

**FORMATION OF THE "STAPLE FIBER LENGTH" TRAIT IN  
GEOGRAPHICALLY DISTANT, VARIETAL-LINEAR F1-F2 HYBRIDS OF  
THE COTTON SPECIES G.BARBADENSE L**

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**Annotation**

*The article presents the results of field studies related to the establishment of some genetic patterns of variability, inheritance and heritability of the "staple fiber length" trait in geographically distant, varietal-linear F1-F2 cotton hybrids of the species G.barbadense L. Some genetic patterns have been established that allow us to identify promising initial forms for hybridization and create F1-F2 hybrids based on the best, followed by a recommendation of the best for further breeding work.*

**Keywords:** *cotton, fine fiber, source material, hybrid, selection, variability, inheritance, heritability, generation, trait, staple fiber length*

**INTRODUCTION**

Cotton species of the Malvaceae family of the New World were introduced into culture in prehistoric times. The conducted botanical-geographical and historical studies allow us to restore, if not complete, then quite close to the actual history of the evolution and geographical distribution of polyploid cotton species.

The cotton culture in Mexico and South America has been known since prehistoric times. The center of origin of the species G.hirsutum L. this is a separate mountainous area-the Chicanas locality (Vavilov, 1926, Zaitsev, 1929, Mauer, 1954, Zhukovsky, 1964), which is confirmed by archaeological and historical data, excavations of Peruvian cemeteries, as well as finds in cave settlements of Arizona Indians and on the Yucatan Peninsula (Mauer, 1954).

Accelerated breeding of cotton varieties that combine a complex of basic economically valuable traits depends on the involvement of a genetically new source material in the breeding process. At the same time, the various genetically new cultural potential of the G.barbadense L. species created in recent years (Avtonomov, Kimsanbayev, 2007), (Avtonomov, Egamberdiev, 2009), created in recent years, is being used insignificantly.

Cultural forms of the species G.barbadense L. evolved gradually from the wild as a result of conscious human activity (Avtonomov, 1936, 1948, 1956, Avtonomov, 1984, Avtonomov, 1973, Ravshanov, Avtonomov, 2021).

To the founders of breeding work with cotton species *G. barbadense* L. in the north of the world cotton belt, such recognized breeders as (Avtonomov, 1936, 1948, 1956, Avtonomov, 1973), (Kulebyaev, 1937, 1953), (Krasichkov, 1950), (Maksimenko, 1936), (Emmanuilov, 1937) should be attributed.

### **METHODOLOGY AND SOURCE MATERIAL**

In 2022, work continued aimed at carrying out research carried out within the framework of the approved work program of the laboratory: "seed science and primary seed production".

In summer, as you know, the weather in the Surkhandarya region of the Republic of Uzbekistan is hot, without sudden changes and with very little precipitation. As a rule, the last spring frost is observed at the end of February, the first autumn frost is at the end of November.

The temperature conditions in 2022 during the field experiments turned out to be favorable, the sowing was carried out at the optimal time - April 16.

Agrotechnical measures carried out in the field to carry out these studies are typical for this cotton cultivation zone.

Phenological observations and biometric descriptions were carried out according to the method of conducting breeding work with cotton (VNIISSE, 1968). The following research methods were used, these are hybridological and variational-statistical. Phenological observations and biometric descriptions were carried out according to the method of conducting breeding work with cotton (VNIISSE, 1968).

Based on the actual data, variation series were constructed according to the studied feature. The calculation of statistical indicators was carried out according to the formulas given in the book of Dospekhov (1979).

The degree of dominance according to the "staple fiber length" studied in F1 hybrids was judged by the magnitude of the dominance index (hp) calculated by the formula given in the work of Beil G.M., Atkins. (1965).

The degree of heterogeneity of hybrid populations F2 was judged by the value of the indicator of genotypic variability – the heritability coefficient (h<sup>2</sup>), calculated by the formula given in the work of Allard R.W. (1966).

The object of research in the field experiment was the fine-fiber cotton lines created by the breeder V.A. Avtonomov, which were used as paternal forms during hybridization of L-1 and L-130, and as maternal forms of L-160 and varieties 6465-B, 9280-I, Surkhan-103, S-6040 and 9453-And, as well as hybrid combinations F1-F2 created with the participation of the above-mentioned lines and varieties, combining high values of such a feature as: "staple fiber length".

### **RESULTS AND DISCUSSIONS**

Fiber is the main product for which cotton is grown. The volume of its harvesting and the profitability of cotton growing as a whole, as a branch of agriculture in Uzbekistan, directly depends on the quality and quantity of the fiber obtained after cleaning the harvested crop of raw cotton.

In connection with the above, studies were conducted aimed at creating hybrids with a high value of the analyzed trait.

Proceeding from the above, we will consider the research results presented in Table 1.

