Physiological indicators of water metabolism in plants of parental forms and F_1 hybrids of *G. Barbadense* L. cotton type under different water supply conditions

Saydigani Nabiev[1,*], *Mirkosim* Sagdiev[2] and *Rano* Alimova[2]

[1]Institute for Genetics and Plants Experimental Biology at the Science Academy of the Republic of Uzbkistan, Tashkent, 100140, Uzbekistan
[2]Tashkent State Agrarian University, Tashkent, 100140, Uzbekistan

Abstract. This article presents the findings of an extensive research endeavor aimed at comprehending the physiological intricacies of water metabolism in novel strains of fine-fiber cotton belonging to the species Gossypium barbadense L. These strains include L-2006, L-167, L-5440, L-5445, L-1, L-10, L-663, and L-450, alongside the standard variety Surkhan-14 and its F1 hybrids. The study was conducted under various water regime conditions to unravel the responses of these cotton genotypes to different levels of water availability. Upon analysis, it was discerned that the physiological parameters of water metabolism exhibited dynamic changes across the studied genotypes of fine-staple cotton. Specifically, when confronted with simulated soil drought conditions, the water content and transpiration intensity of leaves demonstrated varying degrees of reduction. This response was contingent upon the individual characteristics of each genotype. Furthermore, a noteworthy trend emerged: the water-retaining capacity of leaves displayed an increase under water stress conditions. This observed rise in water-retaining capacity in the leaves can be considered a vital physiological mechanism. It's a mechanism that contributes to the adaptation of fine-staple cotton to water stress. These findings offer valuable insights into the strategies employed by fine-fiber cotton genotypes to cope with water scarcity. By shedding light on the interplay between physiological responses and water availability, this research provides a foundation for informed decision-making in cotton breeding, agricultural management practices, and the cultivation of drought-resistant cotton varieties.
Keywords. Cotton plant, fine-staple cotton lines, varieties, hybrids, optimal water supply, water deficit.

1 Introduction

Cotton plant is an important industrial crop that provides raw materials for the textile, food, chemical, cotton and other industries. Fiber is the main product of cotton. In the global cotton

* Corresponding author: m.saydigani@mail.ru

market, the fiber of *G.barbadense* L. varieties is estimated at 1.5-2 times more expensive than the fiber of medium-staple cotton varieties. From one ton of fiber *G.barbadense* L., 1.3-2.0 times more and more expensive fabric is obtained than from one ton of fiber of the *G.hirsutum* L. species [1-3].

G.barbadense L. is the youngest, plastic species and its homeland is South America [4]. Globally, varieties of the species *G.barbadense* L. are sown on an area of 9% of the total area occupied by cotton. This species was mainly sown in the shores of the island and the plains of the United States and was known under the name of Sea Island. Later, the Sea Island cotton varieties entered the Nile Valleys of Egypt and began to be grown as long and fine staple varieties in Egypt [5].

In the Republic of Uzbekistan, more than 1 million tons of medium-staple cotton varieties of cotton are grown annually, and the country ranks fifth in the world in its production [6].

Global climate change, a gradual increase in air temperature and the presence of an acute environmental problems in Uzbekistan – limited water resources require the creation of drought-resistant varieties of cotton – one of the main crops of the republic [7]. To solve this problem, along with the determination of a complex of economically valuable traits in a wide range of varieties and lines of cotton, it is also necessary to study the physiological parameters of water metabolism in plants under different conditions of water supply, including deficiency conditions of irrigation water [8].

In terms of creating drought-resistant varieties of cotton, targeted research in the fine-stapled species *G. barbadense* L. has great prospects. It should be noted that large-scale fundamental and applied research has been and is being carried out on fine-staple cotton by foreign scientists [9-12] and also by local scientists [13-19]. In these works, economically valuable traits, their inheritance and variability in fine-staple cotton were studied.

Studies were conducted on molecular labeling of fiber traits and resistance to Fusarium wilt, associative mapping and linkage disequilibrium mapping in the germplasm of the species *G. barbadense* L. [20].

By a number of local scientists [21-23] were created and released such varieties of fine-staple cotton as C-6029, C-6030, C-6032, C-6037, C-6040, C-6042, Karshi-8, Karshi-9, as well as varieties of the Surkhan group.

