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Research Article

Epizootic Monitoring for Helminthoses in Cattle in the West Region of Kazakhstan

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Abstract | The research was aimed at determining the epizootology of main helminthiases in cattle in the steppe, semi-desert, and desert zones of the West Kazakhstan region in various seasons in various age groups. Cattle infestation with helminths was determined using the Fülleborn's method. Thelazia were washed from the conjunctival sac with a solution of boric acid. To detect the cysts of larval cestodiases, parenchymatous organs were examined. In the West region of Kazakhstan, the extensity of cattle infestation with main types of helminths was as follows; Moniezia expansa (14.2 %), Echinococcus granulosus (larvae, 35.8%), Nematodirus spp. (35%), Ostertagia spp. (60.5%), Cooperia spp. (55.1%), Haemonchus spp. (22.4%), Trichostrongylus spp. (22.6%), and Thelazia rhodesi (35.8%). The seasonal and age dynamics of cattle infestation with helminths is significantly affecting their prevalence in this region. The maximum infestation of the animals with Moniezia, digestive tract Strongylata, and Thelazia was observed in the summer and the autumn seasons, while the minimum infestation was in the winter and the spring seasons. Moniezia Strongylata. Cattle in the West Kazakhstan region are infested with Moniezia, Echinococcus, Strongylata of the digestive tract and Telazia. These helminthiases have seasonal and age-related dynamics of invasion. Our results describe a comparative analysis for cattle infestation with the common types of helminths in the steppe, semi-desert, and desert zones of the West region of Kazakhstan with consideration for the season and age dynamics of animals' infestation with helminths in these zones.

Keywords | The West region of Kazakhstan, Steppe, Semi-desert, Desert zones, Cattle, Helminths, Infestation rate

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INTRODUCTION

Cattle helminthiases are widespread in the territory of the Republic of Kazakhstan causing significant economic losses (Karmaliyev, 2011).

In cattle in the West region of Kazakhstan, the main epizootic importance is related to helminthoses of the cestode and nematode classes (Karmaliyev, 2011). Cestodes include Monieziases; the pathogen is Moniezia expansa. M. expansa was found in cattle in the Ural District of Kazakhstan in 1929 (Skryabin, 1937). In the southern districts of the West region of Kazakhstan, the prevalence of sheep infestation with M. expansa Moniezia was ranged between 4–25 % (Yerbolatov et al., 1988).

Cattle Monieziasis is widely spread and occurs in the form of an enzootic disease with severe clinical course and mortality for young animals (Kuznetsov, 1958). Kuznetsov et al. (1958) reported that correlation between the age of the animals and their infestation

rate with Moniezia. The prevalence of infestation with M. benedeni in cattle in the Orenburg region was 53 %, in the Samara region was 12.6 %, and in Kazakhstan was 28.3–46.6 % (Bondarev, 1958). Monieziasis mostly found in the calves within first year of age (Kuznetsov, 1958). At the beginning, calves' grazing from mid- of May, proglottides and eggs of Moniezia dected in late June, early July, and sometimes in the winter. After the first year of age, calves can be infected with Moniezia to a lesser extent (Egorov, 1995; Kuznetsov, 1972; Durdusov, 1999) while adult calves are more resistant to infestation (Dikov and Dementyev, 1978; Yerbolatov, 1988).

In Kazakhstan, Monieziasis is spread throughout the territory of the Republic. In late summer and the autumn, the animals can excrete the eggs of Moniezia benedeni (Karmaliev, 2010). Meanwhile, Moniezia were identified in young calves and adult animals in all seasons of the year with the peak infestation in the spring and the summer (Karmaliev, 2010). Moniezia Larval echinococcosis cestodiasis caused by Echinococcus granulosus has an epizootic significance on cattle. In Kazakhstan, the infestation of cattle with E. granulosus (larvae) is notified and the prevalence of infestation ranged between 13.7 – 30.3 % (Skryabin, 1950; Wolf, 1936; Shalmenov, 1987; Kereyev, 1999; Karmaliev et al., 2003a). In Kazakhstan, the anthropogeneous plays an important role in the epizootic of echinococcosis (Ramazanov, 1995). According to Suleimenov et al. (2003), in the Almaty region, echinococcosis prevalence in cattle ranged between 14.9–31.9 %, and in sheep was 7.08–32.4 %, and they supposed that the main source of infestation was from dogs. In the West region of Kazakhstan, the prevalence of dogs' infestation with echinococcosis was 45.1 % (Suleimenov, 2003). The prevalence of cattle infestation with larval echinococcosis in the West region of Kazakhstan region was between 38.0 and 40.4 % where there is a correlation between age and the intensity of infestation (Karmaliev, 2010). In the organs of fattening cattle at the age of 1.5 – 2 years, single petrified cysts are detected, while at the age from 5 – 10 years and older, 1 to 12 larval cysts of Echinococcus might be detected (Dikov et al., 1978; Shalmenov, 1987; Abirova, 2008).

