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Role of earthworms (Lumbricidae) in the formation of the aggregate structure of anthropogenic soils

Gilbert White was one of the first to recognize the potential of earthworms in 1777 to improve soil aggregate structure and the subsequent effect of these changes on plant growth and soil water regime. A hundred years later, Darwin (1881) made the first scientific observations on the effects of earthworms on soil structure. They were devoted to finding out the role of earthworms in the evolution of soils and landscapes. Darwin showed that earthworms promote vegetation growth by mixing organic and mineral matter, which facilitates water retention and release of nutrients, and provides an environment suitable for root sprouting.

The aggregate structure of the soil provides the soil with a number of important ecological functions, which are a condition of soil fertility, the anti-erosion potential of the soil and the deposition of carbon in the soil. The anthropogenic impact significantly disturbs the aggregate structure of the soil and, thus, deteriorates the intensity of ecological functions. Soil animals are the most important factor in the formation and restoration of the soil structure. The nature and direction of zoogenic restoration of soil structure in anthropogenic soils is an important scientific problem.

The object of the study is the aggregate structure of anthropogenic soils.

The subject of the study is the role of earthworms in the aggregate formation of anthropogenic soils.

The aim of the study: to assess the importance of earthworms (Lumbricidae) in the formation of the aggregate structure of anthropogenic soils on the example of recultivated soils and urban soils.

The following tasks should be solved in order to achieve the aim:

1. Study ecological diversity of earthworms in the region.
2. Evaluate the functional importance of different ecological groups of earthworms in the formation of soil structure.
3. Clarify the role of soil structure in the formation of earthworm communities.
4. Identify specific features of earthworm impact on soil physical properties.
5. Evaluate the possibility of earthworms application in zooremediation of recultivated soils and urban soils.

Field research methods and laboratory experiment will be used in the work.

Field research methods:

1. Accounting for the spatial variability of the earthworm community in natural and anthropogenic soils.
2. Observation of soil properties at earthworm sampling points (moisture, hardness, electrical conductivity, aggregate structure, density, porosity of soils).
3. Description of vegetation at earthworm sampling points and application of the method of phytoindication of ecological regimes.

Laboratory research methods:

1. Organization of a laboratory experiment to identify the effect of earthworms on soil aggregate structure.
2. Evaluation of physical properties of earthworm coprolites.
3. Study of earthworm influence on soil algae as a factor of aggregate formation.

Methods of statistical processing of the obtained results

1. The methods of descriptive statistics and data visualization.
2. Correlation, regression and factor analyses.
3. Ecological ordination and gradient analysis.

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