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Systematic Structure, Ecology and Economical Meaning of Soil Macrofauna of Zarafshan Valley's Orchards

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ABSTRACT

It has been established that the soils macrofauna 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.As studies result of orchards soils macrofauna of Zaravshan valley, it was found that insects accounted for 50%, terrestrial molluscs 32% and earthworms 18%. It has been established that the macrofauna of the soils of the orchards of the Zeravshan Valley, including earthworms, terrestrial mollusks, insects and their larvae in terms of their species and quantitative composition, the ecological group of geobionts is represented by the largest number of species - 18, which amounted to 64.33%, species of the xerogigrobiont group - 14 and 14.2%, xerobiont species - 3 and 10.7%, and hygrobiont, psammobiont and xeromesobiont groups by 1 species, which was 3.57%.

KEYWORDS: *Soil Microfauna, Orchards, Seasonal Dynamics, Middle Zarafshan Valley.*

INTRODUCTION

Today, the fruit trees and vegetable crops cultivation is one of the most important areas in order to provide the world's population with high-grade food. It should be noted that the rapid increase in the cultivated volume of intensive orchards in the world, as well as the agriculture intensification, are the changes cause in biocenoses and natural natural resources, in particular, a river decrease in the fauna species composition, which, along with this, leads to a decrease in soil fertility.In this regard, the orchards faunistic analysis impoverished in the soils species composition , in particular, the individual species participating determination in soil restoration, their importance assessment in increasing soil fertility is important in the development and implementation of practical recommendations in production.

Currently, all over the world, in order to improve the agricultural landfertility, 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 soilsmacrofaunaeconomic value, is of great scientific and practical importance, as well as and economic importance (David Bignell, et. al., 2015; Barros E., et al., 2002; Bruce A. Snyder & Mac A. Callahamjr, 2019; Juliane Filser, et al., 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 faunastudy, in particular, the rare invertebratesprotection, as well as the biodiversitypreservation, the modern methods development of their rational use.

MATERIALS AND METHOD

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 Ettiuyli 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 materialcollection, 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; 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 cmdepth. Each sample collected was labeled with the day, collectionyear 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).

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.

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% (Table 1). 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 $0.25m^2$, 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.

Table 1: Taxonomic composition of orchards soil macrofauna in Zarafshan valley

Soil macrofauna families	Taxonomic units		
	Births Number	Number of species	in %
Lumbricidae	3	5	17.9
Cochlicopidae	1	1	3.57
Valloniidae	1	1	3.57
Ariophantidae	1	1	3.57
Agriolimacidae	1	1	3.57
Parmacellidae	1	1	3.57
Hygromiidae	2	4	14.3
Scarabaeidae	10	14	50.0
Total: 8	20	28	100.0

As studies result of orchards soils macrofauna of Zaravshan valley, it was found that insects accounted for 50%, terrestrial molluscs 32% and earthworms 18%. It has been established that the number of insect species is high, terrestrial mollusks are average, earthworms are few in number, and species harming plants'leaves and roots dominate in a quantitative ratio (Figure 1).

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 Ettiuylisay, walnut and apple orchards of Zarafshan national natural park), group 2 - agrocenoses (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, Amphmallon 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 agrocenoses. *Aporrectodea caliginoza caliginoza* was first recorded in the Samarkand region as a new subspecies.

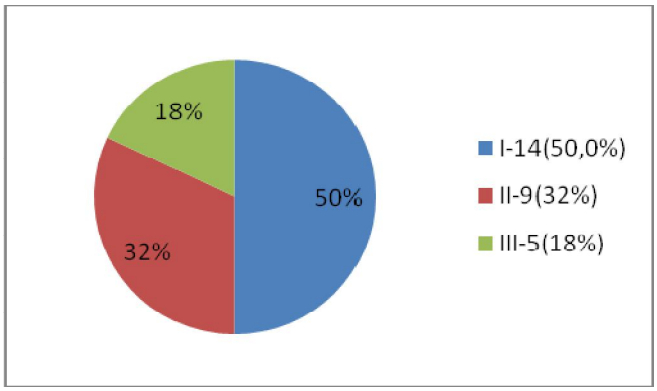

Figure 1: Species composition of orchards soils macrofauna
I-insects, II-terrestrial mollusks, III-earthworms

In the second group, in agrocenoses, 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 *Dendrabaena 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.

