THE IMPORTANCE OF SOIL AND ITS ROLE IN THE LIFE OF LIVING ORGANISMS

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ABSTRACT

This article highlights the importance of soil in nature and human life. Soil is one of the most important natural resources of the Earth, where plants grow and the food chain necessary for animal and human life is formed. Soil is a significant ecological system that ensures the balance of biological, chemical, and physical processes. It enables plants to absorb water and nutrients through their root systems. In agricultural production, soil fertility is considered the main determining factor.

Soil - is a light, porous, and fertile layer that provides favorable conditions for plant growth. Soil is a natural formation composed of genetically interconnected horizons, formed as a result of changes in the surface layers of the lithosphere under the influence of water, air, and living organisms. It represents the fertile upper layer of the Earth's crust. The most important characteristic that distinguishes soil from weathered rocks is its fertility. Soil science focuses on studying soil, developing its classification, improving its composition, and creating methods to enhance soil fertility. The main soil-forming factors include climate, parent material, vegetation and fauna, land relief, geological age of the area, and human economic activity. Rocks exposed on the Earth's surface are weathered under the influence of precipitation, carbon dioxide, oxygen, air temperature, mechanical forces, water and dissolved substances, air, microorganisms, and lower plants such as mosses and lichens. Weathered rocks break down into smaller particles, forming a porous layer. Over time, this layer acquires new properties such as moisture-holding capacity and a certain amount of nutrients that plants can absorb.

Types of soil types depend on the structure of the Earth's surface relief. Based on regional characteristics, soils are divided into several types:

Chernozem (Black soil) – one of the most fertile soil types on Earth. It is mainly formed in temperate steppe regions. Chernozem soils contain a very high amount of organic matter (humus). Their dark color indicates a high content of decomposed organic residues.

Gray soil – mainly formed in arid climatic zones. A large part of Uzbekistan's territory consists of gray soils. Naturally, this soil type has moderate fertility. Although the upper layer of gray soil is relatively poor in humus, with proper cultivation it becomes highly prproductive**.**

Brown soil – commonly found in forest-steppe regions. Crops such as wheat, rye, and barley grow well in brown soils. This soil type is formed as a result of the decomposition of forest plant leaves and branches.

Sandy soil –mainly composed of sand and fine particles. It allows water to pass through easily but cannot retain it for long periods. Sandy soil has low fertility and dries out quickly. Therefore, such soils require regular irrigation and fertilization.

Saline soil – contains excessive amounts of salts. These soils are often formed as a result of improper irrigation or water influence. Plant roots cannot develop normally in saline soils. To improve such soils, leaching, drainage systems, and gypsum application are carried out.

Marshy soil – found in areas with excessive moisture. Due to limited air exchange, organic matter accumulates in these soils. Although they contain a high amount of organic matter, their fertility is low because of oxygen deficiency. Plant roots rot quickly in marshy soils. Drainage and aeration measures are required to make them suitable for agricultural use.

Soil fertility is the ability of soil to supply plants with water, nutrients, and other essential substances. Soil differs from rocks primarily due to its fertility. Fertile soils provide the main environment for producing food for humans. Land is considered important in agriculture only because of its fertility.

Importance of soil is the primary medium for plant growth and development. It supplies plants with nutrients, water, and air, ensuring their proper growth. Most agricultural products are cultivated on fertile soils. Soil is also essential for livestock farming, playing a crucial role in fodder production. In addition, soil filters water and helps keep groundwater clean. Soil serves as a habitat for various microorganisms that decompose organic matter and enable nutrient recycling. Soil plays an indispensable role in maintaining ecological balance on Earth.

Soil composition includes mineral, organic, organo-mineral substances, and certain chemical elements. The mineral part of soil consists of primary minerals (quartz, feldspars, amphiboles, pyroxenes, mica, etc.) and secondary minerals (montmorillonite, kaolinite, hydromica, etc.). The organic component of soil consists of humus, which includes humin substances, humic acids, and fulvic acids, whose elemental composition is not constant. Soil solution contains organic and mineral substances as well as gases.

Soil water retention . Soil water is retained in various pores and cavities and constantly interacts with soil particles depending on its chemical composition and properties. This interaction determines water movement, characteristics, and absorption by plants. Different forms of water are present in soils:

Chemically bound water – occurs in mineral colloids and minerals in the form of hydroxide compounds such as $Fe(OH)_3$, $Al(OH)_3$, $Ca(OH)_2$, or as molecular water in compounds like $CaSO_4 \cdot 2H_2O$.

Hygroscopic water – water adsorbed onto the surface of soil particles. The ability of soil to absorb moisture from the air is called hygroscopicity, and the absorbed moisture is known as hygroscopic water.

Gravitational water – Its amount increases significantly after rainfall or irrigation. In some soils, the subsoil layer does not transmit water well or transmits it very slowl, causing gravitational water to remain in the plow layer for a long time.

Soil productivity is the ability of soil to supply plants with nutrients, water, air, and heat, supporting their normal growth and development. The more fertile the soil, the higher the crop yield. Soil productivity provides favorable conditions for plant growth, and fertile soils are richer in nutrients. Soil productivity is one of the main factors determining yield. When irrigation systems are properly organized, soil productivity increases significantly.

Soil properties depend on its composition and structure and directly affect plant growth. Physical properties include water permeability, aeration, and porosity. Chemical properties are determined by nitrogen, phosphorus, potassium content, and soil pH. Biological properties depend on the presence of microorganisms, earthworms, and humus content. Physicochemical properties such as adsorption capacity and colloidal composition ensure the availability of nutrients for plants.

Conclusion.

Soil is a fundamental component of the biosphere and plays a decisive role in the circulation of matter and energy. Its physical, chemical, and biological properties directly influence plant growth, nutrition, and yield formation. Soil humus and minerals provide essential nutrients, while microorganisms decompose organic matter. Soil porosity, density, and water-holding capacity regulate root development. Soil pH and cation exchange capacity determine plants' ability to absorb nutrients. Studying soil resources and ensuring their sustainable use is an important task. Soil serves as the primary environment for plant growth and development, supplying water, air, and nutrients necessary for plant life processes..

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