DISTRIBUTION OF EARTHWORMS IN SOILS OF THE SOUTH KAZAKHSTAN REGION

Issayeva AU*, Kenzhalieva GD, Dabylova JJ M.Auezov South Kazakhstan State University, Shymkent city, The Republic of Kazakhstan *E-mail of the corresponding author: akissayeva@mail.ru

Abstract

As a result of studies, it was found that population of earthworms in the territory of the South Kazakhstan region form a 6 species of the family Lumbricidae: Aporrectodea caliginosus trapezoids, Aporrectodea caliginosus caliginosus, Aporrectodea roseus, Dendrobaena veneta, Eisenia foetida, Allolobophora leoni. Earthworms Aporrectodea caliginosus trapezoids, Aporrectodea caliginosus caliginosus, Aporrectodea roseus, Eisenia foetida are found in many types of soils, including typical and light gray soils, gray-brown and takyr saline. The other two species - Dendrobaena veneta and Allolobophora leoni confined only to the mountain-brown soil types foothill districts.

Key words: earthworms, soils, distribution, the South Kazakhstan Region

1. Introduction

Earthworms are natural inhabitants of soil involved in a complex cycle of mineralization of organic waste. On the other hand, their livelihoods affected by different soil and climatic conditions. As a consequence, their number correlates with soil characteristics such as moisture levels, salinity, presence of heavy metals or other toxic ingredients. It is this quality is used as a bioindicator for determining the level of environmental pollution (Domínguez J et al, 2001). In addition, the known data on the seasonal dynamics of the number of earthworms in the soil (Gordo H, 2003, Monroy F et al, 2006, Cervantes G et al, 2010). During the taxonomic analysis of earthworms focuses on molecular analysis of the data (James S, 2010).

2 Materials and methods of researches

2.1 Soil

Materials of our research were populations of earthworms, common to different types of soils of the South Kazakhstan Region (SKR). In the region there are 19 types and subtypes of soils. Of these, mining and black-brown, mountain-gray-brown, meadow-gray and gray soils irrigated, compared with others, are less common. The first two types of soils are found only in the high foothills Tulkubas, Tolebi, Kazygurt and Baidibek areas, last 2 types - mainly on the plains adjacent to the river basin. Other types of soil in the direction of flow of the geographical Tien Shan mountains to the valley of the Syr Darya river forms a conditional series of horizontal bands in the following order: the typical gray soils \rightarrow light gray soils \rightarrow gray-brown \rightarrow desert sand \rightarrow saline solonets \rightarrow takyr. However, this number is determined by the conditional predominant soil type. The humus content in these soils ranges from 0.3 to 1.8%, total nitrogen N (by Kjeldahl) 0.01 - 0.2%, phosphorus - P2O5 5.6 - 38 and K 11.0 - 38.2 mg / kg.

Climatic conditions: In the direction of the geographical runoff from the mountains to the lower reaches of the region are developing several climatic conditions - mountain, moderately moist,

moderately dry and dry, the totality of which is characterized as arid climate. Precipitation decrease in the same direction from 600 to 150 mm. SKR territory has the highest thermal background in Kazakhstan. The summer months are characterized by deficiency of moisture and high temperatures with large daily fluctuations. Temperature differences between winter minima and summer maxima can range from - 30 to $40 \pm 4,5^{0}$ C.

Set of characteristics listed above soil and climatic conditions, allows to subdivide the territory of SKR into five natural-economic zones, with the following weights: -3015.1 desert, foothill-desert-steppe - 7878.5, subtropical deserts - 2906.7, subtropical foothill desert - 3509.9, Central- Asian mountain area - 1504.7 thousand hectares These areas differ in the degree of anthropogenic load and structure prevailing evolutionary ecosystems.

Areas of distribution of various species of earthworms were investigated in Baidibek, Suzak, Chardara, Tolebi, MaktaralSKRm, KazygurSKRm and Ordabasy district SKR.

2.2 Research Methods

2.2.1 Collection of earthworms. Collection of earthworms was conducted by the method II Malevich (1950) for the soil horizon depths 0-10, 10-20, 20-30, 30-40, 40-50 cm. In the lab samples collected in special bags transported of dense tissue with the soil. Before examining the specimens collected earthworms were fixed in 2% formaldehyde. Fixed material was stored in 0.4% formalin with addition of 3-4 drops of glycerol.

2.2.2 *Taxonomic analysis*. Taxonomic analysis of the species composition of populations of worms was determined in vitro by Reynolds, J. W., and Wetzel, M. J. (2004). The main taxonomic characters were used the number of segments, the length of adult worms, head shape and location of the broad belt segments.

3. Results of researches and discussion

3.1 The taxonomic analysis of earthworms

Study found that the territory of SKR found six species of earthworms, areas of distribution are confined to the specific soil and climatic zones of the region. This species: *Aporrectodea caliginosus trapezoids, Aporrectodea caliginosus caliginosus, Aporrectodea roseus, Dendrobaena veneta, Eisenia foetida, Allolobophora leoni.*

Genus Aporrectodea. Nephridia clavate (U), folded. The digestive system begins with the mouth and esophagus ends. Color worms varies from brown to colorless. In males, the sex organs are located on the 15 segment.