Out of the nematodes of the trichostrongyle family that are parasitizing in cattle, representatives of genera Ostertagia, Nematodirus, Trichostrongylus, Haemonchus, Cooperia are of major concern (Karmaliev, 2010) where diseases caused by these helminths usually developed in the form of mixed infestations causing significant economic damage including death of animals and reduced their productivity (Karmaliev, 2010). In the West region of Kazakhstan, Aktobe and the Atyrau; species of Nematodirus spathiger (Railliet), Ostertagia ostertagi (Stiles), Cooperia oncophora (Railliet), Haemonchus contortus (Rud), and Trichostrongylus colubriformis (Giles) are widely spread due to their ability to parasitize on cattle (Karmaliev, 2010).

Previous studies reported the infestation of Nematodirus spatiger in cattle, sheep, goats, and camels in the Atyrau, the Mangystau and the West Kazakhstan regions (Dikov and Dementyev, 1978; Yerbolatov et al., 1988; Ashetova, 2003). Likewise, Ostertagia ostertagi, Haemonchus contortus and Cooperia oncophora was found in cattle and camels in Kazakhstan (Wolf, 1936), including the West region (Dikov and Dementyev, 1978; Yerbolatov et al., 1988; Ashetova, 2003; Semenov et al., 2018). On the other hand, Trichostrongylus colubriformis is widely spread in Kazakhstan including Western region and considered the most common types of trichostrongyles, due to its unusual wide range of hosts (Karmaliev, 2010).

Cattle and sheep get infected with trichostrongyloses (genera Trichostrongylus, Cooperia, Ostertagia) in the first days of staying in the pasture. The prevalence of infestation increases from the early spring to the autumn and constitute 25 % of the intensity of infestation, i.e., 110 – 120 bions/animal while the intensity of infestation decreases by the winter season and adult animals are less infected than young animals (Yerbolatov et al., 1988; Dikov and Dementyev, 1978; Karibekov, 2002; Bragina, Khisametdinova, 2018). Haemonchosis is notified everywhere in the territory of the former Soviet Union, including Kazakhstan (Karmaliev, 2010). Cattle and sheep get infected with haemonchosis and nematodirosis in wet pastures and the disease mostly affects young animals and the prevalence of infestation is about 25 % (Karmaliev, 2010).

The current research aims to determine the epizootology of main helminthiases in cattle of different age in the steppe, semi-desert, and desert zones in the West region of Kazakhstan region during summer and winter seasons and studying the seasonal and age-related dynamics of cattle infestation with the most common types of helminths.

MATERIALS AND METHODS

This study is based on collection of samples from cattle infected with helminths. The research was carried out in peasant farms engaged in cattle breeding. Based on the physical and geographical zoning and the environmental tonality of the territory of the Western region of Kazakhstan, all farms are divided into three natural zones; Steppe, Semi-desert, and Desert. Considering the natural and climatic conditions, twenty-nine farms are located in various zones of the West region of Kazakhstan were considered for sampling (Table 1); eight farms in the steppe

zone, twelve farms in the semi-desert zone and nine farms in the desert zone. The results of the helminthological study were compared to the climatic data of the branch of RSE "Kazgidromet" for the West region of Kazakhstan. The research was carried out four times a year: in 2018, in winter from 13 to 25 February, in spring from 23 to 25 April and from 25 to 31 May, in summer from 2 to 11 June, in fall from 24 September to 03 October; in 2019, in winter from 09 to 18 January, in spring from 22 April to 1 May and from 9 to 11 May, in summer from 8 to 18 July, in autumn from 30 September to 9 October.

Table 1: Peasant farms in West region of Kazakhstan where samples were collected.

No.	Zone	Region	Peasant farm
1	Steppe	Tascala	Arai
2			Luch
3			Bayan
4			Shkanov
5		Burlin	Enbek
6			Tugultaev
7		Chingirlau	Zhaylau
8			Gaini
1	Semi-desert	Zhanibek	Stepnoy
2			Dauren
3			Erzhakai
4		Zhalpaktal	Merey
5			Kyzyltu
6		Akzhaik	Irmekkai
7			Aimeken
8		Syrym	Nur
9			Sebek
10			Shugyla
11		Karatobe	Mukhambetkali
12			Sultanbek
1	Desert	Bokeiorda	Ores
2			Birzhan
3		Jangala	Alipkali
4			Aytkaliev
5			Bekarys
6			Kaysar
7			Khamit
8		Akzhaik	Shimshir-Meshiti
9			Zhubanysh

Epidemiology of cattle helminths in the steppe, the semi-desert, and the desert zones of the West region of Kazakhstan

The research was carried out four times a year: in 2018, in winter from 13 to 25 February, in spring from 23 to 25 April and from 25 to 31 May, in summer from 2 to 11 June, in fall from 24 September to 03 October; in 2019, in winter from 09 to 18 January, in spring from 22 April to 1 May and from 9 to 11 May, in summer from 8 to 18 July, in autumn from 30 September to 9 October.

