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THE EFFECT OF DRIP IRRIGATION TECHNOLOGY ELEMENTS ON COTTON IRRIGATION REGIME AND COTTON YIELD

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Abstract:

This article presents the results of scientific research conducted on the development of an irrigation regime for the "Khorezm-127" cotton variety based on drip irrigation technology, in the alluvial, moderately saline, light mechanical composition soils of the "Birlashgan Pakhtasi" farm, located in the Namuna area of the Gurlan district in the Khorezm region.

Keywords: cotton, drip irrigation, furrow irrigation, technology, soil, irrigation, standard.

INTRODUCTION. For many years, the modern, economical, and computerized drip irrigation method has been widely used for irrigating agricultural crops in countries around the world. Both foreign and Uzbek scientists and specialists in this field have studied the advantages of drip irrigation over other techniques and technologies to some extent. According to the results of scientific research conducted to date, drip irrigation saves up to 40-50% of water per hectare of crop area compared to sprinkler irrigation, reduces labor costs by 1.5-2 times, saves up to 35-40% of mineral fertilizers, and increases cotton yield by 0.8-1 tons per hectare. The peculiarity of the drip irrigation system lies in its constant water distribution network, which operates under pressure. This network continuously and systematically delivers water to the root zone of crops at a rate that matches the water needs of the plant.

Drip irrigation allows for uniform plant development by maintaining a constant moisture level in the root zone. In this system, soil moistening occurs primarily through capillaries, which prevents sudden changes in the water-physical properties of the soil. Drip irrigation systems can be used in virtually any environment, even in conditions where other irrigation methods are not feasible or effective.

MATERIALS AND METHODS. Studies assessing the impact of drip irrigation on the soil reclamation regime of the "Khorezm-127" cotton variety in the alluvial, moderately saline, light-textured soils of the Khorezm region were conducted on the irrigated lands of the "Birlashgan Pakhtasi" farm, located in the Namuna region of the Gurlan district.

Field, laboratory studies and phenological observations were conducted based on the Research Institute of Cotton Breeding and Seed Production Agrotechnologies "Methods of conducting field experiments" (UzSRIC, 2007) and the methods adopted at SRIIWP for determining the elements of irrigation technology.

Experimental system for determining the elements of drip irrigation technique
Table 1

Options	Irrigation method	The distance between the drip pipes, m	Dropper water consumption, l/h	The distance between the drops, cm	Soil moisture before irrigation, relative to LFMC, %
1 (control)	Furrow	Production control			70-80-60
2	drip	to each, 0,6 м.	1,8	25	70-80-60
3		by interval, 1,2 м.	1,8		
4		to each , 0,6 м.	2,0		
5		by interval, 1,2 м.	2,0		

RESULT AND DISCUSSION. In scientific research on the development of irrigation regimes based on drip irrigation technology for cotton, irrigation was carried out based on soil moisture deficits. In the control (i.e., irrigated) version 1, irrigation was applied according to the recommended pre-irrigation soil moisture content for the VIII hydromodule district of the Khorezm region 70-80-60% relative to the recommended pre-irrigation soil moisture content (LFMC). The irrigation rate for cotton was determined using the following formula (1), recommended by S.N. Ryzhov:

$$M = (W_{чднс} - W_x) \cdot 100 \cdot \gamma \cdot h + K, \quad (m^3\ ha^{-1})\ (1.)$$

In this formula, Wchdns is the field moisture capacity relative to soil weight, %, W_x- is the soil moisture before irrigation,, %; γ - is the soil bulk density, g/cm^3; h - is the calculated layer thickness, m; K - is the amount of water spent on evaporation during irrigation, m^3 ha^{-1} (in the amount of 10% of the moisture deficit)..

In the experimental field production control (Option 1), cotton was irrigated six times using the 1-4-1 irrigation system, based on the growth and development phases. The irrigation rate was 800-1050 m³ per hectare, with a seasonal irrigation total of 5446 m³ per hectare.

