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WAYS TO IDENTIFY MICROORGANISMS IN THE SOIL

Annotation. The study shows the dynamics of the bioavailability of lower plants in man-made contaminated soils, monthly respiratory activity. To determine the dynamics of biological activity of the soil by dividing the population of lower plants into separate groups and comparing them with each other. As a result of this research work, it is possible to predict the direction of the process of soil formation of man-made contaminated soils and the ecological situation in the region.
Key words: Bacteria, actinomycetes, yeasts, phages, water, soil.

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СПОСОБЫ ВЫЯВЛЕНИЯ МИКРООРГАНИЗМОВ В ПОЧВЕ

Аннотация. В исследовани показана динамика биодоступности низших растений в техногенно загрязненных почвах, месячной дыхательной активности. Определить динамику биологической активности почвы можно путем разделения популяции низших растений на отдельные группы и сравнения их между собой. В результате данной научно-исследовательской работы можно прогнозировать направление процесса почвообразования техногенно загрязненных почв и экологическую ситуацию в регионе.
Ключевые слова: бактерии, актиномицеты, дрожжи, фаги, вода, почва.

Microorganisms are widespread in nature, including in the soil, and they are the main component of the soil. Soil is composed of organic and inorganic substances. Organic matter often adheres to its mineral particles and forms granules. These granules are the main habitat of microorganisms. The soil is rich in nutrients necessary for microorganisms and protects them from direct sunlight.

Bacteria, actinomycetes, yeasts, microscopic fungi, algae, simple organisms, various insects are mainly found in the soil. There are also various ultramicroscopic organisms in the soil - phages, bacteriophages and actinophages.

The spread of microorganisms in the soil is influenced by environmental conditions. These include nutrients, ambient temperature and reaction. For many years, soil was recognized in science as a physical and chemical substance,which means only the environment in which plants grow, and microorganisms living in the soil were not taken into account at all. Prominent Russian scientists P. A. Kostychev, VV Dokuchaev and VR Of Williams.

His work proved that the soil is a very complex environment, inhabited by thousands, millions of microorganisms and other insects [1].

Due to the active life of these organisms, the remains of plants and animals that remain in the soil are decomposed and subjected to biochemical changes, from which new substances with completely different structures are formed. The amount of these substances varies depending on the type of soil. For example, the annual amount of organic waste in forest lands ranges from 1.5 to 7 tons per hectare, and the amount of organic waste per hectare in meadows ranges from 2 to 11 tons. These wastes are rich in nitrogen and carbon. They feed on microorganisms. In order to decompose so much organic matter, the number and activity of microorganisms in the soil must be different. In addition, 1 g of soil contains several billion cells of microorganisms. But they are more common in the upper layer of the soil than in the lower layer. The weight of an individual microbial cell cannot be ignored, but their abundance increases the total weight of microorganisms in the plowing layer of each hectare from 5 to 15 tons. In addition to their abundance in the soil, active life activities are usually important for increasing soil fertility. Soil microorganisms produce strong enzymes. With the help of such enzymes, organic matter in the soil is broken down into nutrients that are easily absorbed by plants. It is used as a nutrient not only by plants but also by microorganisms. While some of the microorganisms in the soil grow and multiply, the other part completes its life processes and becomes dead. Such carcasses are fed and decomposed by living microbes. Humus is formed from the waste products of decomposition. Academician V. R. According to Williams' research, plants grow on fine-grained soils. Such granules are formed from humus, which is formed by the vital activity of microorganisms. Thus, microorganisms are one of the main factors in soil formation [2].

Material research and methods

The object of the study were the soils of the mine tailings storage and adjacent soils, suspensions and strains of lower plants. Water is one of the most important conditions for soil fertility and crop productivity. Plants get almost all of their water from the soil. It occurs in the soil through water: it can be used by plants or not. Soil moisture properties include: water absorption, water permeability, the ability of water to rise from the lower layers to the upper layers, or capillary and water evaporation.

Required tools and materials: Soil samples, aluminum or glass cloth, foam cabinet, paddle sources 1 mm sieve desiccator.