Ap. caliginosa trapesoides - length of 60-160 mm, width 4.7 mm. Number of segments 104-248. Brownish-red color. Rounded body, hardish to the touch. Central roller 29 and located between the segments 34-35

Ap. caliginosa caliginosa - length of 60-160 mm, width 7.4 mm. The number of segments 104-248. Pale reddish color. The body shape is round, sealed. Central roller 27 and located between the segments 34-35.

Aporrectodea rosea - the length of 35-150 mm, width 6.3 mm. The number of segments 71-170. Pale reddish color. The body shape is round, sealed. Central roller 26 and located between the segments 31-33. *Eisenia foetida* - length 40-130 mm, width 4.2 mm. The number of segments 80-130. Worms red-pink color with horizontal stripes. The body shape is round, sealed. Central roller 26 and located between the segments 31-32.

Dendrobaena veneta - length of 50-95 mm, width 4.7 mm. The number of segments 125-140. Worms black-brown color with horizontal stripes. The body shape is round, sealed. The central roller is wider than other species and located between segments 26 and 33.

Allolobophora leoni - length of 65-130 mm, width 8.5 mm. The number of segments 148-180. Worms slightly pink color almost colorless. Rounded body shape, the seal begins after the central belt. The central roller is disposed between segments 25 and 34.

3.2 Distribution of earthworms in soils of the SKR

Revealed that the mountain-brown, gray-brown and gray desert soils typical of foothill areas meet the highest number of species: Kazygurt -5, Toleby-4, Ordabasy -4. While in saline gray-brown soils and takyr of Baidibek, Suzak, Chardara Maktaral areas and their number does not exceed 2-3 species. Species composition of earthworms in each area are presented in Table 1.

Analysis of the results of research shows that species A. leoni from studied seven soil types found only in the mountain-brown soils Kazygurt district, which are high in humus and a loose structure. The incidence of this type of adults was 26 per m2. Species A. veneta found in mountain-brown and gray-brown soils of foothill areas (Kazygurt and Toleby) frequency of 24 to 12 adults per m2. In populations of earthworms collected in other areas of research, these species are not met, which proves that these species are confined to the soil types, nutrient-rich substrate and moderate climatic conditions.

Species Ap. roseus met simultaneously in the meadow gray soils, typical gray earth, mountain gray-brown and gray-brown soils of Baidibek, Suzak, Ordabasy and Kazygurt districts. Incidence was respectively 12, 2, 6 and 29 adults per m2. With taxonomic analysis of samples from the vicinity of the city of Shymkent, Chardara, Toleby and Kazygurt areas was set Ap. caliginosus trapezoides, whose frequency was 12, 2, 8, 34, and 28 adults per m2. This species of comparison with others is the most common in many types of soil area, its frequency of occurrence depends on the performance of the annual rainfall in the area. Accordingly, it is often found in the foothill areas, and its occurrence rate decreases toward the plain. Another of the most common area for species of earthworms is Ap. caliginosus.

It is found in the mountain-brown, gray-brown mountain soil types, as in a typical and light gray soils in the range of 13 to 37 adults per m2. Next species E. foetida also timed to coincide with the different types of soils as a meadow, and a typical light gray soils, mountain-brown, gray-brown mountain and gray-brown soils. These soils incidence adult per m2 in the range from 4 to 18 (Figure 1).

The above data show that the A. leoni and A.veneta preferred nutrient rich soil types temperate climatic zones and, compared with other types of less adapted to other types of soils common in drier areas. The most common species in the territory of South Kazakhstan region are E. foetida and A. caliginosus caliginosus, due to their higher environmental adaptation to arid climates.

4. Conclusion

Thus, on the basis of the research results the following conclusions:

• population of earthworms in the territory of the South Kazakhstan region form a 6 species

of the family Lumbricidae: Aporrectodea caliginosus trapezoids, Aporrectodea caliginosus caliginosus, Aporrectodea roseus, Dendrobaena veneta, Eisenia foetida, Allolobophora leoni.

• earthworms Aporrectodea caliginosus trapezoids, Aporrectodea caliginosus caliginosus, Aporrectodea roseus, Eisenia foetida are found in many types of soils, including typical and light gray soils, gray-brown and takyr saline. The other two species - Dendrobaena veneta and Allolobophora leoni confined only to the mountain-brown soil types foothill districts.

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Species	Areas SKR										
	Shymk ent	Baidib ek	Chard ara	Makta ral	Suzak	Ordab asy	Tolebi	Kazy gurt			
Aporrectodea caliginosus trapezoides	+++	-	+	-	-	++	+++	+++			

Table 1. Species composition of the population of South Kazakhstan Lumbricidae

Aporrectodea caliginosus caliginosus	+++	-	-	++	+	++	+++	+++	
Aporrectodea. roseus	-	+	-		+	++	-	+++	
Eisenia foetida	-	+	+	++	+	++	+++	-	
Dendrobaena veneta	-	-	-	-		-	++	++	
Allolobophora leoni	-	-	-	-	-	-	-	+	
Note: +++ high frequency of occurrence, the average frequency of occurrence ++ + rare - not found									



Figure 1. The frequency of occurrence of species of earthworms on areas SKR