

**SELECTION OF PROMISING INITIAL SOURCES RESISTANT TO
ABIOTIC FACTORS AND POSSESSING SUPERIOR FIBER QUALITY
FROM THE COTTON COLLECTION (*Gossypium barbadense* L.)**

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Abstract: This study was carried out to identify the initial sources resistant to abiotic factors from the cotton collection belonging to *Gossypium barbadense* L. The experiment was conducted at the Research Institute of Fine-Fibered Cotton Breeding located in the Surkhandarya region. The objective was to determine accessions of *G. barbadense* L. that are tolerant to high temperatures, drought, and hot dry winds (garmsel). Thirty collection accessions were studied under field conditions. Morphological and biological characteristics, including plant height, boll weight, fiber yield, and fiber length, were evaluated using standard breeding methods. The soil type of the experimental plot was light gray, with a humus content of 1.8–2.2% and a pH of 8.3–8.8.

The research results showed significant variability among the accessions. Among them, Termiz-13 (Uzbekistan), Suwin (India), Pima-1590 (USA), and Elotan (Turkmenistan) displayed high tolerance to abiotic factors and produced stable yields and high fiber quality under conditions of extreme heat. These genotypes are considered valuable as initial sources for breeding fine-fibered cotton varieties adapted to arid and hot climates.

Keywords: *Gossypium barbadense* L., abiotic stress, fiber yield, heat tolerance, breeding, fine-fibered cotton, collection accessions

Introduction: In the southern regions of the Surkhandarya province, factors such as high temperatures and hot dry winds (garmsel) remain among the main limiting conditions for cotton cultivation. According to data from the Surkhandarya Regional Meteorological Center, summer air temperatures often reach +40–46°C and even higher. Such extreme heat during the vegetation period of cotton significantly reduces crop productivity.

Therefore, the selection of cotton varieties adapted to local climatic conditions, especially the expansion of fine-fibered cotton cultivation areas, and the implementation of scientifically based agrotechnical practices are of great importance. According to studies conducted by well-known Uzbek cotton breeders M.S. Istamomin, Ye.G. Gavrilov, and M. Tojiev fine-fibered cotton varieties have shown greater adaptability than medium-fibered ones under the climatic conditions of Surkhandarya.

The selection of **Gossypium barbadense* L.* accessions from the cotton collection that are resistant to abiotic stresses and possess high fiber quality is considered a scientifically and practically significant task.

Materials and Methods: The research was conducted at the Research Institute of Fine-Fibered Cotton Breeding located in the Surkhandarya region of Uzbekistan. The experimental site is characterized by a sharply continental climate with hot, dry summers and mild winters. The soil type of the field was light gray, containing 1.8–2.2% humus and a slightly alkaline reaction with a pH range of 8.3–8.8.

A total of thirty accessions of *G. barbadense L.* from the world cotton collection were studied. These accessions represented diverse ecological and geographical origins, including Uzbekistan, Turkmenistan, India, Egypt, the United States, Brazil, Bulgaria, Czechoslovakia, and Pakistan. The locally adapted fine-fibered variety “Surxon-14” was used as the standard control.

The field experiment was carried out under natural abiotic stress conditions typical of the Surkhandarya region, such as high temperatures and limited moisture availability. Phenological observations and biometric measurements were conducted following the standard methods accepted in cotton breeding and agrotechnology.

The following parameters were recorded: plant height, number of sympodial branches, number of bolls per plant, boll weight, seed cotton yield, and fiber yield percentage. Fiber technological properties—including fiber length, fineness, and tensile strength—were determined in the laboratory using standardized testing methods in accordance with international fiber classification protocols. Statistical processing of the obtained data was performed using standard biometric methods to determine the reliability of the results and variation among accessions.

Results and Discussion: In our research, we are conducting a comprehensive evaluation of more than thirty fine-fibered cotton accessions (*Gossypium barbadense L.*), including cultivars developed by local Uzbek breeders and those introduced from the United States, Bulgaria, Brazil, India, Egypt, Pakistan, Peru, Czechoslovakia, and Turkmenistan. These accessions are being studied for the first time under the agro-climatic conditions of the Surkhandarya region to identify genotypes exhibiting tolerance to high temperature, hot dry winds (garmsel), and soil salinity, as well as superior fiber technological characteristics. The primary objective of this research is to select promising breeding sources that combine stress resistance with high fiber quality for the development of new fine-fibered cotton cultivars adapted to arid environments.

