Seasonal Changes Of Microflora Of Sandy Steppy Soils Konimekh District

Normamat Chorievich Namozov, Dilrabo Abdukarimovna Kodirova, Matluba Ikhtiyarovna Usmonova

Abstract— The article presents the results of research on sandy steppe soils in Konimekh district of Navoi region. Due to the low content of humus and nutrients and the unfavorable hydrothermal conditions of degraded sandy steppe soils, there isn't high enough level of microorganisms. The high content of all microorganisms found in the sandy steppe soils locate on the upper soil layer and their amount may decrease dramatically as they penetrate into the lower soil layers. Changes in the number of microorganisms in the seasons are strongly felt in the number of ammonificators and fungi. Due to the adaptation ability and resistance of actinomycetes and oligonitrophils to unfavorable soil conditions quickly, any significant differences in their amount by seasons were not observed.

Index Terms—microorganisms, fungus, bacteria, ammonificators, oligonitrophils, actinomycetes, sandy steppe soils, grassy layer

1 INTRODUCTION

One of the most important issues of today is the improvement and conservation of soil fertility which is considered a main producing means of agriculture. The study of the microbiological and biochemical processes in the soil is of great importance in solving these problems. It is clear that microorganisms and microbiological processes play an important role in soil formation, fertility formation, and plant nutrition. The soil is a favorable nutrient media for the development of microflora. Microorganisms play a vital role in the alteration of substances and energy in the process of soil formation, such as the transformation of organic matters, the formation of various simple salts from components of mineral and organic compounds of the soil, breakdown of soil minerals and formation of new substances, their movement, and accumulation. Microorganisms belonging to a particular group develop and differ in each soil type with specific physical and chemical properties and hydrothermal conditions.Data on the seasonal dynamics of soil microorganisms in different soil-climatic zones have been presented in many researches [1, 2, 3, 4, 5]. The present researches investigated the seasonal dynamics of microorganisms in soil types, mainly in mountain and piedmont, steppe and plain regions. However, the total amount of microorganisms, physiological groups and their variation under the influence of hydrothermal conditions on the soils of the desert region have not been sufficiently studied yet. Bacteria are the most common microorganisms in the soil. Bacteria convert complex organic matter into humus and then mineral salts. It is involved in the production of nutrients essential for plants to grow and to improve soil fertility: ammonification, nitrification, nitrogen fixation, and other processes. Decomposition bacteria make the biggest part of common bacteria in the soil. They play a major role in soil formation. By cleaning the surface of the land from the residue of plants and animals, bacteria perform an important task of the ecology - sanitation. Ammonia in the soil is converted into nitric acid [6].In the studied soils, fungi are also widespread. Soil microscopic fungi play an important role in soil fertility along with other microorganisms in the soil. A large number of these species are actively involved in the decomposition of plant residues in the soil. Fungi found in soil are not only involved in soil biological processes but also play an important role in the life of plants. Fungi flora is of great importance both in nature and in economic activities of man. Many of them are used in industry, and some serve to produce valuable medicine, antibiotics (penicillin, streptomycin, aspergillin, etc.), enzymes and in its turn they may cause many diseases of animals and agricultural crops. Therefore, the study of soil fungi is not only scientific – worldwide, but also of great practical value. A.Sheraliev [7], I. Turapov [8], L.A Gafurova, D. Kodirova [9], L.A Gafurova, M.E Saidova [10] and others have conducted research works on the study of soil fungi in Uzbekistan. Their work mainly focuses on the quantitative and qualitative distribution of fungi mainly in soils of steppes and virgin lands, and also in some mountainous soils. However, despite the need for a more extensive and thorough study of the microflora of Uzbekistan, particularly, soil fungi have not been sufficiently studied yet. Oligonitrophils (many researchers call oligoazopholes) are involved in the mineralization of nitrogen-containing organic matters in the soil. Atmospheric nitrogen has a weak fixation with their presence and consequently enriches the soil with protein. Oligonitrophils play an important role in the decomposition of carbohydrates from organic matter in plants and in the reduction of the ration of carbon-to-nitrogen [11,12]. From the data presented, it is obvious that despite the fact that a great deal of data is collected on the dynamics of variation of microorganisms amount in the soil during the year, this issue is viewed as the most controversial and unsolved. Therefore, we investigated the dynamics of changes by seasons in the amount of major microorganism groups (bacteria, oligonitrophils, fungi, and actinomycetes) that are spread in sandy steppe soils.

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2 MATERIALS AND METHODS

The surveys are conducted in the Konimekh district of the Navoi region under 3 methods: Route - expeditionary, Stationary - key fields, Cameral - laboratory, separate soil samples were taken and analyzed for microbiological analysis by seasons of the year at depths of 0-15, 15-30 and 30-50 cm. Analyses were done according to "Soil microbiology and biochemistry methods" by Zvyaghintsev [13].

