

The Impact of Water-Saving and Resource-Saving Technology on the Productivity of Cotton Plant Variety UzPITI-201

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Abstract: Under water and resource-saving technology the seeds of cotton variety UzPITI-201 were planted under transparent film in the second sowing period from March 15 to 25 in double rows, leaving 95.5 and 155.4 thousand seedlings per hectare and the fertilizer $N_{180}P_{125}K_{90}$ kg/ha was applied in norms, particularly, in the variant that were irrigated optimally in 70-75-60 % compared to limited field moisture capacity. the seeds were provided with higher level nutrients and were able to retain soil moisture longer compared to the seeds sown in the conventional open-sided and double-row control variants, due to a favorable soil condition under the film occurred by the positive influence of transparent film the possibility of cultivation of additional 7,2-9,3 c cotton yield per ha was determined.

Keywords: cotton variety UzPITI-201, transparent film, double-row, single-row, seedbed, limited field moisture capacity, seedling density, yield.

1. INTRODUCTION:

In the production and improvement of farm crops it is expedient to develop resource-saving technologies, to use water efficiently, mineral fertilizers and other natural resources. In addition, scientific researches are significant on increasing efficacy of the use of mineral fertilizers and proper seedling density in order to obtain high yield of new cotton varieties in various soil climatic conditions by sowing cotton seeds in double-row and single-row method under transparent film which is considered as one of important elements of water and resource-saving technology in the cultivation of cotton plant, also elaborating irrigation methods and implementing them into practice.

Compared to irrigation procedure with soil moisture of 70-70-60 percentage relatively to limited field moisture capacity (LFMC), the cotton yield of all film variants in the irrigation procedure of 65-65-60 percentage was harvested more. 65-70% of the yield was harvested in the 1st harvesting (September 16). When mineral fertilizers in the variants was used the norm of $N-P-K$ - 200-140-100 and 150-105-75 kg per hectare, productivity was 37.7 and 40.2 centner/ha [2].

The formation of cotton yield elements and other processes varied depending on the norm and time of nitrogen fertilizers. In the experiment, it was proven that the use of 200 kg of nitrogen fertilizer per hectare in the growing season, or 50% before the planting and 50% in the growing season was proper. Also, the increase in fertilizer rates led to a slowdown in the cotton harvest rate [3].

In order to determine the optimal irrigation rates for Bukhara-6 and Denov varieties in Surkhandarya region, cotton was cultivated during three years which resulted in cotton yield of 39.8 c/ha with the height of cotton plant 95.7 cm / ha, pieces of yield branches 17.4, number of cotton bolls 13,9 and the number of seedlings was 83.7 thousand pieces per ha when the plants were irrigated in 5477 m³/ha rate in the season with soil moisture content of 65-70-60% relatively to LFMC (in 1-2-1 system). [6; B. 11-12].

2. MATERIALS AND METHODS:

Our research work was conducted on the base of methodological manuals by Uzbekistan Cotton Research Institute, Uzbekistan Research Institute of Plant Science; Uzbekistan Research Institute of Plant Protection and Agricultural scientific-production centers of Uzbekistan. Field experiments were carried out in 2016-2018 by planting cotton variety UzPITI-201 seeds in two sowing time: the 1st - time is between March 5-15 in 7 variants (1-7 variants); the 2nd - sowing time is between March 15-25 also in 7 variants (8-14 variants). Experimental fields were old irrigated light virgin soils. Mechanical content was sandy. The groundwater level was 3-4 m below the surface. The experiment consisted of 14 variants in three repetitions, single-spaced, with a total area of 400 m² per plot, a calculated area was 200 m². The precision of productivity obtained on experimental variants and repetitions was analyzed by dispersion analysis [1]. Agrochemical [4] and agrophysical properties [5] of the soil of experimental field was tested under the indicated method.

3. RESULTS AND DISCUSSION:

The effectiveness of farm measures in a certain degree which were used in the experiments is reflected in the cotton productivity. According to the results of three years of research under the water and resource-saving technology for cotton variety UzPITI-201, the intended results were obtained from the variants where the cotton seeds were sown in single-row and double-row methods under transparent film between March 5-15 of the first early period of sowing and the second sowing period from March 15-25.

