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THE IMPORTANCE OF SOIL THERMAL REGIME IN THE LIFE OF PLANTS

Annotation*. The article deals with the crop growth, productivity, and soil thermal conditions in agriculture. Insufficient or excessive thermal in the soil adversely affects the germination of plant seeds. Therefore, it is important to know well the laws of formation of the soil thermal regime and its control measures.*

Keywords*: albedo, thermal regime, temperature, mineral*

Introduction. We know that the thermal properties of soil include: soil thermal absorption, thermal capacity, and thermal conductivity. Here is a brief description of these properties of the soil. The thermal absorption of the soil is the property of the soil to receive and absorb solar energy. This property of the soil is usually characterized by Albedo (A) index. The percentage of energy returned to the total energy of sunlight falling on the earth's surface is called Albedo (A). The lower the albedo, the more the soil absorbs solar energy. Albedo depends on soil color, moisture, structural condition, soil surface flatness, and vegetation cover [4].

Materials and methods. The thermal regime of various soils has been studied in more detail by A.P.Voekov, A.F.Chudnovsky, M.I.Budiko, A.M.Shulgin, V.N.Dimo, in Uzbekistan I.Turapov and others [8].

The results of the scientists' experiments show that dark, humus-rich soils absorb more solar energy than light ones, and moist soils absorb more solar energy than dry ones, and the Albedo index is lower.

The thermal conductivity of the soil depends on its mineralogical, mechanical composition and the amount of organic matter, as well as on the mutual ratio of the soil mixture and the solid, liquid, gaseous phases of the soil. Accordingly, soil components have different thermal conductivities.

The thermal regime of the soil is influenced by the climate (flow of solar radiation, humidification and drying of the atmosphere, etc.), as well as the relief conditions of the place, vegetation and snow cover.

The thermal regime of the soil is formed under the influence of climate (flow of solar radiation, humidification and drying of the atmosphere, etc.), as well as the relief conditions of the place, vegetation and snow cover [9]. The main indicator of the thermal regime, which characterizes the thermal state of the soil, is the temperature of the soil. Soil temperature is determined by the incoming solar radiation flux and the thermal properties of the soil.

Results and Discussion. The maximum temperature of the soil surface is around 1 pm, the lowest temperature is before sunrise in the morning. The soil layer, which changes rapidly with temperature, is 0-1 cm, and sharply decreases from 3-5 cm. At a depth of 35-100 cm, there is practically no daily change of soil [6]. The rate of temperature change is also much slower due to the rapid changes in surface temperature and the low thermal conductivity of the soil.

Clear or cloudy weather, precipitation, wind and soil composition, vegetation and snow cover affect the daily changes in soil temperature. In summer, the temperature of the soil surface in the bare, open areas reaches 70-75° C in Central Asia and 82° C in the tropic countries [2].

Change in average annual soil temperature: the average daily change in July and August is maximum, and in January-February, minimum. In summer, the highest daily average temperature is usually observed in the upper part of the soil and decreases in the lower part. In winter, it’s opposite, the temperature on the surface of the soil decreases and rises in the lower parts. The annual change of soil

grunt temperature in the northern latitudes reaches a depth of 25 m, with an average of 15-20 m. In the southern regions, this indicator is up to 10 m, below which the temperature is constant, and it takes 20-30 days for the minimum or maximum temperature to change to a depth of one meter.

The main natural factors causing fluctuations in soil temperature are relief, soil properties, vegetation and snow cover. Soils on the southern slopes are relatively warmer than those on the west and east. The steeper the northern slope, the greater the difference in soil temperatures, and the lower the slope, the smaller the difference in soil temperatures in the southern and northern parts (0,2-1,5° C) [3].

Different plants require different amounts of heat during certain growing seasons for normal growth and development. That is, the seeds germinate at a temperature not lower than 0-1.

The higher the temperature in the soil (up to a certain limit), the faster the plants grow. For example, autumn wheat seeds germinate in 4 days at a soil temperature of 5-10° C degrees and in 1-2° C days at a temperature of 15-20 degrees. Higher temperatures than this, will negatively affect it [5, 7].

High temperatures also affect plants. In particular, the formation of tubers in potatoes is reduced. At low temperatures, plant growth slows down, the growing season prolongs, and plant yields decrease. Under these conditions, the transfer of moisture and nutrients from the soil to plants, especially phosphorus and nitrogen, decreases, biological-chemical processes slow down and the metabolism of nutrients is disrupted. All these lead to a decrease in yield. At soil temperatures below 10° C, the root system of plants becomes less branched and grows slowly, becoming thicker and more porous [1].

Soil temperature is also important when overwintering cultivated plants. Low soil surface temperatures can seriously harm plants. The level of damage depends

on the sort and biological properties of plants, the nature of autumn weather, the duration of exposure to low temperatures, etc.

For each plant species, minimum soil temperature limits are required for seed germination and grass germination (Table 1).

Table 1. The minimum temperatures required for the germination of seeds and herbs of various crops (according to V.N.Stepanov)

Crop type	Seed germination	Grass view
Ridjik, hemp, colored grass, sebarga, alfalfa	0-1	2-3
Rye, wheat, barley, peas	1-2	2-3
Flax, buckwheat, lupine, beets	3-4	6-7
Sunflowers, potatoes	5-6	8-9
Maize, millet, mushrooms, soy	8-10	10-11
Beans, corn	10-12	12-13
Cotton seeds, peanuts, sesame seeds, rice	12-14	14-15

As can be seen from the table, the necessary minimum temperatures for germination of seeds and grass seedling for various agricultural crops have been considered.

Conclusion. Low soil temperatures (below 10° C) lead to a slowdown in plant growth, an extension of the growing season and, ultimately, to a decrease in yields. The main reason for the decline in crop yields at low temperatures is a slowing of the growth process as a result of a decrease in the absorption capacity of the root and the low absorption of phosphorus by the plant. This disrupts the metabolism of the whole plant, the distribution of nutrients to the roots and surface organs. As the soil temperature decreases, the effectiveness of the fertilizers applied to the soil decreases. Rising soil temperature also has a negative effect on plants. For example, as mentioned earlier, high soil temperatures can cause potatoes to rot.

This means that soil temperature plays an important role in plant life. If the soil temperature is not normal for plant growth, it will lead to plant growth and reduced productivity. In our research, we aimed to study the seasonal effects of soil temperature on agricultural crops in different soil types distributed in the Republic of Karakalpakstan, and we will consider them in our next work.

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Article number 02001. E3S Web Conf., 227 (2021) 02001. DOI: https://doi.org/10.1051/e3sconf/202122702001