3 RESULTS AND DISCUSSION

Studies have shown that spores forming decomposition bacteria in the studied soils had the highest indications in comparison with other microorganism groups, as they varied in number from 100 thousand to 209 thousand cells per 1 g of soil in the upper grassy soil layer. There was a dramatic decrease in the number of these bacteria (12-96,000 cells per 1g soil) depending on the amount of humus and nutrients in the lower layers of soil (Figures 1 and 2).

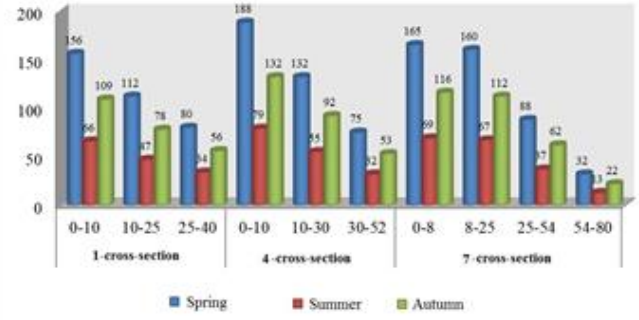

Fig. 1. Changes in bacterial content in sandy steppe soils by season, per 1 g of soil

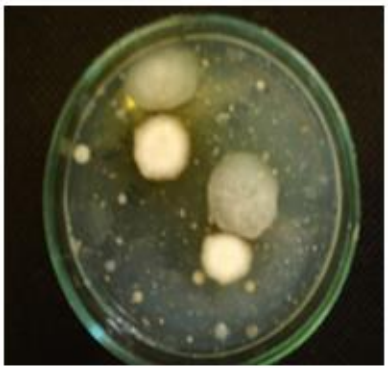

Fig. 2. A view of a bacterial colony on sandy steppe soils

When analyzing seasonal variation in the number of spore-forming bacteria, their highest amount is noted mainly in the spring. By summer, we can see from the table data that the number of spore-bearing bacteria has declined dramatically.This may be explained by the high heat of sandy steppe soils during the daytime temperature up to 50-60 ºC high and the reduction of soil moisture. This is one of the major constraints on the development of spore-forming bacteria during the summer. By autumn, the plant residues and precipitation facilitate hydrothermal conditions of the soil more favorable than in the summer contributing to the growth of spore-forming bacteria. According to the data obtained, microscopic fungi have a specific feature in their seasonal distribution. As noted above, the number of fungi in the studied soils was found to be much lower compared to the number of bacteria. In the upper layers, their highest content is observed in the spring, that is, fluctuates between 10 to 35,000 cells per 1 g of soil (Figs. 3 and 4).

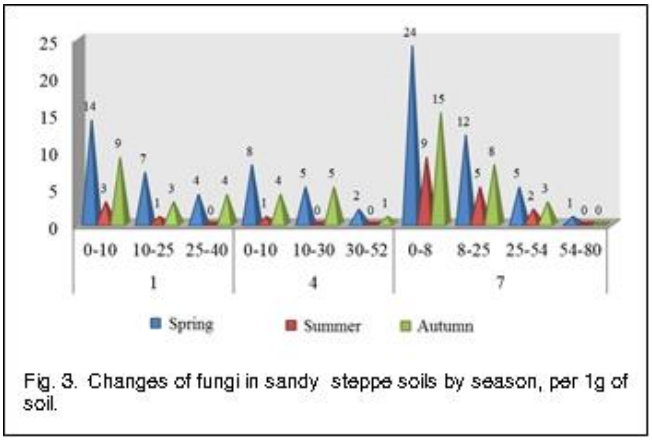

Fig. 3. Changes of fungi in sandy steppe soils by season, per 1g of soil.

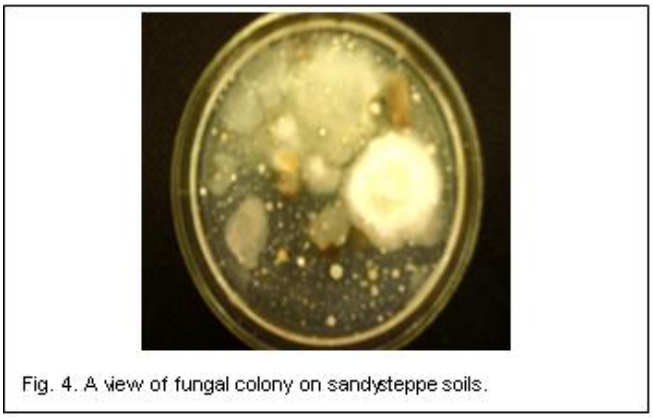

Fig. 4. A view of fungal colony on sandysteppe soils.

