ASSESSMENT OF THE EFFECT OF LOW-TEMPERATURE GROUNDWATER ON THE VEGETATIVE PERIOD OF PLANTS.

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Abstract. In the article, extensive research was conducted on conducting hydro geological research on the rational and ecologically safe use of underground water resources, studying the effect of the physical and chemical characteristics of underground water on the process of plant development. In particular, the most perfect options for growing sunflower crops from water sources of different temperatures in irrigation were researched. Negative effects on the vegetative period and physiological processes of sunflower have been studied, especially when using low-temperature underground water. Changes in soil temperature are usually short-lived. Within 24 hours after irrigation, soil temperature at a depth of 10 cm tended to return to its pre-irrigation level. Temperature changes at great depths lasted longer. It takes at least 12 hours to restore the initial temperature level at a depth of 120 cm. The heating of the irrigation water as it moves across the field causes the soil temperature to drop less at a distance of 120 m from the main furrow than at the point of water intake in the field. Based on the method of field research, the growth, development, and productivity of the studied sunflower crop samples were studied in 3 different options. Accordingly, we determined the phenological observations and biometric measurements of 100 typical plants selected from the cultivars and samples and created a model for evaluating the vegetative period and physiological processes of the sunflower. Also, in this process, the methods of physic-chemical analysis, comparison of statistical data, and study of the effect on the growth, development, and productivity of sunflower during the growing season by conducting field experiments and evaluation by methods of systematic analysis are presented.

Key words: assessment, vegetation, field experiment, groundwater, sunflower, oilseeds, yield, and limited field moisture capacity (LFMC)

1 Introduction

The demand for water resources that can be used in world practice is increasing year by year. Especially in this regard, countries with arid and semi-arid climates use more groundwater for irrigation. In particular, 46% of the total irrigated area in the USA, 33%

in the PRC, 59% in Iran, and 100% in Libya are irrigated from this type of source. Despite the fact that the climatic conditions of Uzbekistan are dry, this figure is only 7% [1, 2].

Today, in our Republic, underground water, due to its underground nature, is used for irrigation from sources with a temperature of 12–16 °C. This amount of irrigation is lower than the specified norm, i.e., (220S) [3]. In addition, the rise of saline seepage water causes water logging of irrigated lands, i.e., secondary salinization, and a further decrease in soil temperature, which is necessary for plant development. Researchers concluded that temperature is the main factor that directly affects the rate of plant development [4] and that the temperatures required for moderate plant growth are below 32°F (0°C) or 100°F (+37.7°C) in high or low temperature extremes, with normal growth at temperatures higher than [5]. Temperature plays a key role in various developmental functions of plants [6–8]. Also, the temperature of groundwater increases with depth and from polar to equatorial oases, causing them to be divided into zones according to existing classifications [9]. For this reason, the low temperature of underground water leads to the extension of the vegetation period of plants [10–13].

Materials and methods

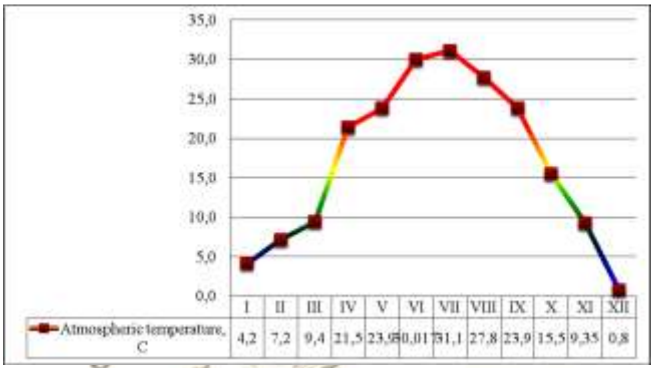
Based on the above analysis, experiments and research were carried out in the Vobkent district of the Bukhara region. This area is located in the northern part of the region and is bordered by Peshku, Shafirkon districts from the northwest, Kyziltepa district of Navoi region from the southeast, Kagan district of Bukhara region, Bukhara district from the south, Gijduvon district from the northeast, and Romitan district from the southwest. The main part of the land area is cultivated. It was found that it consisted of lands and pastures.

The selected area is mainly located in the plain between the desert and the irrigated oasis. The soil consisted mainly of meadow-alluvial, brown-gray, and desert-sandy soils.

The climate is continentally dry; precipitation is 116–130 mm per year; the air temperature varies sharply throughout the year, the number of days without frost is 246-272; the summer is hot and dry; and the winter is short and cold. It was taken into account that the amount of useful temperature is 2430-2690ºC. Also, it was observed[1] that almost 60% of the precipitations during the year are the precipitations until the end of January and April of the year (Graph 1,2).

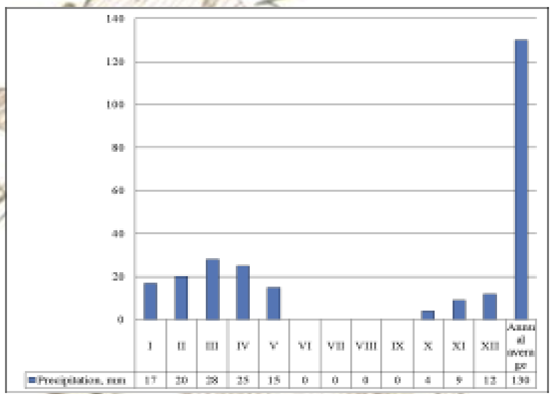
[1] Data recorded during the year from the roof of the Bukhara Meteorological Observation Center of the Bukhara Region Hydrometeorological Department. https://meteostat.net/ru/place/uz/bukhara?s=UTSB0&t=2023-03-01/2023-03-06

Graph 1



Graph 1. Monthly and average annual air temperature, Bukhara meteorological station, 2022.

