions and the system of animal husbandry in the foothill-mountain ecosystems of Uzbekistan are specific, which certainly affects the formation of both the fauna of the animal world and its helminths.

The helminth fauna of cattle in the foothill-mountain landscape of Uzbekistan is represented by 66 species. The main core of the complex is 26 species (*Taenia hvdatigena* (larvae), *Taeniarhynchus saginatus* (larvae), *Echinococcus granulosus* (larvae), *Dicrocoelium dendriticum*, *Trichocephalus ovis*, *T. skrjabini*, *Bunostomum trigonocephalum*, *B. phlebotomum*, *Chabertia ovina*, *Oesophagostomum venulosum*, *O. radiatum*, *Trichostrongylus axei*, *T. colubriformis*, *T. vitrines*, *Grosspiculagia occidentalis*, *Haemonchus contortus*, *Marshallagia marashalli*, *Nematodirus helvetianus*, *N. abnormalis*, *N. spathiger*, *N. oiratianus*, *Teladorsagia circumcincta*, *Gongylonema pulchrum*, *Thelazia skrjabini*, *Setaria labiatopapillosa*, *Stephanofilaria stilesi*).

Cestodes *Echinococcus granulosus* (larvae) and *Taenia hvdatigena* (larvae) are widely distributed here, for which

cattle acts as an intermediate host. Mature forms of these worms are parasites of the small intestine of carnivores. Of the representatives of trematodes, it should be noted the distribution of *Dicrocoelium dendriticum*, which develops with the participation of terrestrial mollusks and ants.

In the foothill-mountain landscape, nematodes are quite widely represented in cattle, mainly moisture-loving species from the group *Trichocephalus*, *Chabertia*, *Bunostomum*, *Oesophagostomum*, *Trichostrongylus*, *Nematodirus*, etc.).

The richness of the fauna of helminths of cattle of the foothill-mountain complex is due to the great diversity of landscapes, vegetation, wildlife and its high density. Consequently, there are favorable conditions for the development of terrestrial mollusks, intermediate hosts of dicrocoeliasis, oribatid mites, intermediate hosts of anoplocephalates, carnivorous and agricultural animals, definitive and intermediate hosts of teniate.

Of the total number of helminths, 58 species were noted in cattle of both the plain and foothill-mountain complexes. This indicates a high degree of adaptation of most helminth species to various environmental conditions.

Among the widespread helminthiasis of cattle in Uzbekistan, which negatively affect their productivity, are monieziosis, larval taeniasis, fascioliasis, paramphistomidiasis, trichocephalosis, hemonchosis, parabronemiasis, thelaziosis, stephanofilariasis and other helminthiasis.

CONCLUSION

Thus, as a result of studying a huge amount of factual material and analyzing literature data, the species composition of helminths of cattle in various biocenoses of Uzbekistan has been established. Based on many years of our own research and analysis of literature data, 71 species of helminths were identified in cattle of Uzbekistan, of which 12 species belong to the class of cestodes, 12 species to trematodes and 47 species to nematodes.

Of the 71 species of helminths identified in cattle of the Republic, 1 species (*Stephanofilaria assamensis*) was noted by us for the first time in the CIS and 11 species (*Moniezia alba*, *Trichocephalus globulosa*, *Bunostomum trigonocephalum*, *Camelostrongylus mentulatus*, *Cooperia punctata*, *C. pectinata*, *Grosspiculagia occidentalis*, *Nematodirus abnormalis*, *N. spathiger*, *Stephanofilaria assamensis*, *Thelazia skrjabini*) in Uzbekistan.

Among the identified parasitic worms of cattle in Uzbekistan, 37 species develop in a direct way, i.e. they develop without the participation of intermediate hosts. The remaining 34 species of helminths develop with the participation of intermediate and additional hosts. Their intermediate and additional hosts are freshwater and land mollusks, oribatid mites, grasshoppers, ants, dipterous insects, predatory mammals, and humans. Also, it was determined that of the 71 species of helminths

Paramphistomum ichikawai, *Taeniarhynchus saginatus*, *Trichocephalus globulosa*, *Aonchotheca bovis*, *Thelazia rhodesi*, *Th. gulosa*, *Th. skrjabini*, *Th. Petrovi*, *Onchocerca lienalis*, *Stephanofilaria stilesi* and *S. assamensis* parasitize only cattle.

Under the conditions of Uzbekistan, the total infection of cattle with helminths is 94.3%. At the same time, in some regions of Uzbekistan, infection of cattle with trematodes ranges from -34.0 to 66.6%, cestodes from 17.6 to 45.1% and nematodes from 70.0 % to 93.5 %.

The presented materials clearly demonstrate the role of landscape diversity, taking into account their inhabitants (invertebrates and vertebrates), in the formation of the helminth fauna of cattle in Uzbekistan.

Consequently, the extraordinary diversity of the natural and climatic conditions of Uzbekistan, of course, leaves its mark on the formation and distribution of the fauna of helminths of cattle, as well as on their circulation in the biogeocenoses of this region. However, the data obtained are not sufficient for a final judgment about the fauna, ecology, especially the biological characteristics of helminths in cattle. All this requires further comprehensive studies of helminths in cattle, as well as the development of methods and means for regulating the population of pathogenic species of parasites.

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