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# THE EFFECT OF IRRIGATION TECHNOLOGIES ON THE GROWTH, DEVELOPMENT AND YIELD OF COTTON

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**Abstract**

The article presents information on the different irrigation technologies, including variable water jets, counter-watering and irrigation through the furrows on the growth, development and yield of cotton.

**Keywords:** Karakalpakstan, furrow, furrow length, soil moisture, water, saving, technology, cotton, yield;

The right choice of water-saving irrigation technologies and their application in the field are of great importance in obtaining high yields of agricultural crops. With this in mind, the introduction of economical irrigation technology in the irrigation of cotton fields in the Republic of Karakalpakstan and the demand for mineral fertilizers were studied. On this basis, the results of research conducted by scientists in the Republic of Karakalpakstan were reviewed, as well as the norms of fertilization were identified and implemented. Agrotechnical measures were carried out in accordance with the recommendations of PSUEATI.

The norm of annual mineral fertilizers per hectare for cotton experimental field is given as follows: 250 ha of nitrogen, 175 kg. phosphorus and 125 kg. potassium (in the ratio 1: 0.7: 0.5). Fertilization of cotton fields was carried out as follows: 70% -phosphorus and 50% -calcium mineral fertilizers are applied under the plow. 20% nitrogen fertilizer The remaining 80% nitrogen is applied before planting along with potassium and phosphorus fertilizers during harvest and flowering.

The S-4727 cotton variety was treated in August to prevent growth.

In order to evenly distribute soil moisture along the length of the ridge, to create favorable conditions for the plant over the entire area and to reduce the infiltration of water at the beginning and end of the ridge along the length of the ridge and to ensure proper soil moisture, proper selection of irrigation techniques. With this in mind, irrigation water was saved in field experiments by uniformly moistening the soil along the length of the field. The water was leveled at the rhythm of the irrigated area to carry out irrigation work on both sides of the field, i.e. by opposite water supply.

The scheme of irrigation technology is determined by linking the length of the field and water consumption, irrigation time, the calculated irrigation norms to the maximum allowable humidity before irrigation to link the indicators of irrigation technology in the opposite way.

Application of scientifically based irrigation regime for alluvial, saline, light and heavy sandy soils of mechanical composition and 1.5-2.0 meters of groundwater level and low slope of irrigated areas (≤ 0.00015) in Nukus district of the Republic of Karakalpakstan The effectiveness of economical irrigation technologies in the following system was studied for (Table 1).

**Table 1: Experimental system for the study of water-saving irrigation technologies**

| Options | Irrigation technologies | Pre-irrigation soil moisture, % of ChDNS | |
|---|---|---|---|
| | | Light soil (1-experience) | Heavy soil (2-experience) |
| 1 | Production control | 70 - 80 - 60 | 70 - 80 – 60 |
| 2 | Irrigation of the field with variable water consumption | | |
| 3 | Irrigation of the opposite side | | |
| 4 | Intermittent irrigation | | |

*Note: slope length l = 100 m., slope of the slope i = 0.00015, water consumption of the slope: q = 0.50 l / s in light soils; in heavy soils q = 0.20 l / s., in option 2 the water consumption of the slope is reduced by 2 times after the water reaches the end of the slope.*

The main purpose of scientific research is to moisten the soil with the required amount of water, taking into account the maximum moisture content of the soil through the flow of water supplied to the field. At the same time, improving the quality of irrigation, saving water by reducing evaporation, reducing the number of irrigation norms, will increase the yield of cotton.

In experiments, different irrigation technologies had different effects on the growth, development and yield of cotton variety S-4727.

The growth and development of cotton was studied mainly in relation to weather conditions, ChDNS on field options, irrigation technology and irrigation regime of cotton. At the beginning of the growing season, the underground organs, i.e. the root system, were better developed than the above-ground organs of cotton. Later, especially in July, the growth and development of the main stem of cotton increased sharply, i.e. the daily growth of the main stem was 1.5 cm. and more.

According to the results of field research, according to phenological observations (August) on the control of production of experimental fields (2018), the length of the main stem is 63.5-77.6 cm, 10.0-11.2 pieces of fruit horns, 2.6-2.8 nodules, 0.8-1.4 nodules, the number of nodules in September observations was around 9.4-10.1. In the 3rd variant of these experiments, the length of the main stem is 76.3-81.1 cm, the fruiting horn is 11.9-12.0, the open flower (knot) is 2.7-2.9, the cocoon is 2.6-2. 8, the total number of cocoons in September was 13.3-12.5.

