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EFFECTS OF WINTER WHEAT CULTIVATION USING WATER-SAVING IRRIGATION TECHNOLOGY ON THE WATER TABLE LEVEL AND ITS MINERALIZATION IN NEWLY ADOPTED DESERT ZONE SOILS

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Abstract:
This article presents the results of a study on how cultivating winter wheat using economical irrigation technology affects the water table level and its mineralization in newly developed desert zone soils.

Keywords: Water table, dry residue, chlorine, irrigation, hydrogel, winter wheat, water saving, soil.

INTRODUCTION. The location of the water table and its mineralization are the main factors influencing the reclamation condition of irrigated areas. Changes in the water table in these areas mainly depend on the amount of water entering and leaving the area, both at the surface and underground. Additionally, the amount of underground water entering and exiting the boundary of the territory influences changes in the water table.
The object of the study. A highly swelling hydrogel polymer compound was synthesized from local raw materials, including brown soil from the newly developed desert zone of the Bukhara region, the 'Starshina' variety of winter wheat, and its water-saving irrigation technology.

MATERIALS AND METHODS. Scientific research was conducted from 2019 to 2023 on newly developed gray-brown soils with a specific mechanical composition at the "Oltin Boshok" farm, located in the Karaulbazar district, Bukhara region.
Field, laboratory experiments, and phenological observations were conducted on the basis of "Methods of Conduction of Field experiments" ("Methods of field experiments" of the Research Institute of Cotton Breeding and Seed Production Agrotechnologies (UzSRIC, 2007)) [1]. The method of determining the water-physical, agrochemical properties of soil and its content of salts in the method of "Methods of agrochemical, agrophysical and microbiological research in polyvinyl cotton fields" [2]. The accuracy and reliability of the obtained data are analyzed mathematically and statistically using the generally accepted B Dospekhov's multivariate method [3].
In this field experiment, the pre-irrigation soil moisture in all options was at 70-70-65% compared to LSMC. The fertilization rates were the same across all options: N-250, P-180, K-90 kg/ha, and the elite winter wheat variety "Starshina" was planted. The research was conducted with 5 options, each with 3 replications, and the experiments were arranged in a single layer. As a water-saving technology, in addition to the control (1st option), 50 kg/ha of the hydrogel polymer was applied in the 2nd option, 75 kg/ha in the 3rd option, 100 kg/ha in the 4th option, and 125 kg/ha in the 5th option.

RESULT AND DISCUSSION. Water savings were achieved when a highly swellable hydrogel polymer compound, synthesized from local raw materials, was applied at different rates as an economical irrigation technology for winter wheat in newly developed desert zone soils. In the experiments conducted between 2019 and 2023, the seasonal irrigation rate in the control (1st option) without the hydrogel polymer compound was 4577 cbm/ha. In the 2nd option, where 50 kg/ha of the hydrogel polymer compound was applied, the seasonal irrigation rate was 4091 cbm/ha. In the 3rd option, with 75 kg/ha of the hydrogel polymer compound, the rate was 4006 cbm/ha. For the 4th option, with 100 kg/ha of the hydrogel polymer compound, the rate was 3348 cbm/ha. Finally, in the 5th option, with 125 kg/ha of the hydrogel polymer compound, the seasonal irrigation rate was 3271 cbm/ha.
It should be noted that the winter wheat variety "Starshina" was irrigated at a depth of 0-50 cm during the budding period and 0-70 cm during the tuber and ripening periods. Since the level of seepage water was below 3 meters, the irrigation standards did not affect the seepage water level or its mineralization.
Before developing new fields, it is crucial to determine the groundwater level and its mineralization. Considering this, monitoring wells were installed for each option in the experimental area to measure the underground seepage water level and mineralization before conducting field experiments. From 2019 to 2023, in the control version of the

experiments, the average annual seepage water level was 327-330 cm. The period when the water level was closest to the ground surface occurred in June-July, with levels of 312-314 cm. The lowest seepage water levels were observed in January-February, with the level in January at 339 cm and in February at 340 cm. In the research, the control (1st option) showed a 28 cm amplitude change in the seepage water level.

