THERMAL CONDUCTIVITY OF THE SOIL

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Abstract: *Thermal conductivity, like thermal conductivity, is low in absolutely dry soil because the air in the soil conducts heat very little. Therefore, an increase in humidity causes a sharp increase in thermal conductivity.*

Key words: soil, water, moisture, wilting, recovery, porosity, hydromorph, nutrition

The heat (thermal) property of the soil is one of the factors that indicate its fertility, and it affects the plant life and all the biological and chemical weathering processes that take place in the soil. Weathering of rocks, chemical and physical interaction of substances in solid, liquid, gaseous state, exchange of water and substances between the soil and its typical organisms, etc., change directly under the influence of thermal factors.

The thermal factor of the soil cannot be replaced by other physical factors. A simple example. Bring the cold earth to you. In this case, let's say that the temperature of the air should remain around -40-50 C for several days. During this time, plant a plant seed in that soil and watch it germinate. In this case, you will witness that the plant seed has not germinated for a very long time. So, the rapid growth of biological life in the soil depends not only on the optimal amount of moisture, air and nutrients, but also on its thermal state.

The main source of soil thermal regime is solar energy. Biochemical processes in the soil, oxidation-reduction processes, and heat released from soil wetting are the sources of the thermal regime.

The sun, which is the main source of heat, gives an average of 1,946 calories per minute per 1 cm2 of the earth's surface. This is called constant heat content of the sun. The amount of energy reaching the Earth's surface varies greatly from the poles to the equator, depending on the geographic latitude of the region.

The soil does not absorb all the solar energy. Some of this energy is not absorbed by the Earth's surface but returns to the atmosphere.

Albedo (a measure of the ability of the earth's surface to reflect) expressed as a percentage of the ratio of the energy falling on a certain earth's surface to the energy returned by this earth's surface is called albedo. Albedo is highly variable for different land surfaces, as can be seen from some examples below (in %).

- Dry black soil - 14
- Moist black soil 8-9
- Gray soil in the desert zone 29-31
- White sand 40
- Water surface 10
- Standing snow - 70

- Plowed and leveled gray soil-30-31
- Freshly plowed and unleveled gray soil-17
- Sholipoya-12
- Cotton area -20-22
- Dry plow-20
- Wet plow-14

As can be seen from the examples given above, the ability of the soil to absorb solar energy depends on the following factors: the color of the soil - the darker it is, the smaller the albedo indicator; an uneven surface always has a lower albedo than a smooth surface; As the moisture content of the soil increases, its color darkens (that is, a darker color), and as a result, the albedo decreases.

However, when the soil is fully saturated with water, the appearance of a glossy surface can lead to a further increase in albedo. From the examples given above, it can be concluded that in order to improve the thermal regime of the soil, it is necessary to make it darker, keep the soil surface uneven, and thus slightly reduce its albedo.

In order to properly understand the thermal properties and regime of the soil, we need to know the heat capacity of the soil, its thermal conductivity and study the elements that make up the heat balance.

Heat capacity of the soil. The amount of heat required to heat 1 g of soil to 10 C is called the heat capacity of the soil. It is measured in calories. The heat capacity of the soil depends on its chemical, petrographic and mineralogical composition and the level of moisture, which can be seen from the following examples (mass heat capacity, g\cal); air-0.2399; water-1,000; sand-0.194; dry soz-0.233, quartz-0.188, granite-0.192; basalt-0.200; lime-0.214; humus-0.477 and so on.

As the soil moisture level increases, its heat capacity also increases, because the heat capacity of water is four times greater than the heat capacity of air. Depending on the level of moisture, the heat capacity of the soil changes as follows; on sandy soils from 0.72 to 0.302; it varies from 0.83 to 0.24 in soz soils and from 0.91 to 0.15 in peat soils.

Soil thermal conductivity is an important thermal property of the soil, which indicates the rate at which solar energy passes down or up through the genetic layers of the soil.

The thermal conductivity of the soil is measured by the amount of heat (calories) transferred to a distance of 1 cm in one second from its 1 cm2 diurnal section when the temperature gradient is 10 C. Thermal conductivity of the soil also depends on its chemical, petrographic, mineralogical composition and degree of moisture.

Heat transfer coefficient of some components of the soil (in terms of calories); air-0.0000577, water-0.00136, dry sand-0.0022, dry sand-0.0093; quartz-0.0024; granite-0.00817; basalt-0.0052; peat-0.00027 and so on.

Sandy soils heat up faster and deeper than sandy soils. Also, all mineral soils heat up better than soils rich in humus. That is why, in the language of grandfather farmers, light soils (with little humus) were called hot, and heavy soils were called cold soils.

When the moisture level of the soil increases from 0 to 5-6%, its thermal conductivity increases sharply. If the humidity level exceeds this amount, heat transfer will slow down.

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