

THE NECESSITY TO USE HYDROGELS IN CONDITIONS OF ISLAND WATER SHORTAGE IN THE ARAL REGION

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Highlight

Use hydrogels in conditions of island water shortage.

Abstract

The Republic of Karakalpakstan, situated on an island's coast, grapples with an enduring shortage of irrigation water that wreaks havoc on its national economy and agricultural productivity year after year. In response to this pressing challenge, the adoption of hydrogels as a technology for moisture retention emerges as a dependable solution. Hydrogels, renowned for their capacity to absorb and retain water within their structure, offer a promising avenue to mitigate the adverse effects of water scarcity in Karakalpakstan. By integrating hydrogels into soil or irrigation systems, moisture can be efficiently captured and stored, significantly reducing losses due to evaporation and ensuring a consistent supply of water to plant roots.

Keywords

water deficit; soil moisture; hydrogel; saline soil; extreme climate; cotton; productivity; green landscape.

Introduction

According to the information of world experts, by 2030, the water shortage in Uzbekistan may reach 7 billion cubic meters [7]. Since our republic is an agrarian country, it is a country that consumes a lot of water among Central Asian countries. Kazakhstan uses 33% of its water, Kyrgyzstan uses 50% of its water, while the Republic of Uzbekistan uses 169% of its water reserves [12].

The reduction of the total amount of water resources that supply the national economy of our republic, the absorption of a part of the incoming water resources into the soil and waste to the air, water shortage in the Republic of Karakalpakstan, which is located on the coast of the island, global climate change, environmental conditions, and the decrease in precipitation are leading to water shortage in our republic and low yield of agricultural crops or no harvest at all due to lack of water during the period of operation [11].

If there are no agreements between the countries, the world experts confirm that the construction of the Koshtepa canal, which is 100 meters wide and 8 meters deep, and is intended to receive a third of the water of the Amudarya in Afghanistan, can cause serious problems with water shortage in the Republic [12].

Therefore, it is advisable to use artificial polymers - hydrogels, which absorb moisture from the air, snow and rain, in order to harvest crops. The experiences of foreign countries and the results of research conducted by scientists of Therefore, it is advisable to use artificial polymers - hydrogels, which absorb moisture from the air, snow and rain, in order to harvest crops. The experiences of foreign countries and the results of research conducted by scientists of TIAME show that the application of strong swelling polymer hydrogel with different chemical bases is a promising method for water savings show that the application of strong swelling polymer

hydrogel with different chemical bases is a promising method for water saving. It should be noted that hydrogel is used effectively in the developed countries of the world, where there is a shortage of water. However, the effectiveness of using hydrogel in the technology of care of agricultural crops in the conditions of the Republic of Karakalpakstan has not been studied before [9].

The Relevance of the Topic

At a time when, according to international experts, the water shortage may increase, hydrogels that retain moisture in the soil for agricultural crops are very important. Previous observations on soil moisture show that, when there is sufficient moisture in the soil, the first hanging of cotton in slightly and moderately saline soil creates comfortable conditions. At the initial stage of the development of cultivated plants, maintaining such a minimum level of moisture is a primary task. In recent decades, efforts have been made to maintain moisture in the soil. This is mainly achieved by using hydrogels. With their help, it creates an opportunity to correct the lack of moisture in the soil during the period of operation. Hydrogel is a highly absorbent artificial polymer that can retain moisture in the soil for a long time. Saturated from snow, rain or irrigation water, the hydrogel gradually transfers moisture to the roots of plants and has the ability to absorb 250-400 times more water than its own weight. Simply put, 10 grams of polymer can hold up to 2.5-4 liters of water. As for its effectiveness, it can save 20-40 percent of irrigation water for most agricultural crops when used correctly. At the same time, it becomes possible to fully use all the given nutrients and prevent it from washing away the lower layer of the soil [7].

A. Salokhiddinov, A. According to the research results of Khamidov, V. Boirov and L. Yusupov, strong swelling hydrogels used in dry farming have a significant positive effect on winter wheat [13, 14, 15].