In the 2nd option of the experiments, the average annual seepage water level was 327 cm, with the lowest levels also occurring in January and February, measuring 339 cm and 341 cm, respectively. The closest water level to the ground surface, again occurring in June-July, was 313-314 cm. (Figure 1).

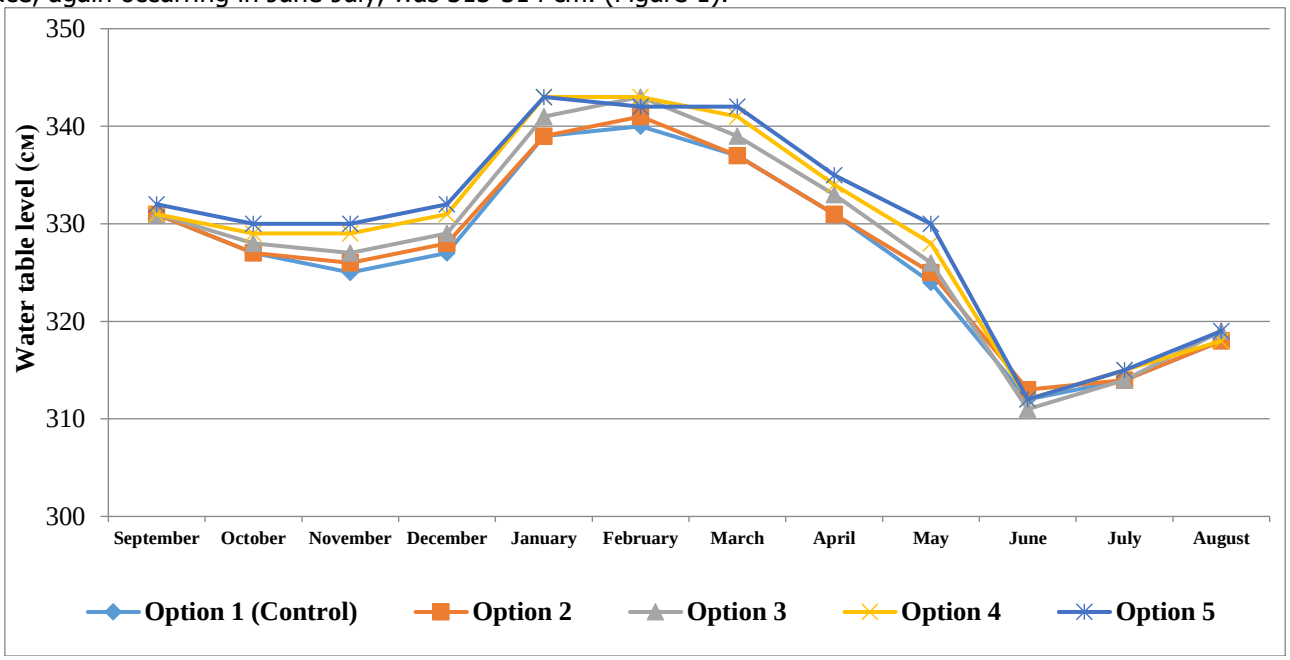

Figure 1. Effect of the application of hydrogel polymer compounds on the water table level (2019–2023 average).

Between 2019 and 2023, the amount of chlorine ions and dry residue in the leachate was determined monthly, as the underground leachate was in newly developed soil within the experimental area. It should be noted that during this period, the amount of chlorine and dry residue in the leachate varied. The concentration of chlorine ions in the leachate was 0.819 g/l in the control option, 0.818 g/l in the 2nd and 3rd options, and 0.817 g/l in the 4th option. In the 5th variant, the concentration was 0.816 g/l. The amount of dry residue was 4.451 g/l in the control option, 4.449 g/l in option 2, 4.448 g/l in option 3, and 4.447 and 4.446 g/l in options 4 and 5, respectively. Since the hydrogel polymer compound was introduced into the soil of the experimental field, the seepage water was located below the active layer, and the irrigation rates had almost no effect on the seepage water level and mineralization (Figure 2).

