ANALYSIS OF FIBER YIELD TRAITS IN HYBRID FAMILIES INVOLVING GOSSYPIUM HIRSUTUM L. AND GOSSYPIUM STOCKSII

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Abstract: In the present study, reciprocal hybridization of local cotton varieties with the accession *Gossypium stocksii* resulted in high heterozygosity for the fiber yield trait, which contributed to the emergence of transgressive segregants. Families located on the right side of the variation series—characterized by early maturity, high productivity, and elevated fiber yield—were selected for further breeding. These families are intended for use as initial breeding material, with the objective of combining fiber yield with other valuable agronomic traits in subsequent generations.

Keywords: cotton, local varieties, *Gossypium stocksii* accession, hybrid, simple hybrid, fiber yield.

Introduction

In our country, fiber yield is one of the most important traits in newly developed cotton varieties and breeding materials. Extensive research has been conducted in cotton breeding to fundamentally modify plants and develop new varieties with early maturity, high productivity, and other valuable agronomic traits. Fiber yield depends on both the quantity and weight of fibers in the seeds. Using cotton germplasm collections and accessions introduced from various countries, improving economically valuable traits in cotton is considered essential.

Results obtained from initial generations of complex and backcross hybrids, including the F_4 generation, have confirmed the improvement of fiber yield. Studies comparing F_4 hybrids with the initial parental forms based on fiber length have also indicated further enhancement of this trait [1].

H. Saydaliev and co-authors [2] conducted experiments with cotton hybrids developed using U.S. accessions to study the formation of early-maturity traits. Their research demonstrated positive heterosis in F_1 hybrids. The expression of early-maturity in hybrids was found to depend on the participation of specific parental forms (male or female) and the genotypes involved. Families with fiber yield of 39.0% or higher can be developed to the varietal level, providing the opportunity to produce varieties with high fiber yield. For this reason, families O-1061-1062, O-524-25/2012, O-109-110, and O-59-60/2012 are recommended for use as initial breeding material in genetic and selection studies [3].

Nearly all introgressive cotton lines demonstrated high fiber yield, indicating the effectiveness of introgressive selection. In terms of fiber length, introgressive cotton lines such as T-4672-73/16, T-4674-77/16, and T-12/06/16 can be used as valuable initial material in breeding programs aimed at improving this trait [4].

Materials and Methods

Newly developed cotton varieties and breeding materials in the Republic must combine early maturity, high productivity, superior fiber yield and quality, as well as resistance to various biotic and abiotic stress factors. In this study, F_3 hybrid families derived from local varieties and an ecologically and geographically distant accession were analyzed for fiber yield at the "Cotton Entomology and Pathology" laboratory of the Research Institute of Cotton Breeding, Seed Production and Agrotechnologies, using the standard variety C-6524 as a reference. Mathematical and statistical analyses were performed according to the methodology of B.A. Dospekhov (1985) [5] and using Microsoft Excel software.

Results and Discussion

In this study, fiber yield was analyzed in F_3 hybrid families obtained from reciprocal crosses of local cotton varieties and the accession *Gossypium stocksii*. The variation series for fiber yield consisted of nine classes (K = 1%). Among parental form families, 14–19 families were observed in these classes, while in hybrid families the number ranged from 18 to 22, and the standard variety C-6524 included 16 families. Plants were distributed across the variation series from 33.0% to 41.0%.

Among the five local parental forms studied, the highest fiber yield (≥39.0%) was observed in 13 families, corresponding to classes 7–9 of the variation series: Barhayot – 22.2%, C-2609 – 17.6%, and *G. stocksii* – 50.0%. This demonstrates that the geographically and ecologically distant accession exhibited relatively higher fiber yield compared to local varieties. In parental forms, the main proportion of plants (36.0–38.0%) were concentrated in classes 4–6, while in *G. stocksii*, 50.0% of plants fell in this range. In varieties C-8284 and C-2609, up to 70.5% of families were located in these classes. Relatively lower fiber yield (33.0–35.0%) was observed in C-2610 (26.3%) and C-2612 (37.5%) with 5–6 families in each. The coefficient of variation for fiber yield in parental forms ranged from 2.93% to 5.96% (Table).