Methodology

All irrigated lands of the Republic of Karakalpakstan saline, soil fertility is low. The demand of our people for food products and its quality is increasing. The use of hydrogel, which contains mineral fertilizers, trace elements, and plant protection agents against various diseases and pests, leads to rapid germination, development, and productivity of almost all lawns. As a result, a large amount of mineral fertilizers and water is saved. Groundwater damage is prevented, and importantly, it is possible to plant crops on previously unusable lands and harvest them [6].

The Purpose of the Study: The aim is to determine the effect of hydrogel parameters on the growth and productivity of cotton in the saline soil of Karakalpakstan, which is located on the shores of the drying Aral Sea.

Research Object: As a research object, the study of the effect of hydrogel resins on cotton yield and soil moisture was based on the land of Karakalpakstan Agricultural Scientific Research Institute. The total area of the experimental field at the Karakalpakstan Agricultural Scientific Research Institute is 0.8 ha, its length is 100 m, and its width is 80 m. The experimental area is 57.6 m long and 20 m wide, and 20 x 2.4 m areas were selected for each option.

The Subject of Research: The basis of the research subject is to determine the optimal parameters of the hydrogel, which creates the basis for obtaining the planned harvest from the Chimbay-5018 and Chimbay 5060 cotton varieties used in production in our republic.

Content of the Issue: A number of researches are being carried out in our country to increase the productivity of the saline soil, improve the nutritional conditions of cotton, and save organic and mineral fertilizers as a result of the combined use of polymer hydrogel with organomineral fertilizers. Based on experiments conducted in different soil regions and melioration conditions of our country, it was found that its use can increase the storage period of productive moisture by 80%. For example, experimental work on the use of "Miracle" hydrogel was carried out at the agricultural company "Akhror Abror Anvarbek" of the Uychi district of the Namangan region. 60 kg of hydrogel was added to 100 kg of ammonium nitrate and uniform mixing was achieved, and 1 ha. evenly distributed over the area. Cotton on 1 hectare area treated with hydrogel was treated in the same way as the untreated area. After one month, according to the examination conducted by experts in the field, it was found that the buds in the area where the hydrogel was applied had grown significantly, and the number of buds, flowers, and pods had increased to 15-20 [5,8].

Foreign researchers Ada Mudhanganyi, G. Hilton, T. Ndagurwa found out that hydrogels had a good effect on the survival and growth of newly transplanted *Pinus patula* saplings in soil amendment [1] Examining the plant in shown in fig. 1.



Figure 1. Examining the plant

However, in the conditions of the saline soil of the Republic of Karakalpakstan, experiments on the use of hydrogels have not yet been conducted to improve the conditions of cotton during the growing season.

Of course, at present, the creation of new synthetic materials with complex properties, which are very high and can satisfy all the requirements of some sectors of the national economy, is one of the main tasks of polymer chemistry. Water-soluble or highly soluble polymers (hydrogels), which are obtained from local raw materials and find their place in practice in certain areas of the national economy, are important [2,3]. Today, hydrogel is effectively used in a number of countries. Based on the experiments conducted in different soil reclamation conditions of our country, it was found that keeping it can increase the storage period of productive moisture by 80%. The use of hydrogel has a positive, fast and strong effect on almost all types of plants, ensures stable germination and increases the productivity of plants [4,5,6].

The Solution to the Problem

when we determine the effect of hydrogels on the yield of cotton in different meers along options and returns, when we determine the effect of moisture-retaining "Miracle" hydrogel on the yield of cotton in Chimbay 5018 and Chimbay 5060 varieties in different meers, along the test, options and returns of the experiment, when we determine the effect of the hydrogels on the control option in which hydrogels are not applied the yield of cotton obtained in the first return was 18.6 t/ha, in the second return 17.4 t/ha, in the third return 16.8 t/ha and in the fourth return 18.8 t/ha, and the cotton yield obtained from the fourth return was 17.9 t/ha / was equal to. In the second version of the experiment, during the spring planting of Chimbay 5018 and Chimbay 5060 cotton varieties, the moisture-preserving hydrogel "Miracle" was given to the rows planted with cotton seeds at the rate of 40 kg/ha per hectare.,3 t/ha, 18.7 t/ha in the third return and 18.9 t/ha in the fourth return, the average yield of cotton from the fourth return was 19.6 quintals/ha and 1.7 quintals/ha extra compared to the non-hydrogel applied control. Yield was obtained.