Uzbekistan is a country that has mastered the technology of growing fine-staple cotton. The main reason for this is that the heat in the southern regions of Uzbekistan is higher than the heat reserve in countries that grow varieties of fine-staple cotton on large areas, i.e. in Sherabad more than in Cairo (Egypt), and in Termez – than in Alexandria (Egypt) and Bayram Ali (Turkmenistan), as well as the effective work of advanced scientists of breeders and seed growers. In Uzbekistan, in 1987, varieties of fine-staple cotton were sown on an area of 204 million hectares and the total yield was 587,000 tons. The republic was in the second place after Egypt in growing fine-fiber varieties of cotton [5]. As you know, the textile industry mainly uses medium-staple grades of fiber having a fifth, rarely a fourth type of fiber. However, in recent years, the demand for high-quality type I-III fibers has increased in the world market. Due to the shortage of fine fiber in the world, the United States has increased the area under Pima varieties (*G.barbadense* L.) from 80,000 to 110,000 hectares. India, in addition to the fiber of its fine-staple varieties, buys an additional 150 thousand tons of Pima fiber.

As noted accelerating the selection process of fine-staple cotton varieties is one of the most urgent tasks of modern cotton growing [4]. Although Pima varieties account for only 3% of the world's cotton production, they are commercial varieties that produce high quality fiber. Pima varieties are mainly grown in Egypt, USA and China. In 2012, 94% of Pima varieties were grown in the US San Joaquin Valley, with the rest in Arizona, New Mexico and Texas.

The main goal of cotton breeding programs around the world is to increase yields and improve fiber quality. Compared with medium-staple varieties, varieties of fine-staple cotton are resistant to adverse abiotic and biotic environmental conditions [12, 18].

All of the above requires scientific research to study, in addition to economically valuable traits, also physiological indicators of varieties and new lines of the species *G. barbadense* L under different conditions of water availability, including conditions of water deficiency in the soil to create new drought-resistant varieties of fine-staple cotton.

2 Materials and methods

The research was carried out in the conditions of a field experiment on the territory of the Institute of Genetics and Plants Experimental Biology at the Academy of Sciences of the Republic of Uzbekistan. The soil of experimental site is typical gray soil, non-saline. As objects of research were taken new fine-staple lines obtained by scientists of the Institute on the basis of hybridization of geographically close and distant forms - L-167, L-663, L-2006, L-5440, L-5445, L-450; cultivars with fine fiber ruderal subspecies *ssp.vitifolium* - L-1 and L-10, variety Surkhon-14 and F1 hybrids obtained by crossing these initial forms. At the experiment these materials were sown in the field on two backgrounds of the water regime: on the background of optimal water supply and on the background of simulated drought in the flowering-fruiting phase.

The studied material on each background of the water regime was sown in three randomized replications, by 25 plants in each replication. Sowing scheme was 90 x20 x1. The physiological indicators of plants were determined simultaneously in both variants of both backgrounds, when the pre-irrigation soil moisture on the optimal background of water supply was 70-72% of the LFMC (limiting field moisture capacity), and on the background of the simulated drought -48 -50% of the LFMC.

Wherein, the total irrigation norm for the background with optimal water supply was 4950 m^3, and for the background with simulated drought 3000 m^3. Of the physiological parameters, the total water content in the leaves was determined, intensity of leaf transpiration, water-retaining capacity of leaves. The obtained digital data were statistically processed according to the method of B.A. Dospekhov [8]. The coefficient of adaptability (Cad.) was calculated by the formula of S.A. Eberhart, W.A. Russel [11].

3 Results and discussion

Under conditions of optimal water supply, the highest rates of leaf hydration were noted in the lines L-5440 and L-5445 (85.5% and 81.1%, respectively), and the lowest rate was in the line L-167 - 76.4%. In hybrids F_1, the highest water content of the leaves had plants of combinations L-663 x L-167 (83.1%), L-450 x L-5440 (82.3%) and L-450 x L-5445 (81.6 %), the lowest rates were in combinations L-5445 x L-450, L-450 x Surkhan-14 and L-167 x L-450, respectively, 78.1%, 78.4% and 78.6% (Table 1).

Table 1. Water content of leaves in fine-staple parental forms of cotton and their F_1 hybrids under different conditions of water availability.