To study the epidemiology of the most common cattle helminthoses, ovo and larvoscopic studies for the fecal samples from 1,231 animals were carried out. To determine the cattle infestation rate with helminths, fecal samples from the steppe, the semi-desert, and the desert zone of the West region of Kazakhstan were studied based on the Fülleborn's flotation method (Cox, 2002). The number of eggs and larvae of helminths in 1 g of feces was counted with the use of a VIGIS counting chamber using the flotation method (Migachev and Kotelnikov, 1987; Chlachula, 2019). To detect Thelazia spp., a strong jet of 3 % boric acid solution was introduced from a syringe into the conjunctival sac, the escaping fluid was collected into a cuvette, from which the washed-out helminths were extracted. Based on the morphological structure of the infective larvae, Strongilata in the gastrointestinal tract was identified up to the genus according to Polyakov (1953) and the larvae were cultivated according to Akulin (Kereyev, 1999). For the larvae cultivation, fecal samples were taken rectally, kept in a thermostat at 25–30°C in petri dishes for seven days. Then, the feces were moistened and aerated every day and the Infective larvae were obtained according to Berman and Orlov and examined under a microscope (Kereyev, 1999). The dynamics of larval echinococcosis in cattle were studied at the laboratories of veterinary and sanitary expertise at urban markets and slaughterhouses of farms. For this purpose, parenchymal organs including liver and lungs were obtained to detect the Echinococcus cysts.

Determination of the seasonal dynamics of cattle infestation with helminths in West region of Kazakhstan region

To study the seasonal dynamics of cattle infestation rate with the most common types of helminths, the helminth ovo- and larvoscopic methods were used for investigating the feces collected from 1,231 animals in the steppe, the semi-desert and the desert zone of the West region of Kazakhstan. Our studies were performed quarterly during winter, spring, summer, and autumn. The number of helminths' eggs in 1 g of feces was counted using a VIGIS counting chamber (Migachev and Kotelnikov, 1987).

Determination of the correlation between age-related dynamics and cattle infestation with helminths

The age dynamics of animals' infestation rate with helminths were studied in all seasons based on the quantitation of

helminths' ovo- and larvoscopic from the fecal samples and helminthological dissection of parenchymal organs of cattle The infestation rate of various animals' age was studied; less than year-old, 1–3 years old, 4–5 years old, 6–9 years old, and ≥10 years.

RESULTS AND DISCUSSION

Our results revealed that Moniezia expansa was found in animals in all zones of the West region of Kazakhstan.

The prevalence of infestation caused by M. expansa, was 16.2 % in the steppe zone, 14.3 % in the semi-desert zone, and 12.3 % in the desert zone (Figure 1). E. granulosus (larvae) were detected in animals in all zones where the prevalence of infestation was 40.3 % in the steppe zone, 35.6 % in the semi-desert zone, and 31.6 % in the desert zone (Figure 1) The average prevalence of infestation caused by Strongylata was 34.5 % in the steppe zone, 23.3 % in the semi-desert zone, and 18.2 % in the desert zone. In particular, the average rate of animals' infestation in the region was 35.01 % caused by nematodes of genus Nematodirus, and the highest prevalence was noted in the steppe zone (38.5 %). Infestation percentage for Cattle was 60.5 % by *Ostertagia* spp., 55.1% by *Cooperia* spp., 22.4% by *Haemonchus* spp., and 22.6% by *Trichostrongylus* spp.