In the third version of our study, which was carried out to determine the effect of our long-retaining hydrogels on soil moisture preservation and cotton yield, in the maintenance of Chimbay 5018 and Chimbay 5060 cotton varieties, during spring planting, the moisture-retaining hydrogel "Miracle" was applied to the rows with cotton

seeds at the rate of 50 kg/ha per hectare. The yield of cotton obtained according to experimental returns was 24.1 t/ha in the first return, 21.6 t/ha in the second return, 21.8 t/ha in the third return and 23.3 t/ha in the fourth return, the average yield of cotton from the fourth return was 22.7 quintals per hectare and 4.8 quintals per hectare and 40 kg/ha of hydrogel compared to the control option without hydrogel 3.1 t/ha additional yield was obtained compared to the option. In the fourth version of our experiment to determine the effect of moisture-retaining hydrogel "Miracle" on the yield of cotton, in the treatment of Chimbay 5018 and Chimbay 5060 varieties of cotton, during spring planting, the moisture-retaining hydrogel "Miracle" was given at the rate of 60 kg/ha to the rows planted with cotton seeds. the yield in the first return is 25.2 t/ha, in the second return 23.7 t/ha, 23.8 t/ha in the third return and 24.5 t/ha in the fourth return, the average yield of cotton from the first return was 24.3 quintals per hectare and 6.4 quintals per hectare given hydrogel 40 kg/ha compared to the control option without hydrogel 4.7 t/ha compared to the second option and 1.6 t/ha additional yield compared to the second option with 50 kg/ha hydrogel per hectare.

In the fifth version of our experiment to determine the effect of "Miracle" hydrogel on cotton yield, when growing Chimbay 5018 and Chimbay 5060 varieties of cotton, during spring planting, the moisture-retaining "Miracle" hydrogel was applied to the rows planted with cotton seeds at the rate of 70 kg/ha per hectare. 27.4 t/ha, 25.4 t/ha in the second return, 25.3 t/ha in the third return and 25.9 t/ha in the fourth return and 8.1 centners per hectare compared to the control option without hydrogel, 6.4 tons/ha compared to the second option with 40 kg/ha of hydrogel, and 3.3 tons/ha and 60 kg/ha compared to the second option with 50 kg/ha of hydrogel. An additional 1.7 t/ha was obtained compared to the option given "Miracle" hydrogel.

