Biological Activity of the Soil and Microbial Dynamics

Zarqum Rahimov Zafarjonzoda

Gulistan State University Foundation Doctoral Student (PhD)

ABSTRACT

The microbiological activity of soils determines the transformation, migration and accumulation of matter, energy and information in the soil. The mass of microorganisms in the soil and especially the mass of plant litter processed by them is comparable to the mass of the litter itself. This determines the role of microorganisms as a factor in soil formation. It is shown that the composition of microorganisms and their weight are indicators of ongoing processes of soil formation, cultivation and degradation of soils. Thus, in the weakly cultivated and well cultivated soddy-podzolic soil in the Ap horizon, the content of microorganisms developing on MPA was 1118 and 1975 thous./1 g, those developing on KAA was 3306 and 3598 thous./1 g of soil. The content of microorganisms developing on MPA in summer was 0.91 million/1 g in the solonetz; in light chestnut soil - 1.42 million/1 g, developing on KAA - 0.79 and 2.8 million/1 g of soil.

Keywords: soil formation, microorganisms, soil cultivation, seasonal dynamics.

Introduction

The soils of the dry steppe zone were chosen as the object of study: light chestnut, solonets and dark-colored soil of depressions, soils of the dry steppe zone; soils of the taiga-forest zone: soddy-podzolic soils of varying degrees of cultivation, soddy-podzolic soils; meadow chernozem soils of rice fields [1, 4].

Materials And Methods

Microbiological activity largely determines the genesis, evolution, and fertility of soils. However, its study as a factor of soil formation is almost not considered. This also leads to little attention to the development of techniques for optimizing microbiological activity for more efficient fulfillment of the specified ecological functions by soils.

The presented work presents experimental materials on the relationship of microbiological activity with the genesis and fertility of soils.

Microbiological activity of soils as a factor of soil formation. Microbiological activity is one of the most important factors determining the genesis and fertility of soils, the occurrence of a wide range of processes in the soil, and the formation of soil regimes. Under its influence, the synthesis and destruction of organic matter of soils and plants, minerals, changes in the degree of oxidation and reduction, hydrophilicity and hydrophobicity of a number of compounds occur. At the same time, the influence of microbiological activity on soil formation is due to the processing of plant litter and soil mineral compounds by microorganisms, the influence on the supply of biophilic elements and toxicants to plants, and on the totality of soil properties and other landscape components.

Results And Discussion

In accordance with Yu. Odum's rule, the reduction of individuals, due to the more complete occupation of the area, increases the specific yield of biomass per unit area, which confirms the greater influence of microorganisms on soil formation compared to plants. The live bacterial mass can reach 4–9 t/ha of dry matter, which, taking into account renewal (up to 30 generations per year), determines their significant effect on soil-forming processes. The carbon content of microbial biomass in the carbon of organic matter reaches 5–20% in the A1 horizon and up to 70% in the mineral horizons [5]. Annual production of microbiological activity reaches 1-90 t/ha.

The interaction of populations of microorganisms with each other proceeds according to the type of competitive relations and according to the type of symbiotic relationships. In a young system, a high rate of reproduction of microorganisms is observed, in a mature system, a low rate of reproduction. During the decomposition of plant litter, microorganisms develop first, using simple water-soluble compounds, namely non-spore-bearing bacteria and "sugar" fungi. They are replaced by spore-bearing bacteria and microorganisms that destroy fiber. At the last stages of decomposition, the leading role belongs to the decomposers of lignin and humus.

The microbiological activity of soils is closely related to the microbiological activity in other components of the biogeocenosis. Thus, according to our data [6], leaves, bark, herbaceous plants, litter, waste, litter, and soil contained, respectively, the following number of actinomycetes (CFU/g lg n): in coniferous forests - 4 .17; 4.74; 4.39; 4.97; 5.74; 6.25; 6.24; in deciduous forests - 4.3; 4.6; 4.47; 4.87; 5.59; 5.6; 5.2.

Based on the results of testing soil samples, the integral indicator of the “health” of the microbial community of the studied soils is calculated according to the formula: G = (N/Nmax 100)/d, where Nmax is the amount of test substrates, N is the amount of consumed substrates, d is a measure of diversity.

Conclusion

It is proved that the state of microbiological activity of soils is characterized by the composition, the ratio of individual groups, their change in space, ongoing microbiological processes: their speed, intensity, duration, change from humidity and temperature, the state of plant associations. The change in the state of microorganisms in soils, in the processes occurring with their participation, characterizes the modes of microbiological activity

soils.

The optimal state of properties, processes, and regimes of soil microbiological activity for the fulfillment by soils of given ecological functions characterizes models of the optimal state of biota for specific agroecological purposes.

Taking into account the enormous role of the influence of microbiological activity on soil formation and fertility, it is necessary to consider it as a soil formation factor when studying the influence of vegetation at a lower hierarchical level and take it into account when developing models of soil fertility, degrees of soil degradation, designing adaptive landscape farming systems.

References

1. Marfenina O.E. Anthropogenic ecology of soil fungi. Moscow: Medicine, 2015. 135 p.
2. Mosina L.V. Anthropogenic change in forest ecosystems in the conditions of a megalopolis (Moscow): Abstract of the thesis. dis. … Doctor of Sciences. M.: RGAU - MSHA im. K.A. Timiryazev. 2013, 48 p.
3. Mosina L.V., Dovletyarova E.A., Andrienko T.N. Experimental forest dacha of RGAU-MSHA as an object of environmental monitoring of forest plantations, landscapes of the metropolis of Moscow, Moscow: UDN, 2014. 218 p.
4. D. N. Nikitochkin, V. I. Savich, V. D. Naumov, and R. F. Baibekov, Russ. Soil fertility models for apple trees in time and space. M.: VNIIA, 2015. 270 p.

5. Norovsuren Zh. Regularities of the geographical distribution of actinomycetes in the soils of Mongolia. M.: MSHA, 2019. 168 p.
6. Savich V.I., Kaurichev I.S., Sidorenko O.D. Redox processes in soils, agronomic assessment and regulation. Kostanay, 2019. 402 p.