SOIL AERATION

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Abstract: *Soil air is involved in many processes. Plants and animals breathe from it. It causes a change in the composition of soil air. For example, if the amount of CO2 gas in the soil air increases due to the decomposition of organic matter or exchange of soil air with atmospheric air (soil compaction) and for some other reason, then the amount of dissolved CO2 gas (H2CO3) in the soil solution also increases. will appear.*

Key words: *soil, water, moisture, wilting, air, porosity, hydromorph, nutrients*

The actual amount of air trapped in the soil, expressed as a percentage of the volume, is called soil aeration. Its amount is determined by the difference in porosity and moisture in the soil. As soil moisture increases, aeration decreases, because in such conditions, most of the soil volume is occupied by water. The maximum level of aeration is achieved when the soil is dry. Soil aeration can be changed as a result of amelioration and agrotechnical measures, such as digging ditches and laying pipes, drying, irrigation and deep plowing of the land.

Soils also breathe, which means that 1 m2 of land can release about 10 liters of CO2 gas and absorb as much oxygen (O) per day. The more CO2 gas is released from the soil, the faster and better the biological processes are. Depending on the rate and amount of CO2 gas released into the atmosphere, we know whether the biological processes going on in these soils are intense or slow. Strong biological aeration is characteristic of porous, slightly moist and humus-rich soils, in which plants always feel very well. In dense, fertile and structureless soils, it is difficult to exchange soil air with atmospheric air, so the amount of CO2 and other gases increases greatly and poisons plants.

It is known from the tests that 7-10 l of carbon dioxide is released per day at 150 C from 1 m3 of soil surface. If the CO2 gas released from the 20 cm layer of the soil does not escape into the atmosphere for 1.5 hours, its concentration in the soil increases by 1.5 times, and during 14 hours it increases more than 10 times. In the field experiments conducted by N.P. Poyasov in the Leningrad region, if we eliminate the CO2 gas released from the soil into the atmosphere for 48 hours, the concentration of this gas in the soil air is 4.2%, and the amount of oxygen is 13.5%.

According to our calculations, 35 ml of carbon dioxide gas (CO2) is released from 1 m2 of the surface of this experimental area for 1 hour.

So, the formation of CO2 gas and consumption of oxygen (O2) in the soil depends on the temperature of the soil, and the progress of this process, in turn, is determined by the activity of microorganisms in it. It should be noted that the role of soil air in the activity of microorganisms and plants is great. In the experiments of A.A.

Kudryavsev in sterile conditions, 1.2-1.6 mg of dry mass of pea through its roots, and -0 for 1 g of corn .35 mg of oxygen is consumed. This amount indicates the consumption of 67 mg/g of oxygen under field conditions (non-sterile), that is, in conditions where the activity of microorganisms has not been eliminated. So, microorganisms consume more oxygen than plants. Microorganisms are divided into the following types depending on their attitude to oxygen consumption: aerobic microorganisms - use free oxygen during their vital activities; anaerobic microorganisms do not need free oxygen in the soil air, they consume oxygen produced during the decomposition of oxygen-retaining substances in their vital activity. The third group of microorganisms is the transient group, and these, in turn, are facultative anaerobic, that is, despite being adapted to anaerobic conditions, they can live in an environment with a large amount of free oxygen, and finally, microaerophilic, i.e. are microorganisms (for example, serobacteria) that can live in conditions where oxygen in the soil air is very low (3% or less).

Quantitatively, diffusion is equal to the amount of gas passing through 1 cm2 of surface for 1 s (when the gas gradient concentration is equal to one) and is expressed in units of cm2 \sec. Minus diffusion in the formula indicates that the pressure or concentration of gases moves towards the lower direction.

Air and gas exchange in the soil is related to air temperature, water level, especially soil moisture, non-uniformity of temperature between the upper and lower layers of the soil, and changes due to wind. If the exchange of soil air with atmospheric air deteriorates, then people in various ways, some with understanding and some without understanding, begin to soften the soil. Plowing the ground, trying to keep it always soft, cultivation after each watering, mowing and other activities are only activities aimed at creating a normal air regime in the soil.

Soil air takes part in many processes. Plants and animals breathe from it. It causes a change in the composition of soil air. For example, if the amount of CO_2 gas in the soil air increases due to the decomposition of organic matter or the exchange of soil air with atmospheric air (soil compaction) and for some other reason, then the amount of dissolved CO_2 gas (H_2CO_3) in the soil solution will also increase. will appear. This, in turn, causes an increase in hydrogen ion concentration, dissolution of calcium carbonate and other salts in the soil, acidification of the soil environment, and a number of other changes. A decrease in the amount of CO_2 gas in the soil air has the opposite effect on the above-mentioned changes. Such examples can be given a lot, because there is a strong connection between soil air, soil solution and its solid phase (colloid complex), the change of some of which leads to changes in the composition and properties of other phases.

When studying the composition of soil air, 2 types of work are performed. 1) extraction of soil air; 2) determining the amount of oxygen and carbon dioxide in the soil air.

Extracting the air contained in the soil without replacing it with atmospheric air is the most difficult task. That is why various authors have proposed equipment designed to separate the air from its pores without disturbing the natural structure of the soil. We will touch on some of them.

F.Y. Gelser proposed a 1-liter stainless steel cylinder in the 1930s in order to study the air composition of gray soils. A tube with a diameter of 7 mm is welded to the bottom of the cylinder. A rubber hose is put on the end of the tube and fixed with a clamp. The upper part of the cylinder is hermetically sealed. Manna is sampled from the walls of the soil section or from the top of the soil using this cylinder. The main requirement is not to disturb the natural condition of the soil and to prevent more atmospheric air from falling into the cylinder. In this way, the air in its pores is removed from the soil sample brought to the laboratory. This requires chemical absorbents that absorb CO2 and O2. It is found by transferring the CO2 gas contained in the soil air to a 0.1 p Ba (OH)2 solution and titrating it with a solution with a clear concentration through the very simple apparatus proposed by F.Y. Gelser.

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