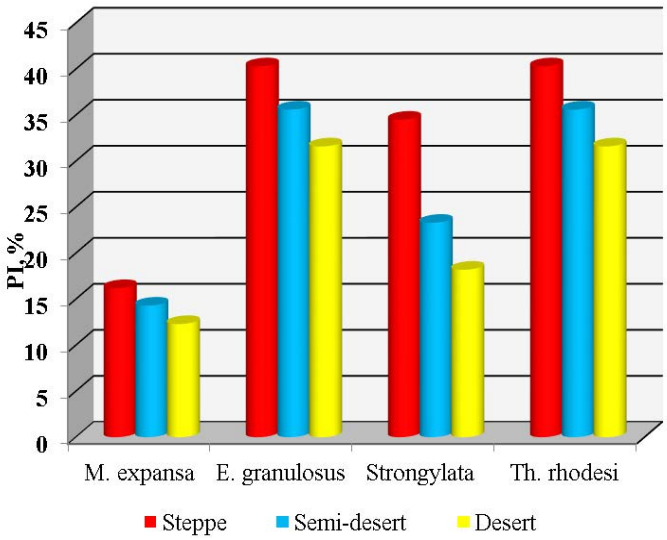

Figure 1: Prevalence of cattle infestation by the most common species of helminths.

In the steppe and the semi-desert zones, the rate of cattle infestation by Strongylata in the digestive tract was higher than in the desert zone (Figure 2).

Thelazia rhodesi was found in animals in all zones of the West region of Kazakhstan. The average prevalence of infestation caused by T. rhodesi was 40.3 % in the steppe zone, 35.6 % in the semi-desert zone, and 31.6 % in the desert zone.

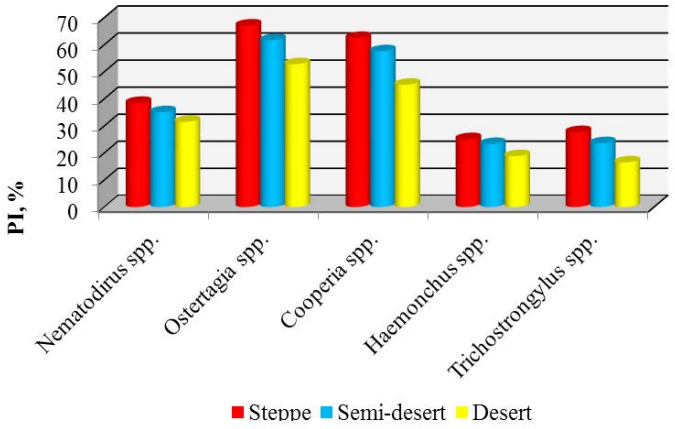

Figure 2: Prevalence of cattle infestation by Strongylata.

The average rate of cattle infestation with helminths (bions per animal) in the steppe, the semi-desert, and desert zones of the West region of Kazakhstan was 164.5 ± 13.7 for M. expansa, 117.9 ± 9.8 for *Nematodirus* spp.; 85.1 ± 7.0 for *Ostertagia* spp., 80.4 ± 6.7 for *Cooperia* spp., 129.5 ± 10.7 for *Haemonchus* spp., 120.1 ± 10.0 for *Trichostrongylus* spp., and 13.3 ± 1.1 for Th. rhodesi (Tables 2 and 3).

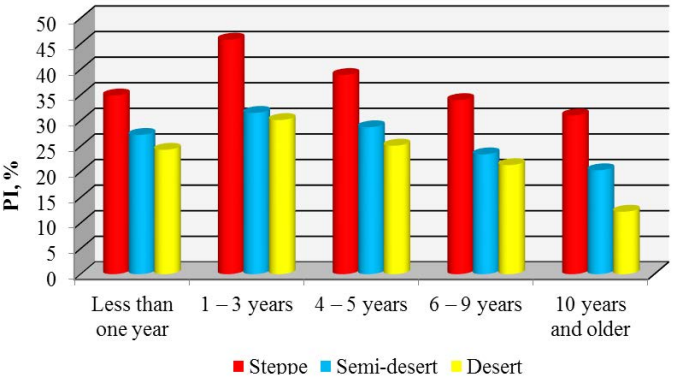

Figure 3: The age dynamics of cattle infestation by Strongylata in the digestive tract.

The seasonal dynamics of cattle infestation by main species of helminths were studied. For this purpose, helminth ovo- and larvoscopic methods were used for studying samples of feces from cattle in the steppe, the semi-desert, and the desert zone of the West Kazakhstan region. The studies were performed quarterly (in the winter, in the spring, in the summer, and the autumn).

Monieziasis the prevalence of cattle infestation by M. expansa in various seasons was the following: in the autumn and the winter, the highest infestation of cattle was observed 17.5 % and 16.2 %, respectively (Table 4). In the spring, cattle infestation decreased to 10.9 % due to the self-liberation of animals, since M. expansa life duration is short. In the summer, cattle infestation increased to 12.4 %. The prevalence of infestation in all seasons changed, and on average, it was 14.9 %. The highest prevalence of infestation was noted in the steppe zone 16.2 %, and the lowest one in

Table 2: Intensity of cattle infestation with the most common types of helminths in various zones of the West Kazakhstan region.