Table 1 shows that the feature "staple fiber length" in varieties and lines involved in hybridization as maternal form it is within the average value of the sign from 1.38 to 1.40 inches. And in the lines used as paternal forms, L-1 and L-130 had an average value of a feature at the level of 1.40 inches. Differences in the average value of the characteristic "staple fiber length" determined the behavior of varietal hybrids F1-F2 of cotton species *G.barbadense* L. Thus, the range of variability in varieties and L-160 used as maternal forms during hybridization was within the limits of 1.38 to 1.41 inches, a similar range of variability was noted in L-1 and L-130 used during hybridization as paternal forms, where the average values were within the limits of 1.39 to 1.42 inches. Analyzing the behavior of F1 hybrids by the scope of variability, as can be seen from

Table 1

Variability, inheritance and heritability of the "staple fiber length" trait in geographically distant, varietal-linear F1-F2 hybrids of cotton species *G.barbadense* L.

Varieties, lines, hybrid combinati ons	K = 0.01							n	M±m	∂	V %	h p	h <sup>2</sup> F <sub>1</sub> - F <sub>2</sub>
	1.3 8	1.3 9	1.4 0	1.4 1	1.4 2	1.4 3	1.4 4						
6465-V	2	1	9					3 2	1,39±0. 001	0.0 05	0.4 0		
9280		2	24	8				3 4	<b>1.40±0. 001</b>	0.0 05	0.3 7		
Surxan- 103			28	12				46	<b>1.40±0. 001</b>	0.0 06	0.4 4		
C-6040	7	5	11					43	1.39±0. 001	0.0 06	0.4 6		
9453-I	11	2	6					39	1.38±0. 001	0.0 06	0.4 7		
JI-160			24	8				3 7	<b>1.40±0. 001</b>	0.0 06	0.4 2		
JI-1			17	7				27	<b>1.40±0. 001</b>	0.0 06	0.4 3		
JI-130			2	25	<b>4</b>			3 1	<b>1.40±0. 001</b>	0.0 04	0.3 1		
F <sub>1</sub> 6465-V	3		6					25	1,39±0		0.4	-	

x Л-1		6							.001	0.0 06	3	1. 0	
F <sub>2</sub> 64 65- VxЛ-1	4	3	75	22	<b>7</b>	<b>3</b>		14 4	1.39±0. 001	0.0 1	0.6 7		0. 73
F <sub>1</sub> 6465-V x Л-130	3	9	8					30	1.39±0 .001	0.0 06	0.4 2	- 1. 0	
F <sub>2</sub> 64 65- V x Л- 130			11	72	<b>22</b>	<b>13</b>		12 1	<b>1.41±0. 001</b>	0.0 1	0.6 1		0. 80
F <sub>1</sub> 9280- I4x Л-1			23	11				36	1.40±0. 001	0.0 05	0.3 9	0. 0	
F <sub>2</sub> 9280 I xЛ-1		1	63	31	<b>13</b>	<b>2</b>		13 0	1.40±0. 001	0.0 1	0.6 5		0. 77
F <sub>1</sub> 9280-I x Л-130			4	22	<b>5</b>			3 1	<b>1.41±0. 001</b>	0.0 05	0.3 8	0. 0	
F <sub>2</sub> 9280-I x Л-130			23	31	<b>12</b>	<b>4</b>		72	<b>1.41±0. 001</b>	0.0 1	0.6 4		0. 83
F <sub>1</sub> Surxan- 3 x Л-1			26	7				35	1.40±0. 001	0.0 05	0.3 9	0. 0	
F <sub>2</sub> Surxan- 3 x Л-1	2	0	53	21	<b>6</b>			11 2	1.39±0 .001	0.0 1	0.6 1		0. 73
F <sub>1</sub> Sur-3 x Л-130			3	27	<b>7</b>			3 7	<b>1.41±0. 001</b>	0.0 05	0.3 6	0. 0	
F <sub>2</sub> Sur-3 x Л-130			29	63	<b>12</b>	<b>5</b>	<b>2</b>	1 18	1.40±0. 001	0.0 1	0.6 7		0. 80
F <sub>1</sub> C- 6040x Л- 1	4	7	10					4 1	1.39±0. 001	0.0 06	0.4 1	- <b>1.</b> <b>0</b>	
F <sub>2</sub> C- 6040xЛ-1	14	2	22	8	<b>3</b>			10 9	1.39±0. 001	0.0 1	0.6 3		<b>0.</b> <b>70</b>
F <sub>1</sub> C-6040 x Л-130			32	8				4 5	1.40±0. 001	0.0 05	0.3 8	<b>1.</b> <b>0</b>	
F <sub>2</sub> C- 6040x Л- 130		1	40	20	<b>2</b>			73	1.40±0. 001	0.0 1	0.5 0		0. 80
F <sub>1</sub> 9453- ИxЛ-1	4	2	7					33	1.39±0. 001	0.0 06	0.4 1	0. 0	
F <sub>2</sub> 9453- ИxЛ-1	4	3	72	34	<b>22</b>	<b>4</b>		1 59	1.39±0. 001	0.0 1	0.7 5		<b>0.</b> <b>70</b>
F <sub>1</sub> 9453- Иx Л-130			23	12				3 8	1.40±0. 001	0.0 06	0.4 2	1. 0	
F <sub>2</sub> 9453-			51	25	<b>7</b>	<b>3</b>		10	1.40±0.	0.0	0.7		0.