Such large variations in fungi in the upper soil layers can be defined with various grassy layers and a bare soil surface due to the degradation processes. The amount of fungi towards the lower layers decreases dramatically, reaching only 1,000 to 5,000 g per 1 g of soil. In summer there is a sharp decline in the number of fungi even in the upper layers compared to the spring and autumn, and it was noted that there were not any fungi found in some lower layers. This is due to the unfavorable soil and climatic conditions of these soils - lack of moisture, the alkalinity of the soil solution environment, low amount of organic matter, high soil density and so on. Among these factors, fungi are particularly demanding for soil moisture. Many microbiologists' researches show that actinomycetes rank the second place by its amount in all types of soil after the bacteria. However, the amount of actinomycetes wasn't high in sandy steppe soils studied by us (Figures 5 and 6).

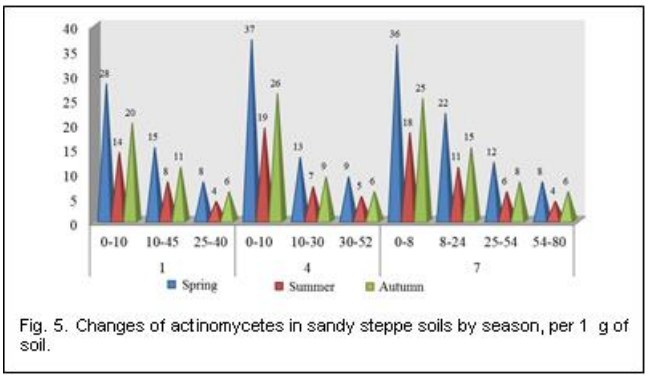

Fig. 5. Changes of actinomycetes in sandy steppe soils by season, per 1 g of soil.

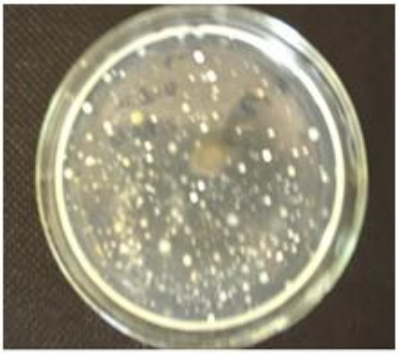

Fig. 6. A view of the colony of actinomycetes on sandsteppe soils.

However, they are much higher than the number of fungi. According to the table, there is no significant difference in the number of actinomycetes by seasonal seasons and soil layers. This may be explained by the fact that actinomycetes have a strong enzyme structure and are more resistant to adverse hydrothermal conditions than bacteria and fungi. Although oligonitrophils are in small quantities, they have a positive effect on nitrogen accumulation in the soil, in all biological processes of the soil, as well as providing active growth conditions. They have abundant number in soil. In the studied soils oligonitrophils were found to be more abundant than fungi and actinomycetes. In the upper layers of the studied soils, they vary in number from 38,000 to 96,000 cells per 1 g of soil in spring (Fig. 7). The amount of oligonitrophils gradually decreases in comparison with other groups of microorganisms that have been identified along the soil cross-section moving towards lower layers and make up 5–36,000 cells per 1 g of soil. No significant differences are observed in seasonal dynamics of oligonitrophils. The microorganisms of this group are able to survive even in zero nitrogen environment, allowing them to develop freely in all seasons and in different soil conditions.

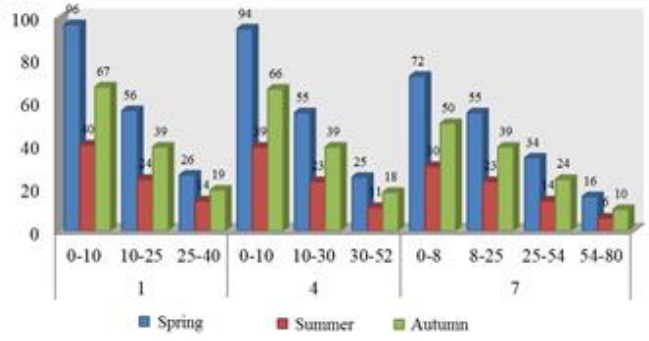

Fig. 7. Changes of oligonitrophils on sandy steppe soils by season, a thousand cells per 1 g of soil

4 CONCLUSION

Due to poor humus and nutrients and unfavorable hydrothermal conditions, degraded sandy soils have low amount of microorganisms. The highest amount of all microorganisms is detected in the upper soil. As they move to the lower layers, their amount drops dramatically. Changes in the number of microorganisms in the seasons are strongly felt in the number of ammoniaficators and fungi. Due to the adaptation ability and resistance of actinomycetes and oligonitrophils to unfavorable soil conditions quickly, no significant differences were observed in their number in the seasons.

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