Helminths	The average number of eggs in 1 g of feces, bions/animal	The number of eggs in 1 g of feces, bions/animal		
		Zones		
		Steppe	Semi-desert	Desert
Moniezia expansa	164.5 ± 13.7	180.7 ± 15.0	160.2 ± 13.3	152.8 ± 12.7
Strongylata spp.	71.1 ± 5.9	77.06 ± 6.4	70.2 ± 5.8	66.2 ± 5.5
Thelazia rhodesi	13.3 ± 1.1	14.5 ± 1.2	13.5 ± 1.1	12.1 ± 1.0

Table 3: Intensity of cattle infestation by Strongylata in the intestinal tract by genera in various areas of the West Kazakhstan region.

Helminths	The average number of eggs in 1 g of feces, bions/animal	The number of eggs in 1 g of feces, bions/animal		
		Zones		
		Steppe	Semi-desert	Desert
Nematodirus spp.	117.9 ± 9.8	122.0 ± 10.1	118.9 ± 9.9	112.8 ± 9.4
Ostertagia spp.	85.1 ± 7.0	88.6 ± 7.3	85.8 ± 7.15	81.0 ± 6.7
Cooperia spp.	80.4 ± 6.7	86.6 ± 7.2	79.5 ± 6.6	75.2 ± 6.2
Haemonchus spp.	129.5 ± 10.7	136.5 ± 11.3	130.7 ± 10.8	121.5 ± 10.1
Trichostrongylus spp.	120.1 ± 10.0	126.7 ± 10.5	121.5 ± 10.1	112.1 ± 9.3

the desert zone 12.3 %. Throughout the year the animals were infected by M. expansa.

Table 4: The seasonal dynamics of the prevalence of cattle infestation by M. expansa in various zones of the West region of Kazakhstan.

Season	Average for the region, PI, %	PI, %		
		Zone		
		Steppe	Semi-desert	Desert
Winter	16.2	17.9	15.8	14.9
Spring	10.9	13.2	10.7	8.9
Summer	12.4	14.6	12.6	10.1
Autumn	17.5	19.1	18.2	15.3
On average	14.2	16.2	14.3	12.3

The intensity of infestation by M. expansa increased in the summer and the autumn and decreased in the winter. The number of eggs of M. expansa in 1 g of feces in the autumn was 181.3 ± 15.1, and in the winter 148.7 ± 12.3 bions per animal. The average number of eggs of M. expansa in 1 g cattle feces over the year amounted to 164.6 ± 13.7 bions per animal (Table 5). By the results of seasonal helminthovoscopic study of the feces, a conclusion can be made that the cattle were infected with M. expansa throughout the year. Eggs of M. expansa could be found in the feces in any season.

Strongylatoses of the digestive tract. Quantitative studies of cattle feces were made four times a year in three zones of the West Kazakhstan region. They showed that the animals' infestation by Strongylata in the digestive tract varied considerably throughout the year. The prevalence of cattle infestation in various seasons was the following: in the spring, before the grazing, the lowest infestation rate was noted 22.4 %. In the autumn, at the end of the grazing season, the highest cattle infestation of 35.1 % was noted. In the winter, the prevalence of infestation reduced to 17.6 %. On average during the year, the prevalence of infestation was 25.2 % (Table 6). The highest prevalence of infestation was noted in the steppe zone 34.5 %, and the lowest one in the desert zone 18.2 %.

Table 5: The seasonal dynamics of the intensity of cattle infestation by M. expansa in various zones of the West Kazakhstan region.

Season	The average number of eggs in 1 g of feces, bions/animal	The number of eggs in 1 g of feces, bions/animal		
		Zone		
		Steppe	Semi-desert	Desert
Winter	148.7 ± 12.3	159.8 ± 13.3	146.5 ± 12.2	139.8 ± 11.6
Spring	154.3 ± 12.8	163.8 ± 11.7	150.4 ± 12.5	148.8 ± 12.3
Summer	174.1 ± 14.5	197.1 ± 16.4	167.8 ± 13.9	157.6 ± 13.1
Autumn	181.3 ± 15.1	202.4 ± 16.9	176.1 ± 14.6	165.1 ± 13.7
On average	164.6 ± 13.7	180.7 ± 15.0	160.2 ± 13.3	152.8 ± 12.7

Table 6: Seasonal dynamics of the prevalence of cattle infestation by Strongylata in the intestinal tract in various areas of the West Kazakhstan region.