#	Material	Optimal Water Supply			Simulated soil drought			Cad., %
		X	hp	heter., %	X	hp	heter., %	
1	L-1	79.6	-	-	71.8	-	-	-9,8

2	Surkhan-14	79.9	-	-	67.1	-	-	-16,0
3	L-5440	81.5	-	-	71.9	-	-	-11,8
4	L-2006	78.2	-	-	75.0	-	-	-4,1
5	L-10	79.6	-	-	74.9	-	-	-5,9
6	L-167	76.4	-	-	70.0	-	-	-8,4
7	L-5445	81.1	-	-	69.8	-	-	-13,9
8	L-450	80.0	-	-	76.3	-	-	-4,6
9	L-663	80.1	-	-	74.5	-	-	-7,0
10	L-450 x L-5445	81.6	1.91	-	74.5	0.45	-	-8,7
11	L-5445 x L-450	78.1	-4.45	97.6	75.3	0.69	-	-3,6
12	L-450 x L-5440	82.3	2.07	-	76.3	1.00	-	-7,3
13	L-5440 x L-450	79.5	-1.67	-	75.0	0.41	-	-5,7
14	L-450 x L-663	79.8	-5.00	-	76.0	0.67	-	-4,8
15	L-663 x L-450	80.5	-9.00	-	69.6	-6.44	93.4	-13,5
16	L-450 x L-167	79.9	0.94	-	79.0	5.85	103.5	-1,1
17	L-167 x L-450	78.6	0.22	-	75.4	0.71	-	-4,1
18	L-450 x Surkh.-14	78.4	-31.00	-	75.2	0.76	-	-4,1
19	Surkh.-14 x L-450	78.5	-29.00	-	76.3	1.00	-	-2,8
20	L-663 x L-167	83.1	2.62	103.7	73.4	0.51	-	-11,7
21	L-167 x L-663	80.2	1.00	-	77.1	2.16	103.5	-3,9
22	L-663 x L-5445	80.2	-0.80	-	77.7	2.36	104.3	-3,1
23	L-5445 x L-663	78.7	-3.80	-	78.6	2.74	105.5	-0,1
24	L-167 x L-5440	79.0	0.02	-	74.7	3.95	103.9	-5,4
25	L-5440 x L-167	79.6	0.25	-	77.5	6.89	107.8	-2,6
26	L-167 x L-10	78.9	0.56	-	75.6	1.29	-	-4,2
27	L-10 x L-167	80.0	1.25	-	78.5	2.47	104.8	-1,9
28	Surkh.-14 x L-2006	79.5	0.53	-	78.2	1.81	104.3	-1,6
29	L-2006 x Surkh.-14	80.6	1.82	-	79.1	2.04	105.5	-1,9
30	L-5445 x L-10	79.6	-1.00	-	75.1	1.08	-	-5,7
31	L-10 x L-5445	78.9	-1.93	-	75.8	1.35	-	-3,9
32	L-450 x L-1	81.00	6.00	-	76.4	1.04	-	-5,7
33	L-167 x L-1	79.9	1.19	-	79.6	9.67	110.9	-0,4
LSD$_{05}$		1,7			1.4			

Leaf water content is one of the most important physiological indicators, and the study of this trait in the original forms of fine-staple cotton and their F1 hybrids is of great importance.

The trait of water content of the leaf under the optimal water regime of 24 F_1 hybrids in 7 hybrids was inherited according to the type of positive overdominance, in 8 hybrids - negative overdominance, in 1 - positive complete dominance, in 1 - negative complete dominance, in 5 - incomplete dominance of the form with a high index, in 1 hybrid - incomplete dominance of the form with a low indicator, in 1hybrid - intermediate, i.e. there was no dominance of any parent.

Thus, the trait of water content of leaves under the optimal water regime was mainly inherited according to the type of positive and negative dominance. Positive heterosis with a low level was noted in the combination L-663 x L-167 (103.7%), and negative heterosis - in the combination L-5445 x L-450 - 97.6%.

With water deficiency, in all the studied parental forms and hybrids of fine-staple cotton, the water content of the leaves decreased to varying degrees. At the same time, in the group of parental forms, the highest rates of the trait were noted in the lines L-450, L-2006, L-10 and L-663 (76.3%; 75.0%; 74.9%; 74, respectively). 5%), and the lowest rate is for the variety Surkhan-14 - 67.1%.

In F_1 hybrids, the highest levels of leaf water content were found in combinations L-167 x L-1 (79.6%), L-2006 x Surkhan-14 (79.1%) and L-450 x L-167 (79.6%) and the lowest indicator is in the hybrid L-663 x L-450 -69.6%.

