

BIOLOGICAL DIVERSITY OF SOIL MACROFAUNA OF SAMARKAND REGION

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Abstract

The systematic composition, ecology and economic significance of the soil macrofauna of the gardens of the Samarkand region were studied. The study revealed 28 species of garden soil macrofauna belonging to 8 families and 20 genera. 9 species of terrestrial molluscs: 6 families and 6 generations; 5 types of earthworms: 1 family and 3 generations and 14 insects: 1 family and 10 generations. As new species for the study areas, 4 species of earthworms, 4 species of terrestrial mollusks and 6 species of insects were identified. Comparison of species distributed in the biocenosis and agrobiocenosis gave the following results. In the distribution of soil macrofauna of gardens in the Samarkand region in biocenoses, 28 species by species: 14 insect species in nuts and almonds, 5 earthworm species and 9 land mollusk species, 10 species in agrocenoses: 6 insect species in diamonds, vineyards and apricots 6 insect species were registered , 9 species of terrestrial molluscs. In the gardens, first laid out on the hills, macrofauna was sparse, only earthworms and insect larvae.

Keywords: soil microfauna, orchards, seasonal dynamics, Samarkand region.

Introduction

Soil management is important from an environmental point of view. If it is not well planned and implemented, it can lead to a decrease in soil organic matter, mainly due to the process of mineralization, leading to increased soil degradation and erosion. Gardens have their own characteristics that balance the soil from an ecological point of view. The perennial nature of the trees, the tiered habitat, and the variety of vegetation in the gardens make them a unique agricultural system that can provide many ecosystem services. Alternative garden management through smart agriculture can play an important role in maintaining biodiversity and its functions. The abundance and diversity of soil fauna and the composition of organic matter are major indicators of the rate of soil improvement in agricultural systems. In a functional agroecosystem, the higher the level of

intraspecific or interspecific biodiversity, the higher the resistance of the latter to degradation, which increases their resistance.

The biodiversity of garden soils is very high and often poorly understood. The most important components of the macrofauna of garden soils are the abundance of earthworms, terrestrial molluscs, ants, termites and beetles and their role in soil formation. The importance of their work has led to them being called "ecosystem engineers", i.e. organisms that directly or indirectly modulate resource availability for other edaphic species by changing the physical state of biotic and abiotic soil materials and their role in creating habitat.

Currently, all over the world, in order to improve the agricultural land fertility, scientific research is being carried out to develop and introduce innovative methods for improving soil fertility. For this purpose, the organisms species

composition determination that take an active part in soil-forming processes and in increasing fertility, as well as the their bio-ecological characteristics assessment is one of the most important tasks. The recommendations development for improving soil fertility of constantly used agricultural areas, in particular orchards soils, based on determining the soils macrofauna species composition in orchards, analyzing their distribution and assessing the macrofauna bioecological characteristics, determining the soils macrofauna economic value, is of great scientific and practical importance, as well as and economic importance (David Bignell, Reginaldo Constantino, Csaba Csuzdi, Agus Karyanto, Suleymane Konaté, Julio Louzada, F. X. Susilo, Jérôme Ebagnerin Tondoh and Ronald Zanetti, 2015; Barros E., Pashanasi B., Constantino R., Lavelle P., 2002; Bruce A. Snyder, Mac A. Callahamjr, 2019; Juliane Filser, Jack H. Faber, Alexei V. Tiunov, Lijbert Brussaard, Jan Frouz, Gerlinde De Deyn, Alexei V. Uvarov, Matty P. Berg, Patrick Lavelle, Michel Loreau, Diana H. Wall, Pascal Querner, Herman Eijsackers, and Juan José Jiménez, 2016).

Today, in our Republic, in order to continuously provide the population with high-quality vegetables and fruits, intensive orchards are being created; special attention is paid to the approach to the problems' scientific solution arising in this area. Currently, our Republic has made significant progress in the ecosystem fauna study, in particular, the rare invertebrates protection, as well as the biodiversity preservation, the modern methods development of their rational use.

Materials and research methods.

The studies were carried out in 2004-2017 in Zarafshan valley (using the example of Samarkand region) in the spring, summer and autumn seasons in orchards in natural biocenoses: in the Etti uyli say Urgut region tract and in the walnut thickets of Zarafshon natural national park of the Jambay region; in agrocenoses - orchards - apricots, apple trees and vineyards. The material collection, its

fixation, anatomical studies and the morphological features study were used methods (Gilyarov, Krivolutsky, 1985; Kryzhanovsky, 1965; Perel, 1979; Fasulati, 1971; Pazilov, Azimov, 2003; Wardle D., 2002; Ruiz N., Lavelle P., 2008; Ruiz N., 2004; Rienk Miedema, 1997; P. Bullock, 2009; David C. Coleman, Diana H. Wall, 2015). Vertical surveys were carried out during excavations at 0-10 cm, 10-20 cm, 20-30 cm and 30-40 cm depth. Each sample collected was labeled with the day, collection year and place. The collected samples were fixed in 0.4-0.5% formalin solution and some in 70% alcohol (Atlavinite, 1990; Zrajevsky, 1957; Protsenko, 1968; Shokhin, 2007).