Season	Average for the region, PI, %	PI, %		
		Zone		
		Steppe	Semi-desert	Desert
Winter	17.6	27.6	14.9	11.6
Spring	22.4	31.8	19.9	15.6
Summer	26.0	34.6	24.9	18.7
Autumn	35.1	44.3	33.8	27.2
On average	25.2	34.5	23.3	18.2

The intensity of cattle infestation by Strongylata in the digestive tract increased in the summer and autumn period, and decreased in the winter. The number of Strongylata eggs in 1 g of feces in the autumn was 107.5 ± 8.95, and in the winter 21.3 ± 1.9 bions per animal. The average number of Strongylata eggs in 1 g cattle feces over the year amounted to 71.0 ± 5.9 bions per animal (Table 7).

The results showed that cattle were infected by Strongylata in the digestive tract throughout the year. Eggs of Strongylata could be found in the feces of animals in any season. The highest intensity of infestation was noted in the steppe zone 76.5 ± 6.3 %, and the lowest one in the desert zone 66.2 ± 5.5 %.

Thelaziosis. Helminthological examination of cattle in three zones of the West Kazakhstan region showed that infestation of animals by Th. rhodesi varied considerably throughout the year. The prevalence of cattle infestation in various seasons was the following: in the winter and the spring, the lowest infestation of 2.4 % and 6.9 %, respectively, was noted. In the summer and the autumn, the highest cattle infestation rate was noted 50.7 % and 81.4 %, respectively. On average during the year, the prevalence of infestation was 35.3 %. The highest prevalence of infestation was noted in the steppe zone 38.6 %, and the lowest one in the desert zone 33.2 % (Table 8).

Table 7: Seasonal dynamics of the intensity of cattle infestation by Strongylata in the intestinal tract in various areas of the West Kazakhstan region.

Season	The average number of eggs in 1 g of feces, bions/animal	The number of eggs in 1 g of feces, bions/animal		
		Zone		
		Steppe	Semi-desert	Desert
Winter	21.3 ± 1.9	25.9 ± 2.6	21.3 ± 1.7	16.8 ± 1.4
Spring	56.9 ± 5.1	63.4 ± 5.7	60.05 ± 5.4	47.3 ± 4.3
Summer	98.3 ± 8.1	102.7 ± 8.5	98.1 ± 8.1	94.1 ± 7.6
Autumn	107.5 ± 8.95	114.1 ± 9.5	101.7 ± 8.4	106.9 ± 8.9
On average	71.0 ± 5.9	76.5 ± 6.3	70.2 ± 5.8	66.2 ± 5.5

Table 8: Seasonal dynamics of the prevalence of cattle infestation by Thelazia rhodesi in various areas of the West Kazakhstan region.

Season	Average for the region, PI, %	PI, %		
		Zone		
		Steppe	Semi-desert	Desert
Winter	2.4	3.2	2.2	2.0
Spring	6.9	8.1	7.2	5.6
Summer	50.7	56.3	48.7	47.2
Autumn	81.4	86.9	79.3	78.2
On average	35.3	38.6	34.3	33.2

Table 9: Seasonal dynamics of the intensity of cattle infestation by Thelazia rhodesi in various areas of the West Kazakhstan region.

Season	The average number of helminths, bions per animal	The number of helminths, bions per animal		
		Zone		
		Steppe	Semi-desert	Desert
Winter	2.3 ± 0.19	3.5 ± 0.29	1.5 ± 0.12	2.0 ± 0.16
Spring	1.28 ± 0.13	1.3 ± 1.2	1.25 ± 0.13	1.3 ± 0.12
Summer	4.4 ± 0.36	4.5 ± 0.37	4.4 ± 0.36	4.3 ± 0.35
Autumn	45.6 ± 3.8	48.9 ± 4.1	46.9 ± 3.9	41.1 ± 3.4
On average	16.3 ± 1.3	14.5 ± 1.2	13.5 ± 1.1	12.1 ± 1.0

The intensity of infestation by Th. rhodesi increased in the summer and the autumn and decreased in the winter and the spring. The average number of Th. rhodesi in the cattle changed throughout the year; in the winter in was 2.3 ± 0.19 bions per animal, while in the autumn it was 45.6 ± 3.8 bions per animal. In the spring and the summer, the number of Th. rhodesi decreased significantly to 1.28 ± 0.13 and 4.4 ± 0.36 bions per animal, respectively. The average number of Th. rhodesi in cattle over the year amounted to 16.3 ± 1.3 bions per animal. The highest intensity of infestation was noted in the steppe zone 14.5 ± 1.2 bions per animal, and the lowest one in the desert zone 12.1 ± 1.0 bions per animal (Table 9).

The age dynamics of animals' infestation rate were studied in all seasons. Based on the results of quantitative helminth ovo- and larvoscopic study of the samples of feces and the helminthological dissection of parenchymal organs from cattle, infestation rate of various age groups was studied less than year-old, 1-3 years old, 4-5 years old, 6-9 years old, and 10 years and older.