External weather factors - in the fifth version of our experiment to determine the effect of "Miracle" hydrogel, which collects moisture from rain, snow and rain, irrigation and humid air, preserves moisture in the soil and provides moisture to plants, on the cotton yield, in the cultivation of cotton varieties Chimbay 5018 and Chimbay 5060, cotton during spring planting In the case where the seeded rows were given 80 kg/ha of moisture-preserving hydrogel "Miracle", the yield of cotton obtained along the experimental plots was 28.9 t/ha in the first return and 25.9 t/ha in the second return 26.6 t/ha in the third return and 29.9 t/ha in the fourth return, the average yield of cotton from the fourth return was 27.8 quintals per hectare and 9.9 quintals per hectare compared to the non-hydrogel control, 40 kg/ha hydrogel 8.2 t/ha compared to the second option, 5.1 t/ha compared to the second option 50 kg/ha of hydrogel, 60 kg/ha "Miracle" hydrogel compared to 3.5 t/ha and 70 kg/ha 1.8 t/ha of additional yield was obtained compared to the variant with "Miracle" hydrogel. In the fifth version of our experiment to determine the effect of "Miracle" hydrogel, which absorbs 250-400 times more moisture than its own body volume, preserves moisture in the soil and provides plants with moisture, in the fifth version of our experiment on the cotton yield, when growing Chimbay 5018 and Chimbay 5060 varieties of cotton, during spring planting, rows with cotton seeds were planted per hectare In the case of 90 kg/ha of moisture-retaining hydrogel "Miracle", the yield of cotton obtained along the trial plots was 31.5 t/ha in the first plot, 28.6 t/ha in the second plot, 28.5 t/ha in the third plot, and 29.8 t/ha in the fourth plot. ha, and the average yield of cotton from the return was equal to 29.6 centners per hectare and 11.7 centners per hectare compared to the control option without hydrogel, 10.0 t/ha compared to the second option with 40 kg/ha of hydrogel, 6.9 t/ha compared to the second option with 50 kg/ha of hydrogel, 60 kg/ha per hectare 5.3 t/ha and 70 kg/ha of "Miracle" hydrogel compared to 5.3 t/ha and 3.6 t/ha and 80 kg/ha of "Miracle" hydrogel compared to 1.8 t/ha additional yield was obtained. "Miracle", which collects water from external weather factors - snow, rain, irrigation water and other sources, absorbs 250-400 times more moisture than its own body volume, preserves moisture in the soil and provides moisture to plants In the fifth version of our experiment to determine the effect of hydrogel on cotton yield, when growing Chimbay 5018 cotton variety, during spring planting, the moisture-retaining hydrogel "Miracle" was applied to rows planted with cotton seeds at the rate of 100 kg/ha per hectare., 29.8 ts/ha in the second return, 29.8 t/ha in the third return and 32.7 t/ha in the fourth return, the average yield of cotton from the first return was 31.4 quintals/ha and 11.8 quintals/ha compared to the non-hydrogel control, 40 kg/ha hydrogel 8.7 t/ha compared to the second option, 7.1 t/ha compared to the second option 50 kg/ha of hydrogel, 60 kg/ha "Miracle" hydrogel compared to 5.4 t/ha and 70 kg/ha An additional yield of 3.6 t/ha was obtained compared to the option given "Miracle" hydrogel and 1.8 t/ha compared to the option given 80 kg/ha "Miracle" hydrogel.

From the results obtained according to the options, it can be concluded that in the soils of the Republic, soil moisture is very low during spring planting. Therefore, in the soils of the Republic of Karakalpakstan, it is

recommended to combine other elements that retain moisture in the soil - for example, mulching, using milling equipment that actively preserves soil moisture and increases the amount of agronomically active soil particles.

Conclusion

1. It is appropriate to use "Miracle" hydrogel, which preserves moisture in the soil, in soils with low soil fertility and moisture in the Republic of Karakalpakstan.
2. Depending on the soil moisture, the yield of cotton from 29.6 to 31.4 centners per hectare was obtained when the "Miracle" hydrogel was given at the rate of 80-100 kg/ha per hectare, compared to the control option without hydrogel, from 11.7 to 13.5 centners additional yield was obtained.
3. The net profit obtained from the option of using "Miracle" hydrogel at the rate of 80 kg/ha was 5 million 452 soums, and the level of profitability was equal to 42.2%.
4. "Miracle" hydrogel at 100 kg/ha, the net profit from the remaining option equaled 6 million 118 soums, and the profitability level reached 45.8%.
5. On the basis of the conducted experiments, in the soil humus and low moisture soils of the Republic of Karakalpakstan, the moisture retaining hydrogel "Miracle" can be purchased for 60-80 thousand soums per kilogram, and it fully justifies itself from the economic point of view.

Recommendations

1. It is appropriate to use the norms of "Miracle" hydrogel in the range of 80-100 kg/ha in soils with low soil fertility and moisture in the Republic of Karakalpakstan.
2. Apply "Miracle" hydrogel at the rate of 80 kg/ha in places where soil moisture has decreased to 13-14%, 90 kg/ha in places where it has decreased to 11-12%, and 100 kg/ha in places where it has decreased to 9-10%. The planned harvest can be obtained from Chimboy 5018 and Chimboy 5060 varieties.

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