As a result of the application of various economical irrigation technologies (on the opposite side of the field) by keeping the soil moisture before irrigation at 70-80-60%, the growth and development of cotton in the field (experiment 2) with heavy soils in all options, all indicators are high observed. In addition to maintaining the soil moisture required for the crop in a normal state, it has been proven that high yields of cotton can be obtained by delivering water on time and on time.

Early opening of the pods was also observed when the cotton was irrigated from the opposite side. This is because by retaining the ChDNS required for cotton, the soil was uniformly moistened along the length of the ridge and the moisture in the soil required for cotton was ensured.Different irrigation technologies, one-time irrigation rates and seasonal irrigation rates, water and air regimes are the main factors influencing the growth and development of cotton and crop yields.

In determining the effect of different irrigation technologies on seedling thickness in the implementation of irrigation of cotton, the correct choice of seedling thickness, taking into account the biological properties of cotton, ensures high and quality yields of cotton. As a result of leaving an optimal seedling thickness in the experimental field and through proper management of soil moisture, high and quality yields can be obtained from the crop. As a result of the full implementation of these works, economical irrigation technologies have been applied in the experimental fields in order to achieve longer retention of soil moisture and reduce evaporation from the soil surface. In view of the above, after the cotton seedlings were fully germinated and they had 2-3 leaves, they were treated.

The scientific results carried out in the experimental fields once again determine the seedling thicknesses at the end of the growing season, i.e. before the cotton harvest (Table 2).

**Table 2 - Dependence of economical irrigation technologies on seedling thickness**

| Options | After unification | | Before dialing | | The number of dead seedlings | | Note |
|---|---|---|---|---|---|---|---|
| | 2018 y. | 2019 y. | 2018 y. | 2019 y. | 2018 y. | 2019 y. | |
| 1 – experience field | | | | | | | |
| 1 | 92,9 | 94,4 | 89,6 | 90,1 | -3,3 | -4,3 | |
| 2 | 92,4 | 93,9 | 89,6 | 90,6 | -2,8 | -3,3 | |
| 3 | 93,1 | 93,9 | 90,9 | 91,8 | -2,2 | -2,1 | |
| 4 | 92,8 | 93,8 | 89,9 | 90,2 | -2,9 | -3,6 | |
| 2 – experience field | | | | | | | |
| 1 | 94,5 | 93,6 | 90,3 | 89,7 | -4,2 | -3,9 | |
| 2 | 93,2 | 92,9 | 90,5 | 90,3 | -2,7 | -2,6 | |
| 3 | 93,2 | 93,1 | 91,5 | 92,1 | -1,7 | -1,0 | |
| 4 | 93,1 | 93,4 | 90,6 | 90,8 | -2,5 | -2,6 | |

From the data given in Table 2, it can be seen that the actual pre-harvest seedling thickness is the highest seedling thickness in the Tulkin cotton variety in the option of irrigating the field in the cotton field on the opposite side - 90.9-91.5 per hectare; 89.9-90.6 thousand units in the case of intermittent irrigation, 89.6-90.5 thousand units in the variant of irrigation with variable water consumption and 89.6-90.3 thousand units in the minimum production control option (2018). In the variant of irrigation of the field from the opposite side in relation to the control of production per hectare - 1.2-1.3; in the case of intermittent irrigation - 0.3; in the variant of irrigation of the field with variable water consumption - 0.2 thousand units. The number of seedlings killed during the growing season averaged 2.2-3.3 thousand seedlings per hectare for all 1 experimental fields and options. In conclusion, it can be concluded that the influence of the studied factors on the death of seedlings in the conduct of experimental work was very small. This can be further explained by the fact that during the initial growth of cotton in the experimental field, the cotton decreased as a result of inter-row processing, threshing and a number of other field activities (Table 2).

In order to study the effect of field irrigation technologies on the weight of cotton in one bale, 100 samples were collected from all experimental options and returns before each harvest, and the weight of cotton in each bale was determined before harvest using the samples (Table 3).

In the variants observed in the experimental fields on cotton, the average weight of cotton per stalk was around 4.10-4.39 grams.

Experiments revealed that various irrigation technologies increased the weight of cotton in each bale by 0.11-0.18 grams compared to the control. The observations made in the field experiments were continued in the following year, in 2019, and the results of the observations did not differ much over the years.