Graph 2



Graph 2. Monthly and average annual precipitation: Bukhara meteorological station, 2022.

In the above data, it was found that the main factor of the climate is that in most cases, the wind blows almost throughout the year, and the direction of the wind is mainly south and southeast.

It was observed that the levels of groundwater are 2.0–2.5 meters with a maximum height, while their minimum depth is 2.5–3.5 meters. It was found that the range of change of the seepage water is equal to 0.5–1.5 meters.

Based on the following information, more than 89% of the irrigated areas in this district, where the research was conducted, consist of lands with varying degrees of salinity.

3. Research method

Sunflower as a repeat crop for Navruz[3] on the experimental field on July 7, 2022. On July 7, 2022, the land cleared from the grain field of the "Toshev Sherzod" farm, Vobkent

[3] Selection variety of the experimental station of oilseed crops of Uzbekistan. Authors: Anarbaev I, Idiyatulina D, Tursunov L, Lee Alevtina Anatolevna, Balkibekova R. Belongs to the group of medium-sized varieties. The average height of the plant is 170 cm. The average weight of 1000 seeds is 71.0 g. The basket is dense, bent down, the seeds are black. Morning. Vegetation period is 98-110 days. Resistant to spills and spills, 4.5 points. Average yield: 32.3 st/ha. During the test years, there were no cases of damage by agricultural diseases. It has been included in the State

district, was leveled with a laser device, a heavy ram was run, and after pulling the chisel, New Holland T-7000 and STV6D-8D seeds were planted on a wheeled tractor. planted using a planter based on a 0.6x0.8x0.4 scheme*. Germinated seeds germinated in 7–8 days. After full germination of grasses, unification was carried out during the period of formation of 1 pair of leaves on the plant. In it, one plant was left in one nest. Before the beginning of the basket formation phase, 30 percent of the annual rate of nitrogen fertilizers (60 kg per hectare) was applied, and the first irrigation was carried out during the growing season. As soon as the soil came to the top, a second cultivation was carried out at a depth of 12 cm.

In the Bukhara region, an area planted with barley was selected on the basis of the technologies required for planting oilseed crops, that is, with the condition that rapeseed, green peas, soybeans, and beans are not planted. In our next experiments, sunflowers were sown in wide rows with 60 cm between rows, and 41 thousand sunflower seeds were placed on 1 ha of soil due to the required moisture level of 70–80-60 % .

In order to study growth and development, phenological observations and biometric measurements were conducted on 100 typical plants selected from the first (control), second, and third beds.

Based on the data obtained in the field experiments, the sunflower crop was divided into two variants and a control field. The sunflower crop was grown using the traditional method of watering three times in all three options during its vegetation period, that is;

In the first option (control), the sunflower crop was irrigated only with canal (river) water;

In the second option, the sunflower crop was irrigated with canal (river) water during the first watering and only from underground water in the remaining two turns;

In the 3rd option, the sunflower crop was watered from underground water three times.

Depending on the different temperatures of the irrigation water in the experimental field during the vegetation period, sunflower development stages were determined in 3 different variants:

As a result, the growing season of the sunflower crop

Option 1 (control) lasted 95–98 days, and the highest indicators were recorded compared to both options. In option 2, it lasted 98–103 days and was extended to 5 days compared to option 1 (control), and in option 3, the biggest difference was observed compared to option 1 (control), that is, the growing season was extended to 9 days.

According to the above, the germination period was the same for all three options due to the high temperature of the atmosphere and soil, i.e., it lasted 6-7 days, the shoot and root developed, the seed pods came to the surface, and the weeding period ended.

Register of the Republic since 2013. Recommended for planting in all regions of our country.. https://www.agro.uz/kungaboqar/#1635092386651-048fe671-a109

From the beginning of the basket formation period to the end of the flowering period, the experimental field was irrigated three times according to the options. According to it,

Option 1, the control, was watered three times only through canal (river) water, while option 2 was watered for the first time using canal (river) water and in the other two turns using underground water, and the last

In option 3, the sunflower crop was irrigated from underground water three times.

5. Conculution.

The main goal of the study was to develop a model for evaluating the yield of the Navruz variety of sunflower under the influence of low-temperature underground water sources in field conditions using the methodology of field experiments. In the field experiment, we studied the growth and development of the studied sunflower crop samples in 3 different options. Based on this, the model based on four months selected from the sunflower growth phase (from July to October 2022) made it possible to predict the impact on the yield. Depending on the biological characteristics of the sunflower crop, different temperature levels of irrigation water affected plant organs as follows: As a result, due to the low temperature of the irrigation water, the growth and development processes of the plant are significantly slowed down; that is, the vegetation period is delayed by 5–9 days. It is expected that the proposed method can be adapted to other locations and different crops.

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