Explanation of the task: The amount of soil's ability to absorb and retain water in the air, water vapor is called hygroscopic moisture. Its size depends on the structural and chemical composition of the soil and the relative humidity. The higher the latter, and the finer the soil, the higher the hygroscopic moisture. It absorbs moisture into the soil and fills all the holes in it. The maximum amount of water that can be absorbed by the soil is the total moisture absorption of the soil. The optimum moisture content for plants is 60% of the total moisture absorption of the soil.

Water in the soil begins to move downward under its own weight. The maximum amount of moisture retained by the soil after the free flow of water is called the field absorption, moisture content of the soil. This percentage is -12% for dry soils, -12% for sandy soils, -18% for purple clay soils, and 24% for black soils. is a constant source of moisture for plants. When the amount of capillary water decreases and it is stored only between the soil particles or small roots, the plant begins to form. This means that not all the water in the soil reaches the plants. If the amount of water in the soil is less than 2/3 of the field moisture (absorbency), plant growth will begin to slow down. Therefore, by determining the field moisture of the soil, taking into account the phenological orientation of the soil during the growing season, it is possible to determine the patterns between crop yield and moisture.

Procedure:

1. The size is 10-15 g. placing the soil sample in a pre-weighed box;

2. Keep it in the oven at 1050C for 6 hours;

3. Then cool in a desiccator and weigh, then re-dry and re-weigh for about two hours;

4. Calculate the field moisture of the soil according to the following formula:

5., where EU is the field moisture;

a is the weight of the empty box, g; c is the weight of the soil box before drying; d; c is the weight of the soil box after drying, g [3].

Determination of soil water permeability. Required tools and materials: 4-5 samples of soil with 2 mm sieves; diameter 45cm, height 25-30cm 45 glass tubes, 4-5 cups, universal tripod, gauze, cardboard, watch.

Explanation of the task: The ability of the soil to absorb water and transfer it from the top to the bottom is called the water permeability of the soil. Water permeability depends on the particles of the soil, its structure, the amount of humus and moisture. It burns and turns black on sandy and barren soil, and it smells like burnt horns.

Separation of fertilizers according to their solubility in water. Mineral fertilizers are divided into completely soluble, semi-soluble (half of the obtained fertilizer is soluble), semi-soluble (less than half of the obtained fertilizer is soluble) and insoluble. Granular mineral fertilizers (nitrogen and potassium) are well soluble in water (especially when heated), loose fertilizers (phosphorus and lime) are poorly soluble or pure insoluble.

To separate the fertilizers, mix 1-2 g of fertilizer in a test tube with 15-20 ml of water. If the fertilizer dissolves, divide the solution evenly into three devices (for a qualitative reaction).

Add 10% № Na OH (KOH) solution to the solution in the first test tube and mix half the volume by volume. If you smell ammonia, ammonia fertilizer belongs to one of the fertilizers (nitric acid ammonia, sulfuric acid ammonia, chemical ammonia, ammophos) [4].

Add a few drops of 2-5% Ba Cl2 solution to the solution in the second test tube and mix. If a weak white precipitate of insoluble ba sulfate (Ba SO4) is formed in weak acids, we notice that the test solution contains fertilizers containing sulfuric acid (ammonium sulfate, potassium sulfate, potassium mg).

To determine if the precipitate is Ba SO_4, make sure that it is insoluble in dilute hydrochloric acid or acetic acid.

Add a few drops of nitric acid and silver $AgNO_2$ solution to the third test tube and mix. This reaction allows the determination of the presence of chlorine ions or phosphoric acid in the solution. A solution of chlorine-containing fertilizers (potassium salt, sylvinite, kainite) when mixed with lapis forms a cheese-like white precipitate: $KCl + AgNO_3 = KNO_3 + AgCl$.

In the presence of phosphoric acid in the solution, with the addition of $AgNO_3$, the solution turns yellow or a yellow precipitate of phosphoric acid silver is formed. It should be noted that even simple amino acids of sulfuric acid form a white precipitate of heavy, coarse sulfuric acid silver. However, the volume of this precipitate is very small compared to Ba Cl_2 [5].