Monieziasis. Helminthovoscopic studies of the feces from cattle showed that the prevalence of infestation by M. expansa reduced with the age of the animals. In young cattle less than one year of age, it was 28.1 %, at the age of 1–3 years 24.0 %, in cattle at the age of 4–5 years 21.3 %, at the age of 6–9 years 4.3 %, and at the age of 10 years and older 0 % (Table 10).

Strongylata in the digestive tract. Helminthovoscopic studies of the feces of cattle showed that the prevalence of infestation by Strongylata in the digestive tract of the animal reduced.

In young cattle less than one year of age, it was 28.8 %, at the age of 1–3 years 35.8 %, in cattle at the age of 4–5 years 30.9 %, at the age of 6–9 years 26.2 %, and at the age of 10 years and older 21.1 % (Table 11).

Larval echinococcosis. Total of 1,019 animals were examined (Table 12). The average prevalence of infestation by echinococcosis was 33.2 %. Young animals under one year of age were free from infestation. In the cattle at the age of 1–3 years, the average infestation rate was 27.8 %, in the cattle at the age of 4–5 years 34.2 %, at the age of 6–9 years 44.5 %, and at the age of 10 years and older 58.8 %.

Table 10: The age dynamics of cattle infestation by Moniezia in the West Kazakhstan region.

The age of the animals	Zone					
	Steppe		Semi-desert		Desert	
	Examined animals	PI, %	Examined animals	PI, %	Examined animals	PI, %
Less than one year	70	33.8	87	26.9	90	23.7
1 – 3 years	71	28.9	88	23.6	87	19.5
4 – 5 years	69	25.3	88	20.5	80	18.3
6 – 9 years	71	5.2	93	4.4	82	3.3
10 years and older	75	0	96	0	84	0
Total	356		452		423	
On average		18.6		15.1		12.9
The total of 1,231 animals were examined						
The average PI is 15.3 %						

The average prevalence of infestation was 15.3 %.

Table 11: The age dynamics of cattle infestation by Strongylata in the digestive tract in the West Kazakhstan region.

The age of the animals	Zone					
	Steppe		Semi-desert		Desert	
	Examined animals	PI, %	Examined animals	PI, %	Examined animals	PI, %
Less than one year	70	34.9	87	27.2	90	24.3
1 – 3 years	71	45.8	88	31.5	87	30.1
4 – 5 years	69	38.9	88	28.7	80	25.1
6 – 9 years	71	34.0	93	23.4	82	21.3
10 years and older	75	31.0	96	20.3	84	12.2
Total	356		452		423	
On average		36.9		26.2		22.6
The total of 1,231 animals were examined						
The overall average is 28.5 %						

The average prevalence of infestation was 28.5 % (Figure 3).

Table 12: The age dynamics of cattle infestation by echinococcosis in the West Kazakhstan region.

The age of the animals	Zone					
	Steppe		Semi-desert		Desert	
	Examined animals	PI, %	Examined animals	PI, %	Examined animals	PI, %
Less than one year	48	0	56	0	51	0
1 – 3 years	63	34.0	78	26.8	61	22.6
4 – 5 years	72	42.1	79	32.0	71	28.7
6 – 9 years	65	50.0	75	49.4	72	34.0
10 years and older	69	62.9	86	58.7	73	54.8
Total	317		374		328	
On average		37.8		33.8		28.0
The total of 1,019 animals were examined						
The average PI was 33.2 %						

With the age of the animals, the prevalence of infestation increased. In the cattle at the age of 1–3 years, parenchymal organs (liver, lungs) had single petrified cysts, and at the age of 4–10 years and older, they had 1 to 10 cephalocysts of echinococcus (Figure 4). Dogs were the main source of cattle infestation with larval echinococcosis.

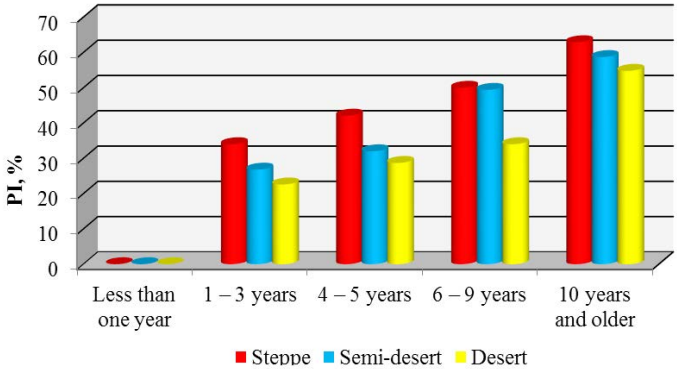

Figure 4: The age dynamics of cattle infestation by Echinococcosis in the West Kazakhstan region.