In the course of the study, it was found that the species composition in the almond trees of Etti uyli say and the walnut orchards of Zarafshan national natural park was 28.50% and 20.80%, respectively, while the smallest composition was found in the newly created intensive orchards and amounted to 5.2%.

In the course of many years of research, it was found that the species of soil macrofauna in orchards of Zarafshan valley belong to 6 ecological groups: I-hygrobionts, II-xeromesobionts, III-psammobionts, IV-xerobionts, V-xerogyrobionts and VI-geobionts. Depending on the way of feeding, the macrofauna of soils is divided into the following ecological groups: beetles and terrestrial mollusks - phytophages, beetle larvae - rhizophages, and earthworms - pedophages.

It has been established that the macrofauna of the soils of the orchards of the Zeravshan Valley, including earthworms, terrestrial mollusks, insects and their larvae in terms of their species and quantitative composition, the ecological group of geobionts is represented by the largest number of species - 18, which amounted to 64.33%, species of the xerogigrobiont group - 14 and 14.2%, xerobiont species - 3 and 10.7%, and hygrobiont, psammobiont and xeromesobiont groups by 1 species, which was 3.57%. (Figure 3).

Geobiont species, which include insects and earthworms, are the main ecological group of soil macrofauna. Among insects, the May beetle is a psammobiont, and the other ecological groups are represented by terrestrial mollusks (Figure 4).

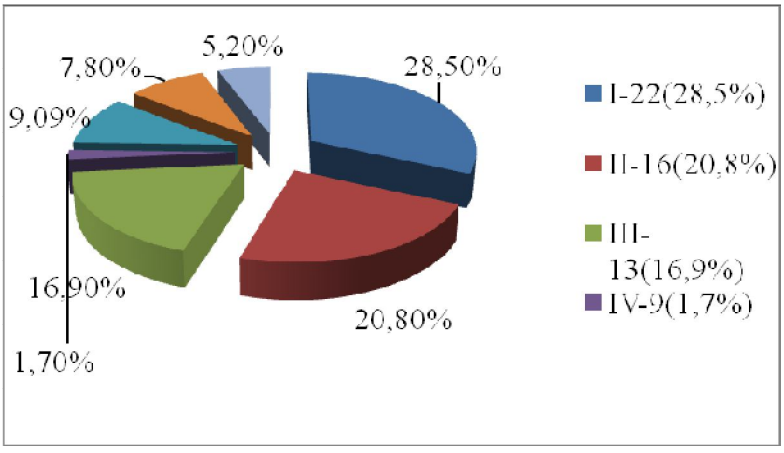

Figure 2: Distribution of fruit orchards soils macrofauna by biocenoses and agrocenoses
I-almond, II-walnut groves, III-apple orchards, IV-vineyards, V-apricot orchards, VI-private gardens, VII-intensive gardens.

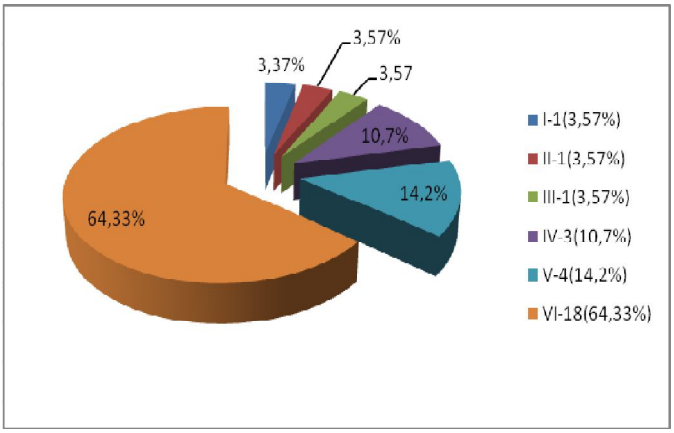

Figure 3. Ecological groups' distribution of orchards soils macrofauna
I-hygrophbionts, II - xeromesobionts, III -psammobionts, IV - xerobionts, V- xerohygrobionts, VI - geobionts.