Research results and discussion.

According to the studies results, it was revealed that the orchards macrofauna of Zarafshan valley consists of 8 families, 20 genera and 28 species. It has been established that the soil macrofauna consists of 14 species of insects and their larvae belonging to 1 family and 1 subfamily, 5 species of earthworms and 9 species of terrestrial mollusks belonging to 8 families.

Based on the collected and identified materials, 14 species of insects and their larvae belonging to 1 family, 5 species of earthworms, 9 species of terrestrial mollusks belonging to 8 families were found in the soil macrofauna, the systematic composition and taxonomic structure of which are given below.

Earthworms

Species Annelides

Subspecies Clitellata

Class Oligochaeta

Category Lumbricomorpha

Family Lumbricidae

Genus Aporetodea (Orley, 1885);
Vsevolodova-Perel, 1997

** *1. *Aporrectodea caliginosa caliginosa* (Savigny, 1826); Vsevolodova – Perel, 1997.

2. *Aporrectodea rosea* (Savigny, 1826), Vsevolodova – Perel, 1997.

Genus *Dendrobaena* Eisen, 1873 emend. Pop, 1941, emend. Vsevolodova – Perel, 1997.

**3. *Dendrobaena byblica* (Rosa, 1893); Vsevolodova – Perel, 1997.

**4. *Dendrobaena veneta* (Rosa, 1886); Vsevolodova – Perel, 1997.

Genus *Eisenia* Malm, 1877, emend. Michaelsen, 1900, emend. Perel; 1974, emend. Vsevolodova – Perel, 1997.

**5. *Eisenia fetida* (Savigny, 1826); Vsevolodova – Perel, 1997

Land molluscs

Species Mollusca

Subspecies Conchifera

Class Gastropoda

Category Srylommatophora A.Schmidt, 1855

Family Cochlicopidae Hesse, 1922

Genus *Cochlicopa* Ferussac, 1821

**6. *Cochlicopa lubrica* (Müller, 1774)

Family Valloniidae Morse, 1864

Genus *Vallonia* Risso, 1826

**7. *Vallonia pulchella* (Müller, 1774)

Family Ariophantidae Gudwin – Austen, 1888

Genus *Macrochlamys* Benson, 1832

*8. *Macrochlamys sogdiana* (Martens, 1971)

Family Agriolimacidae Wagner, 1935

Genus *Deroceras* Rafinesque, 1820

9. *Deroceras caucasicum* (Simroth, 1901)

Family Parmacellidae Gray, 1860

Genus *Candaharia* Godwin – Austen, 1888

*10. *Candaharia levanderi* (Simroth, 1901)

Family Hygromiidae Tryon, 1866

Genus *Leucozonella* Lindholm, 1927

**11. *Leucozonella rufispira* (Martens, 1874)

**12. *Leucozonella retteri* (Rosen, 1897)

13. *Leucozonella mesoleuca* (Martens, 1874)

Genus *Xeropicta* Monterosato, 1892

14. *Xeropicta candaharica* (L.Pfeiffer, 1846).

Banded baleen beetles

Species Arthropoda

Subspecies Tracheata

Class Insecta

Category Coleoptera

Family Scarabaeidae Lawkence, Newton, 1995

Melolonthinae Medvedev, 1951 from the subspecies family; Lowkens, Newton, from a family of subspecies 1995

Species *Melolontha* Fabricius, 1775

15. *Melolontha hippocastani* Fabricius, 1801

16. *Melolontha afficta* Ballion, 1870

Species *Amphimallon* Latreille, 1825

17. *Amphimallon solstitiale* Linnaeus, 1758

Species *Polyphylla* Harris, 1841

18. *Polyphylla adspepsa* Motschulsky, 1854

**19. *Polyphylla tridentata* Reitter, 1892

Species *Chioneosoma* Kraatz, 1891

**20. *Chioneosoma porosum* Fischer von Waldheim, 1823

Species *Oryctes* Illiger, 1798

21. *Oryctes nasicornis* Linneus, 1758

Subspecies family Cetoniinae

Species *Epicometis* Burmeister, 1842

**22. *Epicometis turanica* Reitter, 1892

Species *Oxythyrea* Mulsant, 1842

**23. *Oxythyrea cinctella* Schaum, 1841

Species *Stalagmopygus* Burmeister, 1842

24. *Stalagmopygus albellum* Pallas, 1781

Species *Cetonia* Fabricius, 1775

25. *Chafer Cetonia aurata* Linnaeus, 1761

Species *Potosia* Mulsant, 1871

**26. *Potosia turkestanica* Kraatz, 1886

**27. *Potosia marginicollus* Fabricius, 1792

28. *Potosia lugubris* Herbst, 1786

Note: * - Central endemics of Central Asia.