According to the analysis of the indicators of the dominance coefficient (hp), under conditions of water deficiency, the trait of water content in the leaves of 24 F_1 hybrids was inherited in 13 hybrids according to the type of positive overdominance, in 1 hybrid - negative overdominance, in 3 hybrids - complete dominance of the form with a high indicator, in 7 - incomplete dominance of the form with a high score. This indicates the inheritance of the trait of leaf water content in F_1 hybrids under conditions of water deficit, mainly according to the type of positive overdominance and incomplete dominance of the paternal or maternal form with a high index. Against this stressful background, although with a low degree, the number of hybrid combinations with positive heterosis increased (10 pieces). The degree of positive heterosis ranged from 103.5% (L-450 x L-167, L-167 x L-663) to 110.9% in L-167 x L-1. Negative heterosis was noted in the combination L-663 x L-450 - 93.4%.

In terms of the adaptability coefficient (Cad.), on the basis of the trait of leaf water content, the strongest reaction to soil moisture deficiency in the group of initial forms was noted in the Surkhan-14 variety, lines L-5445 and L-5440, and the weakest reaction was observed in lines L-2006, L-450 and L-10. In the group of F_1 hybrids, strong sensitivity was found in combinations L-663 x L-450 and L-663 x L-167, and most of the F_1 hybrids showed a weak reaction. This indicates a higher adaptation of F_1 hybrids to water deficit in terms of leaf hydration compared to parental forms.

Determination of the intensity of leaf transpiration, which was expressed in mg of water evaporated from one gram of a raw leaf for one hour, showed that under conditions of optimal water supply in the group of parental forms, the intensity of leaf transpiration was high in lines L-10 and L-167 and amounted, respectively , 385.17 mg and 379.48 mg, and the lowest indicator of the trait was noted in the L-1 line - 256.13 mg (Table 2).

In the group of F_1 hybrids, plants of combinations L-663 x L-5445, L-663 x L-167 and L-663 x L-450 had the highest rates of transpiration intensity (397.84 mg, 387.49 mg and 385, respectively). 12 mg), and the combination L-10 x L-167 had the lowest indicator of this trait - 250.51 mg. The remaining F_1 hybrids were between these extreme groups in terms of the intensity of leaf transpiration. Under the optimal water regime, this trait out of 24 F1 hybrid combinations was inherited in 4 by the type of positive overdominance, in 11 - negative overdominance, in 3 - incomplete dominance of the form with a high indicator, and in 6 - incomplete dominance of the form with a low indicator.

Table 2. Intensity of leaf transpiration in fine-staple parental forms of cotton lines and their F_1 hybrids under different conditions of water supply.

#	Materials	Optimal Water Supply			Simulated soil drought			Cad., %
		X	hp	heter, %	X	hp	heter, %	
1	L-1	256.13	-	-	207.55	-	-	-19,0
2	Surkhan-14	369.97	-	-	171.19	-	-	-53,7
3	L-5440	345.02	-	-	234.21	-	-	-32,1
4	L-2006	320.26	-	-	270.21	-	-	-15,6
5	L -10	385.17	-	-	261.02	-	-	-32,2
6	L-167	379.48	-	-	226.99	-	-	-40,2
7	L-5445	360.08	-	-	255.70	-	-	-29,0
8	L-450	321.69	-	-	279.74	-	-	-13,0
9	L-663	369.83	-	-	111.49	-	-	-69,9

