THE "SPECIFIC BREAKING LENGTH" 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 trait "specific breaking length" in geographically distant, varietal-linear F1-F2 hybrids of cotton species G.barbadense L. As a result of the analysis of the results of laboratory studies, some genetic patterns have been established that allow us to identify promising initial forms for hybridization, and then create F1-F2 hybrids based on the best, followed by the recommendation of the best for further breeding work.

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

INTRODUCTION

The soil and climatic conditions of Central Asia are ambiguous by the nature of the distribution and intensity of the manifestation of meteorological factors, which determines the instability of the manifestation over the years and during the growing season, which ultimately affects the profitability of cotton growing in Uzbekistan.

As is known, when solving the urgent problem of increasing the productivity of the lands of cotton-growing regions, one of the main places is assigned to the variety, since its potential consists of the yield and the quality of the fiber obtained in the optimal time, which ultimately determines the possibility of introducing a new variety into production.

Based on the relevance of the problem presented above, the study to a certain extent serves to fulfill the tasks provided for by Resolution No. 47 of 30.01.2020 of the Cabinet of Ministers of the Republic of Uzbekistan. By Decree of the President of the Republic of Uzbekistan No. 5009 dated February 26, 2021 and other relevant regulatory documents adopted in this area.

Millennial selection among wild cotton growing near homes contributed to the emergence of powerful productive plants with a cultural type (Abdullaev, 2005, 2006, 2014; Abzalov, 2005,2008).

Varieties of the species G.barbadense L. are of considerable interest for domestic cotton growing. It is known from numerous studies that wild, ruderal and cultural forms serve as a source of signs that determine the high quality of fiber, the size of the box, resistance to fusarium wilt of modern varieties of fine-fiber cotton. The ancestors in the creation of varieties of fine-fiber cotton were the varieties of Egyptian selection Ashmuni, Menoufi, Giza, from which the first varieties of Uzbek and Turkmen skeletons were created by analytical selection (Avtonomov, 1937, 1948, 1958), (Avtonomov, 1973, Babaev, 1974, Iksanov, 1977), (Avtonomov, Egamberdiev, Kimsanbayev M.X, 2009).

Cotton fiber is of natural origin, while it is present on every seed that is in the box. The box can contain up to 500,000 fibers of Smole, M.S., Hribernik, 5., Kurecic, M. et al. (2019). Cotton fiber is characterized by such signs as staple length, strength, uniformity in length, tonin, color, clogging (remnants of leaves, ovaries, etc.) and other signs. The strength of the fiber is determined by the specific breaking length of the fiber- G.s /tex, which is determined on special technological equipment HVI Haigler S. (2010). The textile industry uses the characteristics of features installed on HVI and AFIS laboratory equipment, in order to determine and predict the quality of yarn and select the fiber with the necessary characteristic, in order to produce yarn of a certain quality Brad JM, Davidonis GH. (2000). The Agricultural Marketing Service divides cotton fiber into different classes from the lowest (23.0 g/tex and below) up to a high class (31.0 g/tex and above), based on the values of fiber quality-determining features measured on HVI Brad JM, Davidonis GH. (2000). The specific breaking length of the fiber depends on the strength and tortuosity of each fiber, which ultimately affects the quality of the yarn Mathangadeera R. (2014). The length of the fiber affects its spinning properties, including the specific breaking length of Naylor GR, Delhom CD, Cui X, Gourlot J-P, Rodgers J. (2014).

The thickness of the fiber is associated with characteristics that include : microneur, maturity , toning , which in turn affects the specific breaking length of the fiber and the quality of the yarn Mathangadeera R. (2014). The value of the specific breaking length of the fiber correlates with the strength of the yarn and can be measured on laboratory equipment "Farimat" Naylor GR, Delhom CD, Cui X, Gourlot J-P, Rodgers J. (2014).

Venue, 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", which was based on the original forms and hybrids created in 2020-2021 by the breeder V.A. Autonomov.

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. Periodically blowing hot winds (harm sills) and lack of irrigation water during the formation and accumulation of the raw cotton crop, 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 of 2020-2022 during the field experiments turned out to be favorable; sowing was carried out, as a rule, at the optimal time in the period from April 8 to April 16.

Agro technical measures carried out in the field to carry out these studies are typical for this cotton cultivation zone, namely the Termez district, Surkhandarya region.

Phonological observations and biometric descriptions were carried out according to the method of conducting breeding work with cotton (VNIISSH, 1968). The following research methods were used; these are hybrid logical and variation-statistical analysis.

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 "specific breaking length" studied in hybrids in F1 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 (h2), 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. Autonomov, 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: "specific breaking length".