In the second variant of the study, cotton was drip-irrigated fifteen times using the 4-8-3 irrigation system, according to the growth and development phases. The irrigation rate was 200-276 m³ per hectare, and the seasonal irrigation total was 3448 m³ per hectare. The interval between irrigations was 5-6 days, and the irrigation duration ranged from 1.8 to 2.3 hours, depending on the growth and development phases of the cotton. A total of 1998 m^3 ha^{-1}, or 36.7% less water, was used compared to the control variant.

In the third variant of the study, the irrigation rate was 192-246 m³ per hectare, the seasonal irrigation total was 3190 m³ per hectare, and the interval between irrigations was 5-6 days, with an irrigation duration of 3.2-4.1 hours. In the fourth variant, the seasonal irrigation total was 3339 m³ per hectare, while in the fifth variant, the seasonal irrigation total was 3222 m³ per hectare (see Table 2).

Irrigation regime in drip irrigation technology for cotton

Table 2

Options	Irrigation rate, m^3 ha^{-1}	Irrigation scheme	Seasonal irrigation rate, m^3 ha^{-1}
Option 1, (control)	800 - 1050	1-4-1	5446
Option 2	200-276	4-8-3	3448
Option 3	192-246	4-8-3	3190
Option 4	196-253	4-8-3	3339
Option 5	198-233	4-8-3	3222

In experiments conducted on the introduction of drip irrigation technology for cultivating the "Khorezm-127" cotton variety in moderately saline, light loamy soils of the Khorezm region, the cotton yield was analyzed. In option 1, where cotton was grown using the traditional method, the yield was 3.57 t ha^{-1}. In option 2, where drip irrigation was used, the yield was 4.17 t ha^{-1}. In option 3, where drip hoses were installed between the rows, the yield was 3.75 t ha^{-1}. In options 4 and 5, where the water consumption of the dripper was 2.0 l/h, the yield was 4.35 t ha^{-1} and 3.82 t ha^{-1}, respectively. Compared to option 1, which used traditional irrigation, the cotton yield in options 4 and 5 was 0.18-0.78 t ha^{-1} higher.

CONCLUSION. In the moderately saline, light loamy soils of the Khorezm region, during drip irrigation of the "Khorezm-127" cotton variety, the distance between the rows was 0.6 meters, drip pipes were laid in each row, and the water consumption of the dripper was 2.0 l/h. In option 4, cotton was irrigated 15 times during the season using the 4-8-3 system. The irrigation rate was 196-253 m^3 ha^{-1}, and the seasonal irrigation total was 3339 m^3 ha^{-1}. It was found that 2107 m^3 ha^{-1} less water was consumed compared to the control, i.e., the drip-irrigated option.

In the drip irrigation of the "Khorezm-127" cotton variety, drip pipes were placed in each plot, with a water consumption rate of 2.0 l/h per dripper, and the seasonal irrigation total was 3339 m^3 ha^{-1}. In the drip-irrigated option, the cotton yield was 4.35 t ha^{-1}, which was 0.78 t ha^{-1} higher than in the control option.

REFERENCES

1. "Methods of field experiments" of the Research Institute of Cotton Breeding and Seed Production Agrotechnologies (UzSRIC, 2007).
2. Dospekhov B 1985 Methods of Field Experience (Moscow: Agropromizdat).
3. Ryjov S 1953 On the Methods of Determining the Timing of Irrigation of Cotton (Tashkent, publishing house: Academy of Sciences of the Uzbek SSR).
4. Khamidov, M. Kh, et al. "Efficiency of drip irrigation technology of cotton in the saline soils of Bukhara oasis." BIO Web of Conferences. Vol. 103. EDP Sciences, 2024.
5. Khamidov M., Matyakubov B., Isabaev K. Water-saving irrigation technology as a way of using water resources sustainably in the Khorezm oasis //Furrow. – 2019. – T. 70. – C. 80-60.