10	L-450 x L-5445	327.09	-0.72	-	323.20	4.62	115.5	-1,2
11	L-5445 x L-450	329.76	-0.58	-	280.64	1.07	-	-14,9
12	L-450 x L-5440	335.31	0.17	-	312.29	2.43	111.6	-6,9
13	L-5440 x L-450	324.36	-0.77	-	265.79	0.39	-	-18,1
14	L-450 x L-663	313.07	-1.36	-	304.51	1.29	108.9	-2,7
15	L-663 x L-450	385.12	1.64	104.1	208.70	0.16	-	-45,8
16	L-450 x L-167	366.81	0.56	-	345.40	3.49	123.5	-5,8
17	L-167 x L-450	311.70	-1.35	-	283.31	1.14	-	-9,1
18	L-450 x Surkh.-14	283.17	-2.60	88.0	267.24	0.77	-	-5.6
19	Surkh.-14 x L-450	303.88	-1.74	94.46	289.15	1.17	-	-4,8
20	L-663 x L-167	387.49	2.66	-	200.55	0.54	-	-48,2
21	L-167 x L-663	355.13	-4.05	96.0	294.63	2.17	129.8	-17,0
22	L-663 x L-5445	397.84	6.75	107.6	376.03	2.67	147.1	-5,5
23	L-5445 x L-663	367.02	0.42	-	322.56	1.93	126.1	-12,1
24	L-167 x L-5440	336.21	-1.51	-	241.03	2.89	-	-28,3
25	L-5440 x L-167	291.13	-4.13	84.4	264.00	9.25	112.7	-9,3
26	L-167 x L-10	374.18	-2.87	-	337.12	5.47	129.2	-9,9
27	L-10 x L-167	250.51	-46.42	66.0	223.63	-1.20	-	-10,7
28	Surkh.-14 x L-2006	333.18	-0.48	-	301.84	1.64	111.7	-9,4
29	L-2006 x Surkh.-14	280.37	-2.61	87.5	251.38	0.62	-	-10,3
30	L-5445 x L-10	292.84	-6.36	81.3	265.95	2.85	-	-9,2
31	L-10 x L-5445	290.60	-6.54	80.7	191.18	-2.53	74.8	-34,2
32	L -450 x L-1	360.95	2.20	112.2	247.94	0.12	-	-31,3
33	L -167 x L-1	290.85	-0.44	-	144.23	-7.51	69.5	-50,4
	LSD_{05}	12,43			13.01			

Positive heterosis of unweak degree in terms of transpiration intensity was shown by combinations of L-450 x L-1 (112.2%), L-663 x L-5445 (107.6%) and L-663 x L-450 (104.1%) , while negative heterosis was observed in combinations L-450 x Surkhan-14 (88.0%), Surkhan-14 x L-450 (94.5%), L-167 x L-663 (96.0%), L-5440 x L-167 (84.4%), L-10 x L-167 (66.0%), L-2006 x Surkhan-14 (87.5%), L-5445 x L-10 (81.3%) and L-10 x L-5445 (80.7%). The results obtained show that under conditions of optimal water supply, the trait of leaf transpiration intensity was mainly inherited by the type of overdominance, with a negative value in 11 combinations and with a positive value in 4 combinations.

Compared to the optimal water regime, under conditions of water deficit, all parental and hybrid genotypes showed a decrease in the intensity of leaf transpiration to varying degrees. On the background of water stress in the group of initial forms, high rates of leaf transpiration were noted in lines L-450 and L-2006 (respectively, 279.74 mg and 270.21 mg), and the lowest rate was in line L-663, the average value of which was 111.49 mg. It should be noted that the Surkhan-14 variety also had a relatively low leaf transpiration rate - 171.19 mg.

With water deficiency in the group of F_1 hybrids, relatively high rates of leaf transpiration intensity were noted in combinations L-663 x L-5445, L-450 x L-167 and L-167 x L-10 (respectively, 376.03 mg, 345.40 mg and 337.12 mg), and the lowest rates are in hybrids L-167 x L-1, L-10 x L-5445, L-663 x L-167 and L-663 x L-450 (respectively, 144.23 mg, 191.18 mg, 200.55 mg and 208.70 mg).

Under conditions of water stress, the trait of leaf transpiration intensity out of 24 F_1 hybrid combinations was inherited in 15 combinations by the type of positive overdominance, in 3 combinations - by negative overdominance, in 6 - by incomplete dominance of the form with a high indicator. Thus, even under conditions of water deficit, the trait of intensity of leaf transpiration was inherited mainly by the type of overdominance. However, if under the optimal water regime during the inheritance of this trait, mainly negative overdominance was observed, then with a deficit of soil moisture, on the contrary, positive overdominance. This indicates a change in the dominance coefficient (hp) depending on the water content of plants. For example, for the combination L-450 x L-5445, the hp indicator with optimal water content is -0.72, and with water deficit it is 4.62, i.e. on the first background there is an incomplete negative dominance, while on the second background there is a positive overdominance.

In contrast to the optimal water regime, under conditions of water deficit, positive heterosis in terms of transpiration intensity was observed in 10 combinations of F_1 and its degree ranged from 108.9% (L-450 x L-663) to 147.1% (L-663 x L-5445). Negative heterosis was noted in combinations L-167 x L-1 and L-10 x L-5445, its degree was respectively, 69.5% and 74.8%.

