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Effect of "RIZOKOM-1" and "SERHOSIL" biopreparations on soil moisture in cotton development.

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Annotation: This article presents data on the dynamics of changes in soil moisture depending on the season during the cultivation of Namangan-77 cotton variety under the conditions of using the ecologically clean "RIZOKOM-1 and SERHOSIL" biopreparations created on the basis of beneficial bacteria and algae in the conditions of water-saving technologies. The obtained results showed that as a result of the use of biopreparations, it was determined that soil moisture can be preserved more than the control option. Experiments show 15-19% more soil moisture between each watering and 12-15 days longer retention time in satisfactory amounts for the plant.

Keywords: Ecological preparations, water-saving technologies, soil, moisture, cotton variety, Namangan-77, water resources, irrigation procedures, agrotechnical measures, water scarcity, agricultural crops, phenological observations, hydromorph, water productivity, productivity.

Introduction: Today, the issues of efficient use of water resources and the development of water-saving technologies are gaining greater and greater importance in the processes of water resource scarcity and their quality improvement, as well as in the new economic, political, social and environmental conditions that are being created [1.2.3].

It is known that in the conditions of our republic, agricultural crops are grown mainly by traditional (egatlab) irrigation method. In particular, the determination of irrigation norms along with agrotechnical measures for growing high-quality abundant crops in cotton plays an important role in farming [4.5.6]. Along with modern water-saving technologies, the development of water-saving technologies based on relatively cheap, simple and ecologically clean biopreparations is especially important. Taking this into account, we planned to study the effects of "RIZOKOM-1" and "SERHOSIL" drugs, created on the basis of algae and beneficial bacteria, on soil moisture and water productivity during cotton development [7.8.].

Research object and methods: Research object: water-saving technology based on irrigated hydromorphic soils and biopreparations "RIZOKOM-1" and "SERHOSIL" in the experimental field of "Tashkent Institute of Irrigation and Agricultural Mechanization Engineers" National Research University. Subject of the research: the effect on soil moisture was studied using the method of water saving in cotton cultivation based on the biopreparations "RIZOKOM-1 and SERHOSIL" created at the Institute of Microbiology under the Academy of Sciences of Uzbekistan. [5.6].

Scientific experiments were conducted on 2.0 ha of land. The seed (35 kg) required for this experimental plot was soaked in large containers with the biopreparation "RIZOKOM-1" 1 day ago, not less than 12 hours. Before planting, the seed is exposed to the air for 60 minutes and then planted. For the control variant, the same amount of land was allocated, and the seed was sown on it without impregnation with "RIZOKOM-1" biopreparation. 1 month after planting the seed, the cotton was treated with the

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biopreparation "SERHOSIL" and the biopreparation was sprayed using a drug sprayer. Phenological observations were made every month until cotton ripening [9].

Each experiment was performed in 3 different periods with at least 3 variants.

It was ensured that agrotechnical measures were carried out uniformly in the experimental and control areas. Since the beginning of the experiment, the study of the dynamics of changes in soil moisture was carried out in the experimental and control areas. Soil samples were taken from the fields from 5 points using the envelope method. Soil samples were taken from each 10 cm layer to a depth of 40 cm in the experimental and control areas using the envelope method, and its moisture content was determined by the thermostat-gravity method. The process of soil sampling is shown in Figure 3. At the beginning of the experiment, before watering and between waterings (every week), soil moisture was studied and its dynamics were evaluated. Soil moisture is determined in the laboratory based on GOST-28268-89 [10]. Experiments were conducted on the Namangon-77 variety.

Obtained results and their discussion

Tables 1 and 2 show the results of experiments conducted during the growing season on the effect of water-saving irrigation technology on soil moisture in the development of cotton plants.

The dynamics of changes in soil moisture depending on the season in the educational centers of the National Research University "TIQXMMI"

Table 1.