As mentioned above, high-quality fiber is what cotton is grown for. Its volume of harvesting and profitability of cotton growing as a branch of agriculture

in Uzbekistan directly depends on the quality of the fiber obtained after cleaning the harvested crop - raw cotton, including the "specific breaking length" feature.

RESULTS

Proceeding from the above, we will consider the result of the analysis of laboratory studies presented in Table 1.

Table 1 shows that the characteristic "specific breaking length" in varieties and lines involved in hybridization as parent forms is within the average value of the characteristic from 33.5 to 38.2 g/tex. At the same time, the lines used as paternal forms during hybridization of L-1 and L-130 had an average value of the trait at the level of 35.5 g/tex and 34.6 g/tex, respectively. Differences in the average value of the characteristic "specific breaking length of the fiber" determined the behavior of varietal hybrids F1-F2 of cotton species G.barbadense L.

Analyzing the behavior of F1 hybrids, according to the scope of variability, as can be seen from Table 1, the value of the characteristic "specific breaking length" of the fiber fits, as with the parent forms, into three classes, which allows us to conclude that the law of uniformity of F1 hybrids is observed. This provision is fully confirmed by the values of the standard deviation (o) and the coefficient of variation (V%), which are approximately at the same level as the parent forms used in hybridization. Whereas in F2 hybrids, the above-mentioned values of the standard deviation (∂) and the coefficient 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 "specific breaking length" in F1 hybrids is inherited in three cases by the type of incomplete dominance of the worst parent, in seven cases it is inherited by the type of incomplete dominance of the best parent, and two hybrids have a heterosis effect, which is confirmed by the value of the dominance index, which falls within the limits of 0.10 in hybrid F1 6465-In x L-1 to 5.0 in F1 Surkhan-3 x L-1.

When analyzing the variation series of F2 varietal hybrids from a breeding point of view, plants with a specific breaking fiber length located in the right part of the variation series are of considerable interest, as can be seen from Table 1. In this regard, the following hybrid combinations of F2 are of considerable interest: 9280-and x L-1, Surkhan-3 x L-1, 9453-And x L-1, 9453-and x L-130, which have plants with a specific breaking fiber length ranging from 38.0 to 38.9 g with/tex, F1 9453-And x L-1, where in 16 plants the value of the trait falls within the limits of 39-39.9 g.s/tex., which is of considerable interest from a breeding point of view.

Considerable interest in the conducted studies is caused by the value of the heritability coefficient (h2) in varietal hybrids F2 of the cotton species G.barbadense L. Thus, the range of variability in varieties and L-160 used as maternal forms during hybridization, as can be seen from the analysis of variation series, fell within the limits of 32.0 to 39.9 g.s/tex, and the range of variability in L-1 and L-130 used during hybridization as paternal forms fell within the limits of 33.0 up to 36.9 g.s/tex. Analyzing the behavior of F1 hybrids, according to the scope of variability, as can be seen from Table 1, the value of the characteristic "specific breaking 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 position is fully confirmed by the values of the standard deviation (o) and the coefficient of variation (V%), which are approximately

Tab 1

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

Varietie, lines, hybrid combinations	K = 1.0 g.s/ tex									n	M± m г.с/ тек с	∂	V %	h p	h^2 F_1-F_2
	31.0-31.9	32.0-32.9	33.0-33.9	34.0-34.9	35.0-35.9	36.0-36.9	37.0-37.9	38.0-38.9	39.0-39.9						
6465-V		6	17	9						32	33.5± 0.12	0.68	2.05		
9280 II					9	22	3			34	36.2± 0.01	0.57	.6		
Surxan-3				15	27	4				46	35.2± 0.01	0.60	1.71		
C-6040			15	20	8					43	34.2± 0.11	0.72	2.10		
9453-I						7	20	12		39	37.5± 0.11	0.69	1.85		

JI-160							11	22	4	37	38.2±0.10	0.61	1.61		
Л-1				4	17	16				27	35.5±0.11	0.61	1.73		
Л-130			4	18	9					31	34.6±0.11	0.64	1.85		
$F_1$6465-V x Л-1			2	17	6					25	34.6±0.11	0.55	1.6	0.10	
$F_2$64 65-V xЛ-1		10	33	71	25	5				144	34.3±0.1	0.9	2.62		0.53
$F_1$6465-V x Л-130			3	22	5					30	34.5±0.1	0.52	1.51	0.72	
$F_2$64 65-V x Л-130	5	14	66	22	14					121	33.6±0.08	0.94	2.80		0.57
$F_1$9280-I4x Л-1				1	7	28				36	36.1±0.1	0.50	.4	0.75	
$F_2$9280-IxЛ-1				16	32	66	11	5		130	36.1±0.1	0.93	2.59		0.64
$F_1$9280-I x Л-130				3	22	6				31	35.5±0.1	0.54	1.51	0.12	
$F_2$9280-I x Л-130			9	33	21	6	3			72	34.8±0.1	0.9	2.7		0.63