After separating well-soluble nitrogen and potassium mineral fertilizers, water-soluble or insoluble phosphoric acid and lime loose fertilizers are identified. To do this, take 1 / 5-1 / 8 teaspoon of fertilizer in a test tube and mix it with a few drops of 1% HCl or ten times diluted acetic acid. The released carbon dioxide of lime structures, tomaschlag, phosphate slag and fluorine-free phosphates boils under the influence of acids.

Hydrogen sulfide is released when it reacts with Thomasshlak. Aqueous solution of Thomasshlak and kiln ash will turn red litmus paper blue because they have an alkaline reaction.

Blue litmus paper turns red because superphosphate reacts more acidically than other phosphorus fertilizers.

The method of determining the mechanical composition of the soil in the dry state (dry method).

A small sample of the soil mass is taken from each soil sample (genetic horizon), rubbed in the palm or between the fingers, and then it is assigned to a group in terms of mechanical composition using the following classification:

1. The pieces are very hard, the structural details are not rubbed between the fingers. If the soil is homogeneous, finely ground during grinding - the soil is loamy.
2. The pieces are hard to crush between the fingers, the structural parts are strong. When grinding in the palm, a tissue mass is formed (clay or fine dust particles) and if it is weakly rough (sandy particles), the soil is loamy.
3. Pieces, structural parts are forcibly grinded between the fingers. When grinding, roughness (sand particles), texture (clay and dust particles) are observed - the soil is moderately clayey.
4. Pieces, structural parts are ground with great force. When rubbing in the palm of your hand, clay (rough) and dusty (tissue) particles are well visible - the soil is sandy.
5. The pieces are easily grated. When grinding, the rough structure is easily observed (clay particles) - the soil is sandy.
6. The lumps turn into a loose mass and are very easily ground (there are a lot of clay particles and they can be easily seen) - clay soil.
7. If the fine soil (particles less than 1 mm) contains mineral and rock residues, then the soil is considered rocky (gravelly).

The method of determining the mechanical composition of the soil in the wet state (wet method) [6].

Water is added to the crushed soil sample (fine soil) to form a dough-like mass, which must be sticky. The soil paste prepared in this way is thoroughly mixed with the fingers of one hand, transferred to the palm of the other hand, shaped into a thread about 3 cm thick, and then wrapped in a ring with a diameter of 3 cm. Then, depending on the mechanical composition, the type of soil is determined by the main indicators in Table 3.

In the laboratory, they must first determine and study the mechanical composition of certain species in the collections. It should contain the words "sand", "sand", "loam", "clay" in the collection, and then determine the mechanical composition of the sample in 6 control boxes by each "dry" and wet methods.

Determination of the mechanical composition of the soil by the method of MM Filatov.

In this method, we first determine the sand and mud, and then the dust. The course of analytical work. The soil should be finely sifted with a 1 mm sieve. We calculate the remaining parts separately. That is, we determine the size of large particles.

Determination of clay: 50 ml of measuring glass is placed on a sieve until the volume is 5 ml. Then add 5 ml of 1 N solution of calcium chloride (Ca CI2) with 30 ml of water to coagulate and mix well and infuse to 50 ml with water for 30 minutes. After settling, measure the increase in soil volume with a meter and record the result in the table. According to the following formula:

Determination of sand. In a 100 ml measuring cylinder, compact up to 10 or 20 ml of compacted soil to determine the amount of clay. Add up to 100 ml of water. Mix it with a glass rod and leave for 90 seconds. At this time, large particles settle and fine particles remain on the surface of the water, making the water muddy. Pour the muddy water again and add another 100 ml of water.

In this way, we drain and refill the water until it is clear. Then we measure the volume of the remaining sand and calculate its size. 1 mm is equal to 10% of its volume.

The amount of dust in the soil is determined by the following formula.

S = 100- (clay + sand + large particles).

Using the ratio of clay and sand, we determine the mechanical composition of the soil and its types using the following table:

Like all living organisms, microorganisms must have sufficient nutrients in their growth medium to thrive. In order to determine the dynamics of growth of azotobacteria cultures in man-made contaminated soils, we observed the growth of bacteria depending on the level of contamination in the liquid medium [7].

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