In cotton breeding, the ability of cultivars to retain a higher proportion of their yield under conditions of extreme heat, water deficit, hot dry winds (garmsel), and very low relative air humidity is considered one of the most critical adaptive and physiological traits. This capacity determines the stability of productivity under

abiotic stress conditions and serves as a key selection criterion in the development of stress-tolerant cultivars.

Among the evaluated accessions, the local cultivar “Termiz-13” (Uzbekistan), “Suwin” from India, “Pima-1590” from the United States, and “Elotan” from Turkmenistan exhibited the highest degree of tolerance to high temperature, moisture scarcity, and hot dry winds. These cultivars retained a greater portion of their yield and showed less damage to reproductive organs compared with the standard control variety “Surxon-14” and other genotypes. Thus, they were identified as the most resilient and high-performing cultivars under the extreme agro-climatic conditions of the Surkhandarya region.

In addition, several cultivars were identified as being less tolerant to abiotic stress factors. Specifically, the Turkmen cultivar “Ash-11,” the Czechoslovakian accession “TCXLI-1,” the Brazilian cultivar “Pin-175,” the American cultivar “Tadla-20,” the Pakistani cultivar “Pima S-2,” and the local variety “Termiz-7” exhibited high sensitivity to elevated temperature, moisture deficiency, and hot dry winds (garmsel). These genotypes showed a marked reduction in boll retention and seed cotton yield under extreme environmental conditions, indicating their low adaptive capacity and poor physiological stability (Fig. 1).



Figure 1. Cotton plants damaged under conditions of extreme heat, water deficit, garmsel (hot dry winds), and very low relative air humidity

In terms of fiber yield, among the evaluated cotton accessions, the Bulgarian sample “No. 146” demonstrated the highest performance, producing a fiber yield of 37.7%, which was 4.0% higher than that of the standard control cultivar “Surxon-14” and other tested varieties. The remaining accessions recorded lower fiber yields compared with the control.

Specifically, the Pakistani cultivar “Karnak × 165” and the Turkmen accession “9883-I” exhibited a fiber yield of 20.0%, which was 13.7% lower than the standard. The accession “9123-I” from Turkmenistan produced 22.2% fiber yield, 11.5% below the control, while the local cultivar “Termiz-13” showed a fiber yield of 22.5%, 11.2% less than the reference variety. These accessions were therefore classified as having the lowest fiber yield among the studied genotypes.

Fiber Length. Fiber length refers to the distance between the two ends of a fiber and is measured in millimeters (mm). In fine-fibered cotton (*Gossypium barbadense* L.), the average fiber length typically ranges from 38 to 42 mm, while in elite cultivars it may reach 44–46 mm. According to both the Uzbekistan national

standard and international classification requirements, fine-fibered cotton cultivars generally possess a fiber length of 35–38 mm, whereas extra-fine and high-quality varieties range between 39 and 45 mm.

In our experiment, the standard control cultivar “Surxon-14” exhibited a fiber length of 37.2 mm. The Czechoslovakian accession “TCXLI-1” produced the longest fibers at 44.7 mm (+7.6 mm compared with the control), followed by the Egyptian cultivar “Sakha-3” with 42.0 mm (+4.9 mm), the Turkmen cultivar “Elotan” with 41.6 mm (+4.5 mm), the American cultivar “Pima S-3” with 41.3 mm (+4.2 mm), the Pakistani cultivar “Karnak × No.165” with 40.8 mm (+3.7 mm), and the American cultivar “Pima-1590” with 40.2 mm (+3.1 mm).

Additionally, the Egyptian cultivar “Giza-13” (+3.0 mm), the local cultivars “S-6037” (+2.7 mm) and “Termiz-7” (+2.7 mm), as well as the Egyptian cultivar “Sakha-11” (+2.3 mm) also demonstrated superior fiber length compared with the standard (*Table 1*)

(Table 1)