According to the analysis of the adaptability coefficient of the trait, the indicators of transpiration intensity under water deficiency in the group of parental forms decreased from 13.0% (L-450) to 69.9% (L-663), and in the group of F_1 hybrids - from 1.2% (L-450 x L-5445) up to 50.4% (L-167 x L-1). On this stressful background, the trait indices also sharply decreased towards combinations L-663 x L-167 and L-663 x L-450 (by 48.2% and 45.8%, respectively). With water deficiency, a weak reaction on this trait was noted in the combinations L-450 x L-663 (-2.7%), Surkhan-14 x L-450 (-4.8%), L-663 x L-5445 (- 5.5%), L-450 x Surkhan -14 (-5.6%), L-450 x L-167 (-5.8%) and L-450 x L-5440 (-6.9%) .

Water-retaining capacity (WRC) is one of the most important indicators in the study of physiological processes occurring in plants under the influence of various abiotic stresses, including water deficiency. It should be noted that high numerical values of the trait indicate low leaf WRC and vice versa, low values indicate high leaf WRC, because they indicate the amount of water used for evaporation within two or four hours in relation to its initial content.

According to the results obtained after two hours under conditions of optimal water supply, a relatively high leaf WRC was noted in the line L-10 (20.5%), and a low leaf WRC was observed in the line L-167 (44.7%). In the group of F_1 hybrids, combinations L-10 x L-167 (22.9%) and L-2006 x Surkhan-14 (24.8%) had a high leaf WRC, and combinations L-5445 x L-450 (41.9%), L-450 x L-5440 (39.4%) and Surkhan-14 x L-450 - 38.7% had low leaf WRC (Table 3). According to the indicators of coefficient of dominance (hp), the trait of WRC of leaves out of 24 F_1 combinations was inherited in 13 combinations as positive overdominance, in 4 - negative overdominance, in 1 combination - incomplete dominance of the form with a high index, in 5combinations - incomplete dominance of the form with a low index, in 1 - intermediate, i.e. in the absence of dominance of the paternal or maternal form.

Water retention capacity (after 2 hours) of leaves of fine-staple cotton varities and lines under different water supply conditions, its inheritance in F1 hybrids (Table 3).

Table 3. Intensity of leaf transpiration in fine-staple parental forms of cotton lines and their F_1 hybrids.

#	Material	Optimal Water Supply			Simulated soil drought			Cad., %
		X	hp	heter, %	X	hp	heter, %	
1	L-1	20.5	-	-	20.1	-	-	-2,0
2	Surkhan	28.6	-	-	18.4	-	-	-35,7
3	L-5440	28.2	-	-	25.1	-	-	-11,0
4	L-2006	29.6	-	-	26.1	-	-	-11,8
5	L-10	26.9	-	-	25.3	-	-	-5,9
6	L-167	44.7	-	-	22.1	-	-	-50,6
7	L-5445	24.7	-	-	23.2	-	-	-6,1

8	L-450	26.8	-	-	21.4	-	-	-20,1
9	L-663	30.3	-	-	23.6	-	-	-22,1
10	L-450 x L-5445	30.6	4.62	114.2	27.1	5.33	116.8	-11,4
11	L-5445 x L-450	41.9	15.38	156.3	28.8	7.22	124.1	-31,3
12	L-450 x L-5440	39.4	17.00	139.7	27.4	2.24	-	-30,5
13	L-5440 x L-450	33.9	9.14	120.2	18.7	-2.46	-	-44.8
14	L -450 x L-663	31.1	1.46	-	19.5	-2.73	-	-37,3
15	L-663 x L-450	32.4	2.20	-	20.9	-1.45	-	-35,5
16	L-450 x L-167	31.1	-0.52	-	25.2	9.86	114.0	-19.0
17	L-167 x L-450	27.0	-0.98	-	20.6	-3.29	-	-23,7
18	L-450 x Surkh.-14	25.1	-2.89	-	20.8	0.60	-	-17,1
19	Surkh.-14 x L-450	38.7	12.22	135.3	23.2	2.20	-	-40,1
20	L-663 x L-167	26.8	-1.49	88.4	23.5	0.87	-	-12,3
21	L-167 x L-663	38.0	0.07	-	24.1	1.67	-	-36,6
22	L-663 x L-5445	35.0	2.68	115.5	30.5	35.5	129.2	-12,9
23	L-5445 x L-663	33.4	2.11	110.2	31.9	42.5	135.2	-4,5
24	L-167 x L-5440	30.7	-0.70	-	19.4	-2.80	-	-36.8
25	L-5440 x L-167	33.4	-0.37	-	19.2	-2.90	86.9	-42,5
26	L-167 x L-10	34.8	-0.11	-	28.6	3.06	113.0	-17,8
27	L-10 x L-167	22.9	-1.45	85.1	19.1	-2.88	86.4	-16,6
28	Surkh.-14 x L-2006	31.2	4.20	-	21.5	-0.19	-	-31,1
29	L-2006 x Surkh.-14	24.8	-8.60	86.7	17.5	-1.23	-	-29,4
30	L-5445 x L-10	29.2	3.09	-	19.9	-4.14	85.8	-31,8
31	L-10 x L-5445	27.3	1.36	-	18.4	-5.57	79.3	-32,6
32	L-450 xL-1	28.8	1.63	-	27.2	9.92	127.1	-5,6
33	L-167 x L-1	32.3	-0.02	-	17.5	-3.6	-	-45,8
	LSD_{05}	2,5			2.7			