In water and resource-saving technology, seeds were planted under a transparent film, each of which produced a specific cotton crop with the influence of the film, single-row and double-row seed-beds, soil temperature, humidity, volume- mass, nutrient-rich soil content and other factors. Specifically, cotton seeds of the variety UzPITI-201 planted in the early planting variants of 5-15th March (variants 1-7) for the reasons aforementioned, 7-8 days later cotton yield was harvested compared to the variants planted in the 5–15th March (8–14 variants). In addition to the 1st planting time it is important to note that, in general, the cotton harvest in these variants was not late, but only in comparison with the deadlines they were regarded late. Due to the fact that the seeds were sown too early in these variants and the growing season was prolonged for the aforementioned weather and other adverse factors.

The second sowing time was within March 15–25 by sowing seeds of UzPITI-201 variety under a transparent film, with an average annual plant density of 95.5 and 155.4 thousand during three years, although the annual norm of mineral fertilizers was decreased to 10-15%, the cotton yields of the variants irrigated in an optimal irrigation procedure of 70-75-60% relatively to LFMC (options 11-12) constituted 39.3 and 41.4 centner/ha after application of *N*-180, *P*-125, *K*-90 kgs of fertilizers, due to the improvement of double-row and single-row seedbeds under the film, the soil temperature, humidity, volume mass, and soil content rich in nutrients and other soil properties, additional 7.2 and 9.3 c/ha more cotton yield was obtained compared to the variants 8 sown under conventional open method during three years with 91.3 thousand. Bushes per hectare seedling density (variants 8); also 4.3 and 6.4 more yield was harvested compared to the variants where the seeds were sown under conventional open method with seedling density of 150.000 bushes per hectare, usually sown in open method; 5.2 and 7.3 t/ha extra yield was produced compared to control variant in which the seeds were sown under black film with 90.2 thousand bushes per ha plant density. Furthermore, in these variants 85-90% of the cotton yield was harvested annually in the first harvesting period and sold as the 1st grade of industry. Finished with two harvesting. In control variants 65-70% of the cotton crop was harvested during the 1st-2nd harvesting period. Totally, the yield was harvested in three harvesting periods.

It is worth noting that these variants have another feature, for example, in the 11th variant where the seeds were sown in double rows under transparent film with an average 95,500 bushes per ha seedling density during three years the cotton yield of 38.0 c/ha in 2016; 40.2 c/ha and 39.7 c/ha in 2017 was produced, we can see that from year to year the soil conditions improved with the positive effect of the film.

The same indications were also recorded in the variant 12 with an average plant thickness of 155,400 seedlings/ha for 3 years and in 2016 39,8; in 2017 41.5; in 2018 cotton production was 42.9 t/ha. Consequently, in the result of volume-mass of soil under transparent film, its porosity, water permeability and accelerating nutrients activity although the rate of fertilizers were decreased, the impact of *N*-180, *P*-125, *K*-90 kgs/ha norm was found to be effective for the growth and development of cotton plant and cotton productivity.

The seeds of UzPITI-201 cotton variety were sown under transparent film in single-row way within average three years with 92.2 and 153.7 thousand bushes/ha seedling density and in this variants the annual norm of mineral fertilizers were declined to 10-15% and *NPK*-180-125-90 kg norms per hectare were used and also irrigated by optimal procedure of 70-75-60% relatively to LFMC (13-14-variants), the cotton yield of average in 3 years made 35.6 and 34.3 c/ha, and extra 3,5 and 2,2 c/ha yield was obtained compared to the variants where the seeds were sown in conventional open method in average three years with 91.3 thousand bushes/ha plant density (8-variants). Comparing to the variant in which the seeds were traditionally planted in open method with seedling thickness of 150.000 bush/ha it made 0.6 and 0.7 c/ha (9-variant) and the additional cotton yield wasn't almost produced, while in black film spread control variant with 90.2 thousand bushes/ha seedling density, extra cotton yield was 1.5 and 0.2 c/ha (10-variant) with little significance. Overall, according to aforementioned properties and due to the less efficacy of single-row seedbeds under transparent film compared to double-row seedbeds it is not advisable to sow seeds in single-row seedbeds under a transparent film.