№	Layer depth, cm	Experimental options and soil moisture (%)							Control options and soil moisture (%)						
		1	2	3	4	5	Average	Average 0-40 см	1	2	3	4	5	Average	Average 0-40 см
1	0-20	16,8±0,84	17,4±0,87	17,6±0,88	17,3±0,86	16,8±0,84	17,1	19,3	16,9±0,84	17,1±0,85	16,8±0,84	17,5±0,87	17,7±0,88	17,2	19,3
	20-30	19,6±0,98	19,2±0,96	20,1±1,00	20,3±1,01	20,4±1,02	19,9		19,8±0,99	19,4±0,97	19,2±0,96	20,0±1,00	20,2±1,01	19,7	
	30-40	20,1±1,00	21,5±1,07	20,8±1,04	21,6±1,08	21,7±1,08	21,2		20,4±1,02	21,2±1,06	20,9±1,04	21,4±1,07	21,5±1,07	21,1	
2	0-20	17,1±0,85	17,9±0,89	17,5±0,87	17,7±0,88	18,0±0,90	17,6	19,2	16,1±0,80	15,9±0,79	15,4±0,77	15,8±0,79	16,2±0,81	15,9	18,5
	20-30	18,9±0,94	19,4±0,97	18,5±0,92	18,7±0,93	19,5±0,97	19,0		19,5±0,97	19,1±0,95	20,1±1,01	19,9±0,99	20,1±1,01	19,7	
	30-40	21,1±1,05	20,6±1,03	21,6±1,08	20,8±1,04	21,7±1,08	21,1		19,9±0,99	20,1±1,01	20,5±1,02	19,7±0,98	20,7±1,03	20,2	
3	0-20	16,3±0,81	16,1±0,80	16,7±0,83	16,9±0,84	17,0±0,85	16,6	18,2	14,3±0,71	14,2±0,71	14,7±0,73	14,5±0,72	15,0±0,75	14,5	17,4
	20-30	18,9±0,94	18,4±0,92	18,1±0,90	18,8±0,94	19,1±0,95	18,6		18,4±0,92	18,8±0,94	18,1±0,90	18,9±0,94	19,0±0,95	18,6	
	30-40	19,3±0,96	19,0±0,95	19,7±0,98	19,8±0,99	20,0±1,00	19,5		19,4±0,97	19,2±0,96	18,7±0,93	18,6±0,93	19,6±0,98	19,1	
4	0-20	15,1±0,75	15,3±0,76	15,6±0,78	14,9±0,74	15,7±0,78	15,3	17,3	12,5±0,62	12,7±0,63	12,8±0,64	13,0±0,65	13,2±0,66	12,8	15,3
	20-30	17,5±0,87	17,3±0,86	17,6±0,88	17,9±0,89	18,2±0,91	17,7		16,4±0,82	16,2±0,81	15,8±0,79	15,6±0,78	16,5±0,82	16,1	
	30-40	18,9±0,95	18,6±0,93	18,1±0,91	18,4±0,92	19,0±0,95	18,6		17,3±0,86	16,5±0,82	16,7±0,83	17,2±0,86	17,4±0,87	17,0	

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One-time and seasonal irrigation norms of cotton

Table 2.

Options	Vegetative irrigation	Watering times	Irrigation rate, m^3/ha	Time between waterings (days)
Control field	I irrigation	11 June	1050	
	II irrigation	05 July	1200	23
	III irrigation	03 Avgust	1200	28
Total irrigation rate, m^3/ha			3450	
Experimental field	I irrigation	11 June	1050	
	II irrigation	05 July	1200	23
	III irrigation	03 Avgust	1200	28
Total irrigation rate, m^3/ha			3450	

From the data presented in Table 1, it can be seen that on the date of the beginning of the study in the experimental field, the natural field moisture in the average volume weight of the soil in the 10-40 cm layer of the soil was 19.4%, when measured on May 13, it was 19.2 %, finally, 2 months after planting, soil moisture was 18.2%. It was found that the soil moisture in the control field was 19.2 percent as of June 11, while the soil moisture was the same at the beginning.

On June 12, the first irrigation was carried out in the experimental and control fields. 3 days after irrigation, that is, on June 15, the soil moisture of the experimental and control fields was determined. To date, the soil moisture in the control and experimental areas was 19.4%. Due to the warming of the days, the soil moisture in the fields decreased intensively, and according to the situation on July 6, the soil moisture in the control fields was 17.4%, and in the experimental field it was 18.2%.

On July 6, the second irrigation was carried out in the experimental and control fields. Soil moisture was determined in the control and experimental fields on July 10, 4 days after the second irrigation. According to the situation on that day, the soil moisture in the control fields was 24%, and in the experiment it was 23.8%. The results of the experiment conducted on August 3 showed that the humidity in the control fields was 15.3%, and in the experiment it was 17.3%.

On August 4, the third irrigation was carried out in the control and experimental fields. The results of the experiment conducted on August 14 showed that the soil moisture in the control field was 21%, and in the experimental field it was 22%.

The determined indicators of the amount of additional water given to ensure soil moisture by irrigating the experimental and control fields 3 times during the growing season are presented in Table 3.

One-time and seasonal irrigation norms of cotton

Table 3.

Options	Vegetative irrigation	Watering times	Irrigation rate, m^3/ha	Time between waterings (days)
Control field	I irrigation	12 June	1050	
	II irrigation	06 July	1200	23
	III irrigation	04 Avgust	1200	28
Total irrigation rate, m^3/ha			3450	
Experimental field	I irrigation	12 June	800	
	II irrigation	06 July	1000	23
	III irrigation	04 Avgust	1000	28
Total irrigation rate, m^3/ha			2800	

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As shown in Table 3, irrigation was carried out 3 times in the experimental and control fields during the growing season. The standard of one-time irrigation was 800-1000 m^3/ha, and the standard of seasonal irrigation was 1000 m^3/ha. This amount of water provided to bring the soil moisture content up to 24 % (70 % of the soil's limit moisture capacity). The period between irrigations was 23 and 28 days, respectively.