Thus, the trait of leaf WRC in F_1 hybrids was mainly inherited according to the type of overdominance (of which 13 were positive, 4 were negative). In 7 combinations, positive heterosis was noted, the degree of which ranged from 110.2% (L-5445 x L-663) to 15.6% (L-5445 x L-450). Negative heterosis was found in combinations L-10 x L-167 (85.1%), L-2006 x Surkhan-14 (86.7%) and L-663 x L-167 - 88.4%.

In case of water deficit in the group of parental forms, the highest rates of leaf WRC were noted in the variety Surkhan-14 and line L-1 (respectively, 18.4% and 20.1%), and the lowest rates - in the lines L-2006, L- 5440 and L-10 (respectively 26.1%, 25.3% and 25.1%). In F1 hybrids L-2006 x Surkhan-14 and L-167 x L-1, L-10 x L-5445 and L-5440 x L-450, the leaf WRC was high (respectively, 17.5%, 17.5% , 18.4% and 18.7%), and combinations L-5445 x L-663 and L-663 x L-5445 had the lowest leaf WRC (Table 3).

On this stressful background, the trait of leaf WRC from 24 combinations of F_1 was inherited as positive overdominance in 10 combinations, negative overdominance in 11 combinations, positive incomplete dominance in 2, and negative incomplete dominance in 1 combination. Thus, the trait of leaf WRC under water deficiency was inherited mainly by the type of negative and positive overdominance. Under stress conditions, the number of F_1 combinations with negative overdominance sharply increased (from 4 on the optimal background to 11 with water deficit). In 7 F_1 combinations, positive heterosis was noted, the degree of which ranged from 113.0% (L-167 x L-10) to 135.2% (L-5445 x L-663). Negative heterosis was found in 4 F_1 combinations, i.e. in L-10 x L-5445 (79.3%), L-5445 x L-10 (85.8%), L-10 x L-167 (86.4%) and L-5440 x L-167 (86.9%). According to the indicators of the adaptability coefficient (Cad.), the WRC of leaves under conditions of water deficit increased in the group of parental forms from 2.0% to 50.6%, and in the F_1 group - from 4.5% to 45.8%. In the group of parental forms on the basis of leaf WRC to water deficiency, a strong reaction was observed in line L-167 and the variety Surkhan-14, and a weak reaction in lines L-1, L-10 and L-5445; L-167 x L-1, L-5440 x L-450, L-5440 x L-167, Surkhan-14 x L-450, while combinations of L-5445 x L-663 and L-450 x L-1 showed weak sensitivity.

4 Conclusions

As a result of the research, the presence of genotypic polymorphism in groups of varieties and lines of the species *G.barbadense* L., their F_1 hybrids was established in terms of physiological indicators of water metabolism of plants under conditions of optimal water supply and water deficiency. The studied parental forms (cultivars, lines) and their F_1 hybrids reacted to soil moisture deficiency by reducing the water content and intensity of leaf transpiration and increasing the water-retaining capacity of leaves, which serve as physiological mechanisms for adapting fine-staple cotton to this stress. In F_1 hybrids under conditions of water deficiency, the trait of water content of leaf was inherited mainly by the type of positive overdominance and incomplete dominance of the paternal or maternal form with a high index, the trait of the intensity of leaf transpiration was inherited mainly by the type of positive overdominance, the trait of the water-retaining capacity of leaves - mainly by according to the type of negative and positive overdominance.

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