(3 table)

**Table 3-The effect of cotton tillage irrigation technology on the weight of cotton in a single bale**

| Experience | Options | Dials | | | | average | difference, ± |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | | |
| 2018 y. | | | | | | | |
| 1 | 1 | 4,54 | 4,10 | 4,01 | 3,74 | 4,10 | - |
| | 2 | 4,66 | 4,37 | 4,07 | 3,78 | 4,22 | 0,12 |
| | 3 | 4,73 | 4,43 | 4,12 | 3,82 | 4,28 | 0,18 |
| | 4 | 4,71 | 4,41 | 4,10 | 3,80 | 4,26 | 0,16 |
| 2 | 1 | 4,62 | 4,35 | 4,08 | 3,81 | 4,22 | - |
| | 2 | 4,73 | 4,46 | 4,19 | 3,92 | 4,33 | 0,11 |
| | 3 | 4,78 | 4,52 | 4,25 | 3,99 | 4,39 | 0,17 |
| | 4 | 4,76 | 4,49 | 4,23 | 3,96 | 4,36 | 0,14 |

| 2019 y. | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 4,55 | 4,26 | 3,98 | 3,69 | 4,12 | - |
| | 2 | 4,69 | 4,36 | 4,04 | 3,71 | 4,20 | 0,08 |
| | 3 | 4,77 | 4,44 | 4,10 | 3,77 | 4,27 | 0,15 |
| | 4 | 4,76 | 4,43 | 4,09 | 3,76 | 4,26 | 0,14 |
| 2 | 1 | 4,66 | 4,37 | 4,08 | 3,79 | 4,23 | - |
| | 2 | 4,75 | 4,45 | 4,15 | 3,85 | 4,30 | 0,07 |
| | 3 | 4,81 | 4,50 | 4,18 | 3,87 | 4,34 | 0,11 |
| | 4 | 4,79 | 4,48 | 4,17 | 3,86 | 4,33 | 0,10 |

In order to determine the effect of irrigation technologies on cotton yield in the experiments, 3 times hand picking and 1 shovel picking (converted to cotton) were performed in all returns from each variant. Data on cotton yields are given in table 4.

According to the results of the experiment, the yield of cotton per hectare (average 2 years): 1 experiment on the field - 41.5 s/ha; According to 2 experiments - 42.6 s/ha, leaving 91.8-92.1 thousand seedlings per hectare, pre-irrigation soil moisture was obtained in option 3, irrigated from the opposite side of the field in the order of 70-80-60% relative to ChDNS.

**Table 4 - The effect of different irrigation technologies on the yield of cotton (average 2018-2019)**

| Experience | Options | Total. s/ha | 1- dial | | 2- dial | | 3- dial | | Last dial | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | s/ha | Relative to the total % | s/ha | Relative to the total % | s/ha | Relativa to the total % | s/ha | Relative to the total % |
| 1 | 1 | 30,7 | 15,4 | 50,2 | 6,2 | 20,2 | 6,6 | 21,5 | 2,5 | 8,1 |
| | 2 | 34,3 | 18,5 | 54,0 | 6,8 | 19,8 | 6,5 | 18,9 | 2,5 | 7,3 |
| | 3 | 41,5 | 24,4 | 58,8 | 8,6 | 20,7 | 6,3 | 15,2 | 2,2 | 5,3 |
| | 4 | 36,1 | 19,8 | 54,8 | 7,6 | 21,1 | 7,0 | 19,4 | 1,7 | 4,7 |
| 2 | 1 | 31,4 | 14,3 | 45,5 | 8,4 | 26,8 | 6,0 | 19,1 | 2,7 | 8,6 |
| | 2 | 33,8 | 18,0 | 53,3 | 8,6 | 25,4 | 4,4 | 13,0 | 2,8 | 8,3 |
| | 3 | 42,6 | 23,6 | 55,4 | 11 | 25,8 | 5,2 | 12,2 | 2,8 | 6,6 |
| | 4 | 38,5 | 20,1 | 52,2 | 9,7 | 25,2 | 6,1 | 15,9 | 2,6 | 6,7 |

Conclusion: In general, when using precautionary irrigation technology while keeping the soil moisture at 70-80-60% ChDNS before irrigating cotton, the most optimal option was the option where this opposite irrigation method was used. In doing so, the furrow was uniformly moistened along the length, and the cotton grew well. The biological development of the main stem of cotton, the normal growth, the increase in yield branches and stalks, the irrigation of the

opposite side of the field yielded higher results than the use of other irrigation technologies. In 3 variants, the yield was 10.8-11.2 quintals per hectare higher than that of production, i.e. cotton.

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