											1	6	6		
F_1Sur-3 x Л-1					8	24	3			35	36.3± 0.1	0.55	1.51	5.00	
F_2Sur-3 x Л-1				17	54	22	13	6		112	35.8± 0.1	1.05	2.94		0.68
F_1Sur-3 x Л-130				23	11	3				37	34.7± 0.1	0.46	1.34	0.67	
F_2Sur-3 x Л-130			14	63	18	15	8			118	34.8± 0.1	1.07	3.1		0.72
F_1C-6040x Л-1				14	27					41	35.1± 0.1	0.48	.4	0.38	
F_2C-6040xЛ-1			21	54	25	9				109	34.6± 0.1	0.84	2.44		0.47
F_1C-6040 x Л-130				12	27	6				45	35.3± 0.1	0.62	.8	4.50	
F_2C-6040x Л-130			6	18	52	6	4			76	35.2± 0.1	0.84	2.40		0.38
$F_1$9453-IxЛ-1					7	21	5			33	36.3± 0.10	0.60	1.67	0.20	
$F_2$9453-IxЛ-1						76	44	23	16	159	37.3± 0.1	1.0	2.70		0.60
$F_1$9453-Ix Л-130					5	24	9			38	35.5±	0.	1.	0.4	

											0.1	60	70	3	
$F_2$9453-Ix Л-130				21	56	24	4	2		107	35.5±0.1	0.84	2.4		0.41
F_1Л-160xЛ-1					5	22	5			39	36.6±0.10	0.64	1.76	-0.18	
F_2Л-160x Л-1			22	61	12	5	3			103	34.5±0.8	0.88	2.6		0.50
F_1Л-160x Л-130				4	27	12				43	35.8±0.1	0.58	1.65	-0.33	
F_2Л-160 x Л-130			21	66	22	12				131	34.6±0.1	0.84	2.4		0.48

at the same level as the parent forms that are under development. Whereas in F2 hybrids, the above-mentioned values of the standard deviation (∂) and the coefficient of variation (V%) are 1.5-2 times higher than in F1 hybrids and parent forms.

The value of the heritability coefficient (h2) in varietal hybrids F1 of cotton species G.barbadense L. is of considerable interest in the ongoing research. based on the "specific breaking length of the fiber".

As can be seen from the analysis of the results of laboratory studies presented in Table 1, the value of the heritability coefficient (h2) falls within the limits of the hybrid F2 C-6040 x L-130 from 0.38 to 0.72 in the hybrid F2 Surkhan-3 x L-130, that is, the sign "specific breaking length" is inherited at an average level, which means indicates the possibility of isolating individual plants among varietal hybrid combinations, starting from the second generation with a trait value at the level of the best or superior to the best parent used in hybridization. In this regard, the following hybrid combinations of F2 are also of interest from a breeding point of view: 9280-And x L-1, Surkhan-3 x L-1, 9453-And x L-1, in which the value of the heritability coefficient is at the level of 0.64, 0.72, 0.60, respectively, among which individual plants with the value of the

characteristic "specific breaking length" at the level of 36.9-39.9 g/tex and at the same time the proportion of genotypic variability is at an average level.

CONCLUSION

- Based on the analysis of the results of the laboratory studies presented in Table 1, some conclusions should be drawn:
- - among the varieties and lines used in hybridization as maternal forms, varieties 9280-I, 9453-I, and L- 160 should be distinguished, which should be attributed to the original forms with a high value of the characteristic "specific breaking length of the fiber", and the lines used as paternal L-1, L-130, it should be attributed to the initial forms that have an average value of the above-mentioned feature;
- - the characteristic "specific breaking length" in F1 varietal hybrids is inherited in three cases by the type of incomplete dominance of the worst parent, in eight cases by the type of incomplete dominance of the best parent and in two hybrids the effect of heterosis is established, namely Surkhan-3 x L-130, where hp=5.0 and C-6040 x L-1, where hp=4.5;
- - both in parent forms and in F1 hybrids, when analyzing the variation series, it can be seen that plants with the values of the characteristic "specific breaking length" 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 variational rows, a wide range of variability has been established in varietal hybrids F2, where plants are placed according to their values of the characteristic "specific breaking length" in 4-5 classes;
- - analyzing the values of the standard deviation (∂) 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 "specific breaking length" trait is inherited at a low and medium level, which indicates the possibility of selecting plants with an increased value of the analyzed trait among the F2 varietal hybrids of the cotton species G.barbadense L., which is very important from a breeding point of view.

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