**Fiber Quality Indicators of Cotton Collection Accessions
(2024-2025)**

No.	Catalogue No.	Cultivar Name	Weight of Cotton per Boll (g)	Difference from Standard (±)	Fiber Yield (%)	Difference from Standard (±)	Fiber Length (mm)	Difference from Standard (±)
1	08992	Pin 175	1,9	-0,7	31,4	-2,3	37,0	-0,1
2	08355	Giza 66	3,5	0,9	27,7	-6,0	36,3	-0,9
3	08562	BLR 14/125	-	-	-	-	-	-
4	08799	PS 4	2,5	-0,2	27,0	-6,7	40,3	3,2
5	08563	Pima S 2	2,3	-0,4	25,0	-8,7	38,5	+1,4
6	08561	Karnak x 165	2,7	0,1	20,0	-13,7	40,8	+3,7
7	08740	№ 146	2,2	-0,5	37,7	4,0	31,3	-5,9
8	08356	Giza 67	4,6	2,0	32,3	-1,4	30,4	-6,8
9	08741	№ 501	4,0	1,4	31,2	-2,5	28,9	-8,3
10	07691	Siyata	4,5	1,9	31,1	-2,6	32,9	-4,3
11	St. Surxon -14		2,6	-	33,7	-	37,2	-
12	08742	№ 241	3,1	0,5	21,6	-12,1	37,9	+0,8
13	08747	Suwin	4,0	1,4	27,8	-5,9	32,5	-4,7
14	08855	9883 I	2,7	0,1	20,0	-13,7	35,4	-1,8
15	08354	Pima S 3	2,7	0,1	26,2	-7,5	41,3	+4,2
16	(AD2-00433)	Tadla-20	2,7	0,1	28,6	-5,1	27,8	-9,4
17	(AD2-00558)	Elotan	2,5	-0,1	25,0	-8,7	41,6	+4,5
18	(AD2-00422)	Pima-1590	2,6	-0,1	32,3	-1,4	40,2	+3,1

No.	Catalogue No.	Cultivar Name	Weight of Cotton per Boll (g)	Difference from Standard ($\pm$)	Fiber Yield (%)	Difference from Standard ($\pm$)	Fiber Length (mm)	Difference from Standard ($\pm$)
19	(HD2-00534)	Ash-173-B	2,7	0,0	23,8	-9,9	38,7	+1,6
20	(AD2-00516)	Ash -11	2,3	-0,4	24,3	-9,4	39,5	+2,4
21	(AD2-00454)	TCXLI-1	2,4	-0,3	27,3	-6,4	44,7	+7,6
22	Giza-13	Giza-13	2,5	-0,1	32,5	-1,2	40,1	+3,0
23	(AD2-00539)	Ash -85-B	3,3	0,7	28,0	-5,7	38,0	+0,9
24	(AD2-00526)	S-6037	3,2	0,6	26,3	-7,4	39,8	+2,7
25	(AD2-00529)	Termiz-13	2,3	-0,4	22,5	-11,2	38,5	+1,4
26	(AD2-00418)	Sakha-3	2,6	0,0	25,0	-8,7	42,0	+4,9
27	(AD2-00519)	Termiz-7	3,1	0,5	24,1	-9,6	39,8	+2,7
28	(AD2-00417)	Sakha-11	2,4	-0,3	25,0	-8,7	39,4	+2,3
29	(AD2-00453)	C-8017	3,1	0,5	28,0	-5,7	38,8	+1,7
30	(AD2-00474)	9123-i	2,3	-0,4	22,2	-11,5	37,3	+0,1

Based on the experimental results, the accessions that exhibited favorable agronomic and technological traits will continue to be studied for at least two additional years. The genotypes demonstrating superior performance compared with the standard control cultivar will be recommended as potential donor sources for the development of new breeding materials.

1. Certain accessions of *Gossypium barbadense* L. showed distinct tolerance to high temperature, indicating the presence of valuable heat-resistant genetic resources within the collection.

2. Genotypes characterized by superior fiber quality parameters were identified, and these are proposed as promising initial sources for use in cotton breeding programs.

3. The selected accessions were tested under the specific environmental conditions of the southern part of the Surkhandarya region, where they demonstrated satisfactory adaptability and stability of expression for key agronomic traits.

Conclusions: Based on the results of this study, several genotypes demonstrating tolerance to abiotic stress factors and possessing superior fiber quality parameters were identified. These genotypes are recommended as potential donor sources for use in breeding programs and the development of new fine-fibered cotton cultivars. The outcomes of this research hold significant scientific and practical importance for advancing cotton breeding and production in Uzbekistan.

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