

STUDY OF PHYSICAL AND CHEMICAL PROPERTIES OF SOILS.

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Abstract: *Soils are one of the most important natural resources available on the surface of the earth, they play an important role in ensuring the stability of ecosystems, maintaining agro-ecological balance and ensuring human food security. Physical and chemical properties of soil are the main factors determining its quality. This article provides detailed information about the physical and chemical properties of soils, their effects and importance.*

Key words: *soil, physical property, chemical property, water permeability, clay, sand, gases in soil, density.*

Physical properties of soils include their structure, density, water permeability, exchange with gases in the air and many other parameters. The structure of the soil can be determined by the size of the particles in its composition and their ratio to each other. Soil particles are generally divided into three main groups: sand, silt, and silt. The size and structure of each particle directly affects the physical properties of the soil. For example, since the sand particles are large, they quickly pass water, which improves the soil's exchange with gases in the air. Clay particles are small in size and have the ability to hold water. These properties are important in providing the soil with water and mineral substances. Soil density is also a very important physical property. Density is defined as the ratio between the weight of the soil and its volume. Density determines the water and air permeability of the soil. High density can cause soil compaction, complicate water and air exchange processes. Therefore, it is important to control the density of the soil, to improve its quality and create favorable conditions for crops. The chemical properties of soils are related to their mineral content, pH level, amount of organic matter and other chemical elements. The mineral composition of the soil determines its chemical properties. Mineral substances present in the soil are a source of nutrients necessary for plants. Soil pH determines whether the soil is acidic or basic. Plants require specific conditions to grow at different pH levels. For example, there is a difference between plants that grow in acidic soils and plants that grow in alkaline soils. The amount of organic matter in soils is also an important part of chemical properties. Organic matter is formed in the soil through the remains of plants and animals, which increase the fertility of the soil. Organic matter improves the water-holding capacity of the soil and stimulates the activity of microorganisms.[1]

This increases the biological activity of the soil and ensures the production of nutrients necessary for plants. The physical and chemical properties of soils, as well as their role and importance in the ecosystem, are interrelated. In order to improve the quality of the soil and increase its productivity, it is important to study and analyze its physical and chemical properties. This process allows proper soil management and efficient use of its resources.[2]

It is important to use modern technologies and methods in the process of soil research. Laboratory analysis, field measurements and modern analytical methods are used to determine the physical and chemical properties of soil. These methods allow to assess the quality of the soil and monitor its changes. Physical and chemical properties of soils are also related to their climatic conditions, geological structure and anthropogenic influences. Climate changes affect the physical and chemical properties of soil. For example, a drier climate can reduce the water-holding capacity of soils. Also, the anthropogenic impact of the soil, that is, human activity, can have a negative impact on the quality of the soil. Soil pollution, erosion and other processes can change the physical and chemical properties of soil.[3]

The use of modern methods and technologies in the process of soil research allows in-depth study of the physical, chemical and biological properties of the soil. With these methods, the processes of identification, assessment and monitoring of various aspects of soil are carried out, which are important in the fields of agriculture, ecology and soil management. Laboratory analyzes are carried out through soil samples. In this process, the chemical composition of the soil, the pH level, the amount of organic matter and other properties are determined. Laboratory analyzes provide accurate and reliable results, helping to assess the quality of the soil. These analyzes provide the information needed to improve soil fertility. Geoinformation systems (GIT) play an important role in soil research. Soil maps are created using GIT and soil physical and chemical properties are analyzed by location. Through these systems, soil changes, erosion processes and other important information are presented visually. GIT technologies are effectively used in soil management and environmental monitoring.[4]

Spectroscopy methods are widely used to determine the chemical composition of soil. Methods such as infrared spectroscopy and NIR spectroscopy are effective in determining mineral substances and organic compounds in soil, and are important in assessing soil quality. With the help of these methods, it is possible to get quick and accurate information about the chemical composition of the soil. Microbiological analyzes are conducted to study the biological properties of soil. Microorganisms present in the soil, their variety and activity are studied, and the fertility and health of the soil are evaluated. This method helps to identify important changes in the soil ecosystem. Modern instruments and methods such as porosimeters and tensiometers are used to measure the physical properties of the soil. Measuring soil physical properties such as density, water permeability, and compaction is important in assessing soil quality. Drones and UAVs (unmanned aerial vehicles) provide innovative approaches to soil surveying. These technologies make it possible to monitor large areas of the soil quickly and efficiently. With

the help of drones, the state of soil vegetation, erosion processes and other changes are observed, which is important in soil management and monitoring. Electromagnetic soil measurements are used to determine the physical and chemical properties of soil. This method is effective in determining soil structure, moisture level, and other properties, providing important information in soil management. Mathematical and statistical models are used in soil studies. These models help predict soil properties and analyze changes. [5]

These approaches are important for soil management and improving soil quality. Biogeochemical analyzes are conducted to study the chemical properties of the soil. By studying the chemical elements and compounds present in the soil, it is possible to assess the quality of the soil and determine the possibilities of effective use of its resources. Modern methods are used to study the relationship between plants and soil. Measuring plant photosynthesis and evaluating soil nutrient availability can help determine soil-plant interactions. These processes are important in increasing soil fertility and developing sustainable agriculture. These modern methods allow to obtain accurate and reliable results in the study of soils, and also provide information necessary for soil management and improvement of its quality. A thorough understanding of the physical, chemical, and biological properties of soil is essential for efficient use of its resources and ensuring environmental sustainability.[6]

Conclusion. In short, the physical and chemical properties of soils are the main factors that determine their quality. Soil properties such as structure, density, water permeability, mineral content, pH level and organic matter content play an important role in ensuring soil fertility and favorable conditions for plants. It is necessary to use modern technologies and methods to study the soil and improve its quality. Management of soils and efficient use of their resources is important for ensuring human food security.

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