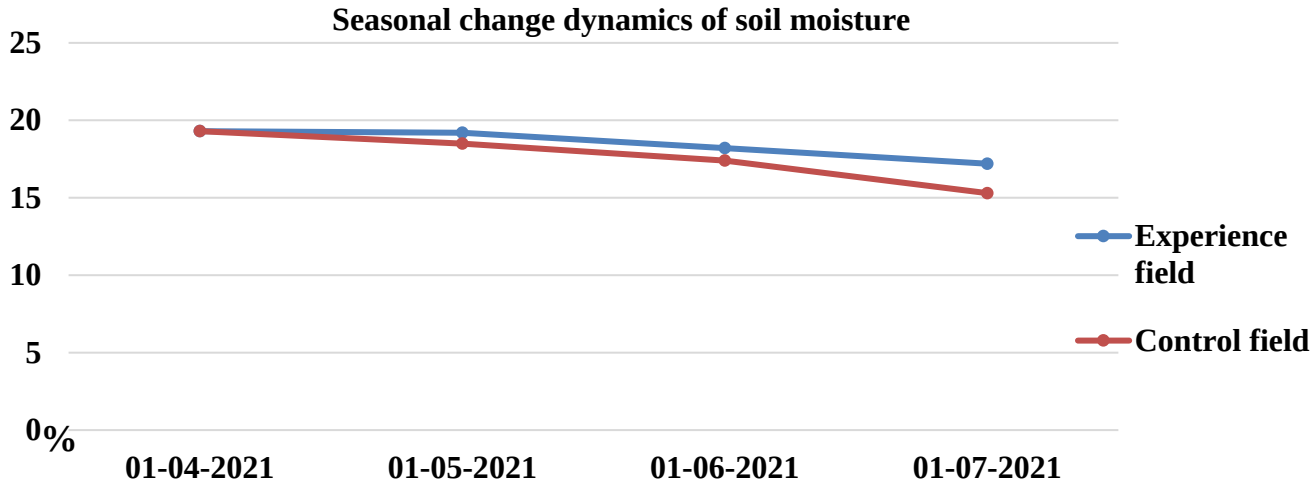
After the first irrigation, it can be seen that the soil moisture in both experimental and control fields reached its limit field moisture capacity or 24% by volume of soil. However, in the later period, due to different evapotranspiration, it can be seen that more moisture is stored in the experimental field. Therefore, it is possible to extend the period of sufficient moisture for the plant by 6 days between the first and second irrigations.

The third irrigation was carried out on August 6, when soil moisture in the control field dropped to 12%. 3 days after the third irrigation, the soil moisture content in both fields was around 22%. After the third irrigation, soil moisture was maintained at sufficient levels for the plant until the crop was matured and harvested.

Summarizing the above analysis, it can be said that due to the effect of "RIZOKOM-1" and "SERHOSIL" biopreparations, the moisture content of cotton-growing hydromorphic soils has improved compared to the control field. Experiments show 15-19% more soil moisture between each watering and 12-15 days longer retention time in satisfactory amounts for the plant.

From a practical point of view, another important issue was the assessment of how much irrigation water can be saved due to the use of "RIZOKOM-1" and "SERHOSIL" biopreparations and their positive effect on soil moisture. According to the results of the conducted experiments, a total of $1050 + 1200 + 1200 = 3450$ m^3/ha of water was given for irrigation in experimental and control fields 3 times. According to the results of the experiment, it was found that the moisture stored in the soil is 16% more than the control area. Based on this, when the water-saving technology based on "RIZOKOM-1" and "SERHOSIL" biopreparations is used, an average of $3450 * 0{,}16 = 550$ m^3 of water per year is saved from the water provided for irrigation of 1 hectare.

Taking into account the importance of the effect of biopreparations "RIZOKOM-1" and "SERHOSIL" on soil moisture and the importance of a more accurate assessment of their distribution patterns, the distribution of moisture in the 0-40 cm deep layer of the soil was studied on selected days. (Graph 1)



Graph 1. Seasonal change dynamics of soil moisture

Conclusion.

As can be seen from the graph, the positive effect of "RIZOKOM-1" and "SERHOSIL" biopreparations on soil moisture is evident in the 5-35 cm deep layer. This law can be justified by the following:

1. "RIZOKOM-1" and "SERHOSIL" biopreparations are mixed as thoroughly as possible into the soil layer at a depth of 0-30 cm;

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2. The lack of effect in the 0-5 cm deep layer can be justified by the decomposition of "RIZOKOM-1" and "SERHOSIL" biopreparations in this layer under direct sunlight;
3. "RIZOKOM-1" and "SERHOSIL" biopreparations have the greatest effect on soil moisture in a layer 5-30 cm deep, based on the fact that they mix in a sufficient concentration in this pen and show their properties;
4. The dynamics of moisture changes in the soil layers at a depth of 35 cm and above and the soil of the control fields is based on the absence of "RIZOKOM-1" and "SERHOSIL" biopreparations in the soil;
5. Summarizing the above points, it should be noted that "RIZOKOM-1" and "SERHOSIL" biopreparations have a significant positive effect on soil moisture.

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