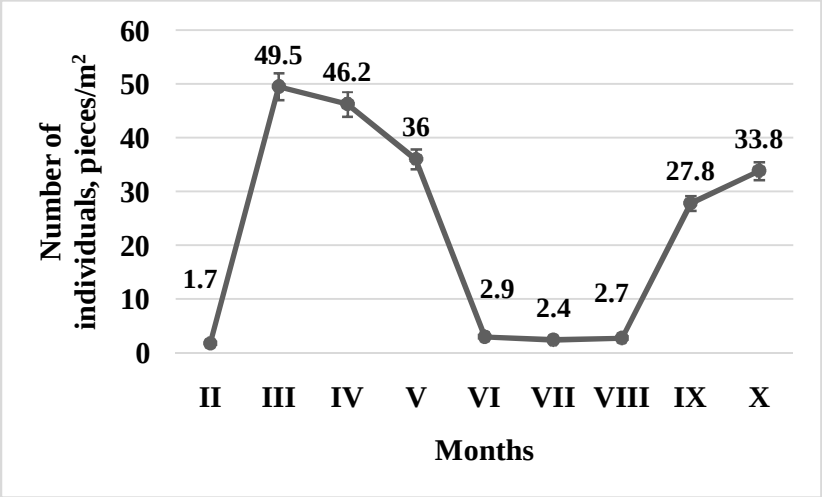

Figure 4: Quantitative dynamics of the May beetle and its larva by the seasons of the year

The studies determined seasonal quantitative changes in the density of M. hippocastani (Figure 5). As a result of the studies, it was found that the population density of *M. hippocastani* in early February was the lowest (1.7 ± 0.5), with an increase in soil temperature in March-April it reached a maximum (49.5 ± 3.4), with decrease in soil moisture starting from May (36.0 ± 2.9), the density again gradually decreased, in June-August the lowest density was recorded (2.4 ± 1.1), and in September the density began to increase again (27.8 ± 2.1), while in October a rather high density was found (33.8 ± 0.9).

In our studies, the distribution of *M. hippocastani* in various areas of Samarkand region was studied. From which it follows that the larvae of May beetle in Djambay region per 1 m2 was 2.1, in Urgut and Taylyak regions - 1.9, and in Pastdargam and Akdarya regions - 1.2 (Figure 5).

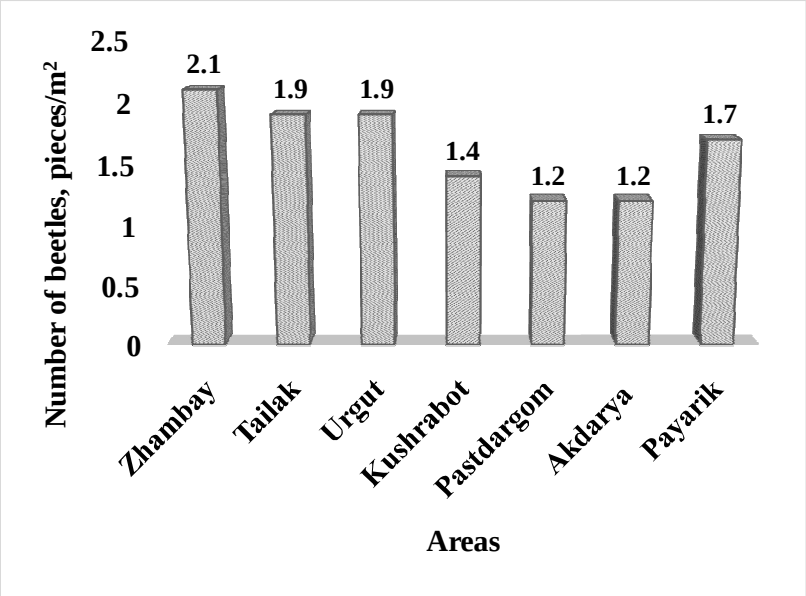

Figure 5: Distribution of May beetle larvae in some areas of Samarkand region

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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