DISCUSSION

According to Dikov and Yerbolatov, Moniezia were identified in young cattle of the previous year of birth and in adult animals in all seasons of the year with the peak infestation in the spring and the summer. The prevalence of infestation was 20–25 %. Monieziasis was mostly found in young cattle, and adult animals were more resistant to infestation (Yerbolatov et al., 1988; Dikov and Dementyev, 1978). Researchers noted that cattle and sheep had been infected with trichostrongyloses (genera Trichostrongylus, Cooperia, Ostertagia) in the first days of staying in the pasture. The prevalence of infestation increased from the early spring to the autumn, and made 25 % of the intensity of infestation, i.e., 110–120 bions/animal. By the winter, the intensity of infestation decreased. Adult animals were less infected than young animals (Yerbolatov et al., 1988; Dikov and Dementyev, 1978; Karibekov, 2002). According to the results of the research, seasonal and age dynamics of prevalence and intensity of cattle infestation by helminths were expressed in the West Kazakhstan region. The maximum infestation of the animals with Moniezia, digestive tract Strongylata, and Thelazia was observed in the summer and the autumn, and the minimum infestation in the winter and the spring. With age, the extensiveness of animals' infestation with Moniezia and the digestive tract Strongylata reduced, and that of infestation with echinococcosis increased. The authors found that the highest prevalence of cattle infestation by Moniezia and Strongylata in the digestive tract was noted in the autumn (17.5 and 35.1 %), and the lowest in the spring and the winter (10.9 % and 17.6 %, respectively).

According to the studies, the prevalence of cattle infestation with larval echinococcosis in the West Kazakhstan region on average was 38.0–40.4 %. With the age, intensity of infestation increased. In the organs of fattening young cattle at the age of 1.5–2 years, single petrified cysts were found, and at the age of 5–10 years and older 1 to 12 larval cysts of Echinococcus (Dikov and Dementyev, 1978; Shalmenov, 1987; Abirova, 2008). According to the data of the authors, the prevalence of infestation by larval echinococcosis increased with the age of the animals. The lowest prevalence of infestation was noted at the age of less than one year 0 %, and the highest prevalence of infestation was noted at the age of 10 years and older 58.8 %.

As noted by researchers, thelaziosis is spread throughout the territory of Kazakhstan. Cattle infestation with Thelazia was observed throughout the year. The peak of infestation was noted from June to October. The prevalence of cattle infestation was 100 %. By the winter, the prevalence of infestation in the animals decreased and amounted to 7–10 %. Thelaziosis was found in the animals of all age groups (Dikov and Dementyev, 1978). According to the results of the authors, the greatest

prevalence of cattle infestation by Thelazia was noted in the autumn (81.4 %), and the lowest in the winter (2.4 %).

CONCLUSION

Cattle in the West Kazakhstan region are infested with Moniezia, Echinococcus, Strongylata of the digestive tract and Telazia. These helminthiases have seasonal and age-related dynamics of invasion. The seasonal dynamics of cattle infestation with helminths were prominent in the West region Kazakhstan region. The maximum infestation of the cattle with Moniezia and Strongylata was observed in the summer and autumn while the minimum infestation was during the winter and spring. The highest rate of cattle infestation by Moniezia and Strongylata was noticed in the autumn (17.5 and 35.1 %) while the lowest rate was in the spring and winter;10.9 % and 17.6 %, respectively Likewise, the highest prevalence of infestation was noted at the age of ≤ one year for Moniezia was 28.1% and 35.8% for Strongylata. While the of infestation rate for older calves (1-3 years old) for Moniezia and Strongylata. was 0 and 21.1%, respectively which mean that older calves are less susceptible to the infestation with M. expansa and *Strongylata* spp. On the other hand, the highest prevalence of cattle infestation by Thelazia was noticed in the autumn (81.4 %), and the lowest was in winter (2.4 %). The highest prevalence of infestation by Moniezia and Strongylata was noted at the age of less than one year and 1- 3 years (28.1 and 35.8 %), and the lowest at the age of 10 years and older (0 and 21.1 %), respectively. The prevalence of infestation by larval echinococcosis increases with the age of the animals. The lowest prevalence of infestation was noted at the age of less than one year 0 %, and the highest prevalence of infestation was noted at the age of 10 years and older 58.8 %.

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AUTHORS CONTRIBUTION

All authors contributed equally to the manuscript.

CONFLICT OF INTEREST

The authors have declared no conflict of interest.

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