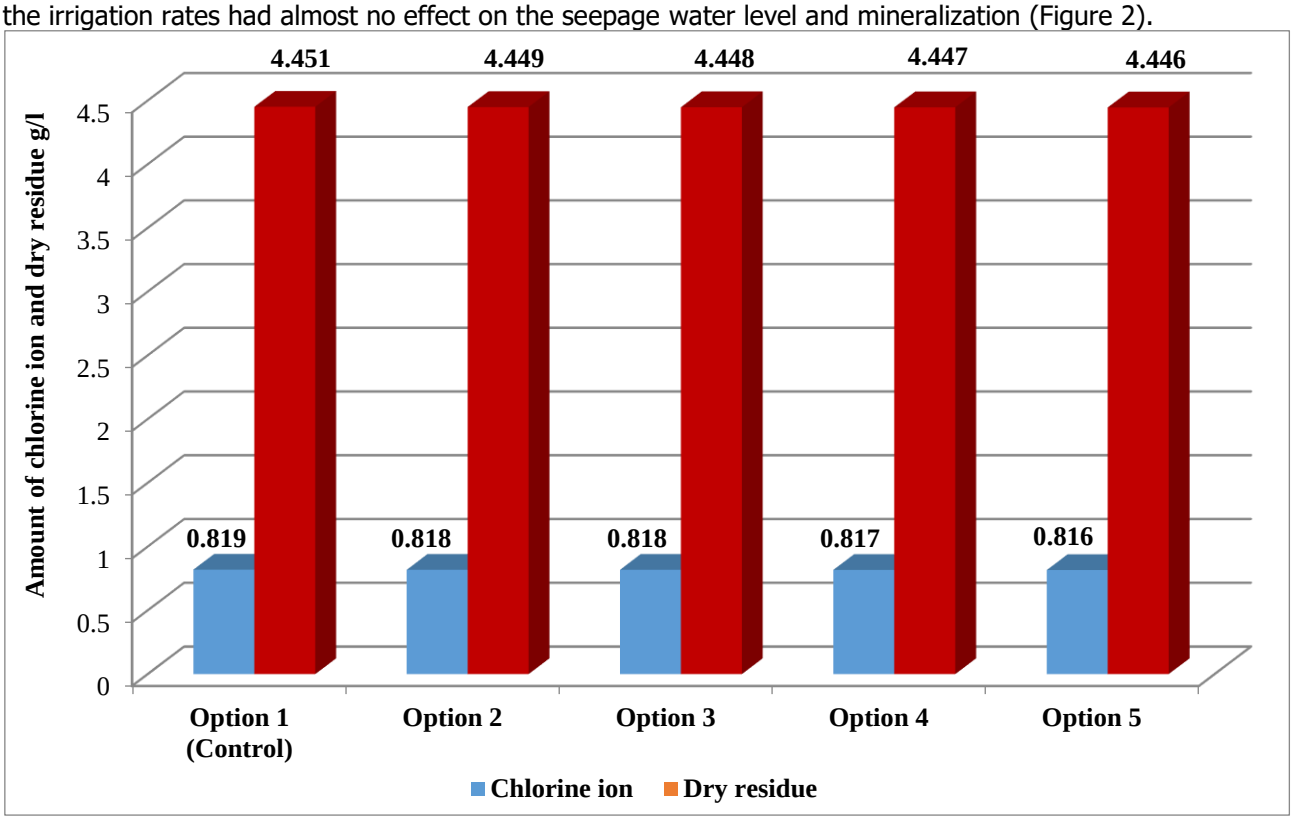

Figure 2. Effect of irrigating winter wheat using water-saving technologies on the water table level, g/l (2019-2023 average).

CONCLUSION. According to research conducted on the irrigation norms for winter wheat and their effects on the water table level and mineralization in the soils of the newly developed desert zone, the water table level remained below 3 meters during irrigation. As a result, the rise in the water table and changes in mineralization did not differ significantly between the options. This can be explained by the fact that the winter wheat variety "Starshina" was irrigated to a depth of 0-50 cm during the budding period and0-70 cm during the tuber and ripening periods.

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