Cotton yield of the control variant with plant density of 91.3 thousand bush/ha sown in the conventional open-field method in double-rows (variant 8) was 32.1 centner/ha for average 3 years, and in the control variant (variant 9) where the number of double-row seedlings was thickened with plant density of 145.5 thousand bush/ha the yield constituted 35.0 c/ha while in black film spread control variant with plant density of 90.2 thousand bushes/ha the yield was 34.1 c/ha.

Generally, it should be noted that for all planting periods, the crop yield of all variants of the 2nd sowing period was 7-8 days earlier than the variants in the 1st sowing period and yielded extra 2.8-9.4 centners of yield per hectare.

Thus, based on the results of 3 years of scientific research, it is not advisable to plant cotton variety UzPITI-201 under transparent film from March 5 to 15 in water and resource-saving technology.

Table-1

The influence of water and resource-saving technology on the productivity of cotton yield of UzPITI-201 cotton variety, c/ha average 3 years (in 2016-2018)

Var. №	Sowing methods	Sowing on seedbed	Seedling density, thousand bushes/ha	Cotton yield				Extra yield compared to control variants				NPK-200-140-100 kgs/ha
				In 2016	In 2017	In 2018	Average three years	Sown in an open field, 95 thousand bush/ha	Sown in open fields, 150 thousand bush/ha	Black film spread variant	NPK-200-140-100 kgs/ha	
The 1st sowing time (March 5-15)												
1	Double-row	open	74,0	28,1	29,0	30,8	29,3	-	-	-	-	-
2	Double-row	open	124,2	29,2	29,8	31,3	30,1	-	-	-	-	-
3	Single-row	Black film	75,3	29,8	30,1	31,0	30,3	-	-	-	-	-
4	Double-row	Transparent film	84,3	32,0	29,6	32,0	31,2	1,9	1,1	0,9	1,9	-
5	Double-row	Transparent film	133,6	31,3	32,9	31,8	32,0	2,7	1,9	1,7	1,9	-
6	Single-row	Transparent film	82,7	30,7	31,9	32,5	31,7	2,4	1,6	1,4	1,4	-
7	Single-row	Transparent film	130,7	28,7	29,5	28,8	29,0	0,3	1,1	-0,7	-0,7	-
The 2nd sowing time (March 15-25)												
8	Double-row	Open	91,3	31,4	32,6	32,3	32,1	-	-	-	-	2,8
9	Double-row	Open	145,5	33,9	35,8	35,3	35,0	-	-	-	-	4,9
10	Single-row	Black film	90,2	33,2	34,9	34,2	34,1	-	-	-	-	3,8
11	Double-row	Transparent film	95,5	38,0	40,2	39,7	39,3	7,2	4,3	5,2	7,2	8,1
12	Double-row	Transparent film	155,4	39,8	41,5	42,9	41,4	9,3	6,4	7,3	6,4	9,4
13	Single-row	Transparent film	92,2	34,8	36,2	35,8	35,6	3,5	0,6	1,5	1,5	3,9
14	Single-row	Transparent film	153,7	33,9	35,0	34,0	34,3	2,2	-0,7	0,2	-0,7	5,3
LSD ₀₅				1,49	1,17	1,52						

4. CONCLUSION:

Thus, in the water and resource-saving technology, the second sowing of cotton variety UzCRI-201 was planted under a transparent film from 15 to 25 March, leaving 95.5 and 155.400 seedlings per hectare and applied fertilizers $N_{180} P_{125} K_{90}$ kgs/ha in the norm, irrigated in optimal irrigation procedure of 70-75-60% relatively to LFCM, the seeds were nourished with higher nutrients than the conventional open-field and double-row control variants (variants 8-9-10) and had a longer soil moisture content. Under the positive influence of transparent film with favorable soil conditions the possibility of extra 7.2-9.3 c/ha yield production was determined.

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