Их Л-130	7	4					7	001	1	5		77
F <sub>1</sub> Л-160xЛ-1			22	11			39	1.40±0.001	0.006	0.46	0.00	
F <sub>2</sub> Л-160xЛ-1	6	3	55	13	4	2	103	1.39±0.001	0.001	0.68		<b>0.70</b>
F <sub>1</sub> Л-160xЛ-130			11	24	8		43	1.40±0.001	0.007	0.47	0.00	
F <sub>2</sub> Л-160xЛ-130			31	61	32	4	131	<b>1.41±0.001</b>	0.002	0.59		<b>0.93</b>

Table 1 the value of the feature "staple fiber length" fits, as with the parent forms, into three classes, which allows us to conclude that the law of uniformity is observed by F1 hybrids. This conclusion is fully confirmed by the values of the standard deviation ( $\sigma$ ) and the coefficient of variation (V%), which are approximately at the same level as those of the parent forms used in hybridization. Whereas in F2 hybrids, the values of the standard deviation ( $\sigma$ ) and the coefficients of variation (V%) are 1.5-2 times higher than in F1 hybrids and parent forms involved in hybridization.

Analyzing the value of the dominance index (hp), it can be seen that the characteristic "staple fiber length" in F1 hybrids is not inherited in six cases, in two cases the effect of heterosis is established and in three cases the effect of negative positive dominance is established, which is confirmed by the value of the dominance index, in three hybrids with a value of -1.0 and one hybrid 1 with a plus sign.

When analyzing the variation series of F2 varietal hybrids from a breeding point of view, plants with the value of the "staple fiber length" attribute located in the right part are of considerable interest, as can be seen from Table 1. In this regard, hybrid combinations such as 6465-V x L-1, 6465-V x L-130, 9280-I x L-1, 9280-I x L-130, Surkhan-3 x L-1, Surkhan-3 x L-130, With-6040 x L-1, C-6040 x L-130, 9453-And x L-1, 9453- And x L-130 in which plants with a trait size ranging from 1.42 to 1.44 inches were isolated, which is of considerable interest from a breeding point of view.

Considerable interest as a result of the analysis of the results of laboratory studies is caused by the value of the heritability coefficient (h<sup>2</sup>) in varietal hybrid combinations F2 of cotton of the species *G. barbadense* L., on the basis of "staple fiber length".

As can be seen from the results of the studies presented in Table 1, the value of the heritability coefficient (h<sup>2</sup>) in F2 hybrids falls within the limits from 0.70 to 0.93, that is, the analyzed trait is inherited at a high level, which indicates the possibility of distinguishing individual plants among varietal hybrid combinations,



starting from the second generation with a fiber length in inches at the level of the best or the superior parent used in hybridization as the paternal form. That is, the following hybrid combinations of F2 are of considerable interest from a breeding point of view: 6465-In x L-1, 6465-In x L-130, 9280-And x L-1, 9280-And x L-130, Surkhan-3 x L-1, Surkhan-3 x L-130, C-6040 x L-1, C-6040 x L-130, 9453-And x L-1, 9453- And x L-130, in which the value of the heritability coefficient ( $h^2$ ) is respectively at the level of 0.73, 0.80, 0.77, 0.83, 0.73, 0.80, 0.70, 0.80, 0.70, 0.77, 0.70, 0.93. Among the selected F2 hybrids, individual plants with the value of the "staple fiber length" attribute at the level of 1.42-1.44 inches were identified, in which the share of genotypic variability is due to a high level, more than 70%.

## CONCLUSION

Based on the analysis of the results of laboratory studies, which are presented in Table 1, the following conclusions should be drawn:

- among the varieties and lines used in hybridization as maternal forms, varieties 9280-I, Surkhan-3 and the L-160 line should be distinguished, and among the lines used as paternal L-1, L-130, which should be attributed to long-fiber;
- the feature "staple fiber length" in F1 varietal hybrids is not inherited in six cases, two hybrids have a heterosis effect and the remaining three hybrids have a negative effect of complete overdominance and one hybrid has a positive dominance effect;
- both in parent forms and in F1 hybrids, when analyzing the variation series, it can be seen that plants with the values of the "staple fiber length" attribute fit into three classes, which allows us to talk about compliance with the law of uniformity by F1 hybrids and about the high purity of the source material involved in hybridization;
- analyzing the placement of plants in the variation series, a wide range of variability has been established in F2 hybrids, where plants are placed according to their values of the analyzed trait in grades 5-6;
- analyzing the values of the standard deviation ( $\sigma$ ) and the coefficient of variation (V%), it can be seen that they are 1.5-2 times higher in F2 hybrids than in F1 hybrids and parent forms used in hybridization;
- the analyzed trait is inherited at a high level, which indicates the possibility of selecting plants with an increased staple fiber length among the F2 hybrids of the cotton species *G. barbadense* L., which is very important from a breeding point of view.

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