** - New species for garden soils.

When studying the orchards soil macrofauna of Zarafshan valley, it was found that the dominant species were the families Scarabaeidae (50.0%), Lumbricidae (17.9%) and Hygromiidae (14.3%).

The taxa quantitative parameters common in the orchards soil macrofauna of Zarafshan valley are presented. According to which the macrofauna includes 8 families and 20 genera, of which the families Lumbricidae and Scarabaeidae are represented by a large number of genera, while the Scarabaeidae family includes a larger number of species. Of these, terrestrial mollusks are represented by 6 families and 7 genera, earthworms by 1 family, 3 genera and 5 species and, accordingly, insects made up 1 family, 10 genera and 14 species. The genera belonging to the Scarabaeidae family accounted for 20% and the species of the same family 3.92%. From this it can be concluded that in the soil macrofauna, the number of harmful species

feeding on plant roots is 50%. Representatives of the Lumbricidae family make up 1.4%, but they improve the soil structure. Earthworms, despite the smaller number of species composition, are quantitatively considered the dominant species. In orchards on an area of 0.25 m², 45-50 specimens of this species were found.

Studies results on the soil macrofauna species composition of the studied region, where earthworms, terrestrial mollusks and insects were collected, their external structure and biological characteristics, ecological groups, distribution, as well as distribution in biocenoses and agrocenes of various orchards.

As a study result of the orchards soils macrofauna of Zarafshan valley, all orchards were divided into two groups: group 1 - biocenoses (parcels of almond and nut orchards of Etti uyli say, walnut and apple orchards of Zarafshan national natural park), group 2 - agrocenes (apple, apricot orchards private gardens, as well as the gardens of farms "Kaldirgoch nafis boglari" and "Ohalik intensive boglari").

In the soil macrofauna of the first group - in the biocenoses of almond, walnut and apple orchards, the composition of soil macrofaunas consisted of 22 species in the almond, 16 species in the walnut grove, the populations of *Eisenia fetida* геобионт, *Melolontha hippocastani*, *Amphimallon solstitialis*, *Oryctes nasicornis*, *Cetonia aurata*, geobionts, phytophages, rhizophages are quantitatively dominant.

The largest number of species is in almond and walnut orchards, since the soil in natural biocenoses is not cultivated by humans. In natural gardens, the species composition and number of species is higher than in agrocenes. *Aporrectodea caliginosa caliginosa* was first recorded in the Samarkand region as a new subspecies.

In the second group, in agrocenes, consisting of apple and apricot orchards and vineyards, a private garden and horticultural farms "Kaldirgoch nafis boglari" and "Ohalik intensive boglari", the distribution of species was observed - in apple orchards - 13 species, in vineyards - 9, in apricot orchards - 7, private

garden - 6 and intensive orchards - 4 types. It has been established that the species *Dendrobaena byblica*, *Macrochlamys sogdiana*, *Deroceras caucasicum*, *Melolontha hippocastani*, *Oryctes nasicornis*, *Amphimallon solstitialis*, *Cetonia aurata* are permanent, as well as the dominant species in the soils of orchards.

The low number of species in agrocenoses, especially in intensive gardens, is the result of constant human use of mechanical, agrotechnical, physicochemical and biological methods of pest control. This is due to the fact that in the agrocenosis, due to different processing of gardens, the species and quantitative composition of species decreased.

CONCLUSION

It has been established that the macrofauna of soils in orchards includes 28 species belonging to 8 families and 20 genera. Of these, there are 9 types of terrestrial mollusks: 6 families and 6 genera; 5 species of earthworms: 1 family and 3 genera, and 14 species of insects: 1 family and 10 genera. 4 species of earthworms, 4 species of terrestrial molluscs and 6 species of insects were identified as new for the studied area. It has been determined that the macrofauna of soils of orchards, as a habitat, includes 6 ecological groups: insects and earthworms - geobionts of 18 species (64.33%), terrestrial molluscs - xerohygrobionts of 4 species (14.2%), xerobionts of 3 species (10.7%), psammobionts - of May beetle, hygrobionts and xeromesobionts of 1 species (3.57%); by the way of feeding: beetles and terrestrial mollusks are phytophages, larvae of beetles are rhizophages and earthworms are pedophages.

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