In F_3 hybrid families, the majority of plants were concentrated in classes 4–6, accounting for 40.0% in F_3 (C-2610 × C-2612) up to 72.7% in F_3 (Barhayot × C-2610). Transgressive segregants for fiber yield were more pronounced in hybrid

families than in parental forms or the standard variety. Families with fiber yield ≥39.0% ranged from 5.0% in F_3 (C-2610 × C-2612) up to 47.6% in F_3 (Barhayot × *G. stocksii*). The coefficient of variation for fiber yield in F_3 hybrid combinations ranged from 3.9% to 5.5%. In classes 7–9 of the variation series for F_3 hybrids, plants were distributed as follows: F_3 (C-8284 × Barhayot) – 25.0%, F_3 (Barhayot × *G. stocksii*) – 47.6%, F_3 (C-2612 × *G. stocksii*) – 21.0%, and F_3 (C-8284 × C-2612) – 20.0%. This indicates that these hybrid combinations produced plants with higher fiber yield compared to local varieties and other hybrids.

Conclusion

Based on the analysis of fiber yield, F_3 plants located on the left side of the variation series (≤36.9%) were discarded, while plants on the right side of the series with relatively high fiber yield (≥37.0 g) were selected. Reciprocal hybridization of local cotton varieties with *G. stocksii* led to the formation of transgressive families due to high heterozygosity. Families positioned on the right side of the variation series, characterized by early maturity, high productivity, and elevated fiber yield, were selected as initial breeding material for subsequent generations, with the goal of combining these traits with other valuable agronomic characteristics.

Parental Forms and F₃ Hybrid Families	K=1 %.									n	M±m	δ	V%
	33	34	35	36	37	38	39	40	41				
Barkhayot			2	3	4	5	3	1		18	37,9±0,52	1,67	4,41
C-8284		1	2	3	3	6	1	1		17	37,6±1,15	1,64	4,36
C-2610	1	1	3	3	5	3	2	1		19	36,9±1,55	2,20	5,96
C-2612	1	2	3	4	3	2	1			16	36,0±1,39	1,97	5,47
C-2609			2	2	3	7	2	1		17	38,1±1,40	1,98	5,20
(*G.Stocksii* M x Bukhoro102)				1	2	4	3	2	2	14	38,2±0,79	1,11	2,93
F₃ (Barkhayot x C-8284)		1	2	4	6	3	2	1		19	37,1±1,36	1,93	5,21
F₃ (C-8284 x Barkhayot)		2	2	3	3	5	3	2		20	37,8±1,04	1,47	3,90
F₃ (Barkhayot x [(*G.Stocksii* M x Bukhoro102)]			1	3	3	4	7	2	1	21	38,8±1,42	2,02	5,20
F₃ (C-8284 x [(*G.Stocksii* M x Bukhoro102)]			1	2	2	3	6	3	1	18	38,9±1,43	2,02	5,19
F₃ (C-2610 x C-2612)	1	3	7	3	3	2	1			20	35,9±1,39	1,97	5,50
F₃ (C-2612 x [(*G.Stocksii* M x Bukhoro102)]		1	1	2	7	4	3	1		19	37,7±1,22	1,73	4,59
F₃ (C-2612 x Barkhayot)		1	2	3	9	3	2	1		21	37,0±1,28	1,81	4,90
F₃ (C-2609 x [(*G.Stocksii* M x Bukhoro102)]	1	2	6	4	3	1	1			18	35,7±1,30	1,84	5,17
F₃ (Barkhayot x C-2610)		1	1	2	10	4	2	2		22	37,6±1,44	2,04	5,42
F₃ (C-8284 x C-2612)		1	2	2	7	4	3	1		20	37,5±1,37	1,94	5,17
St. C-6524	1	1	8	3	2	1				16	35,8±0,76	1,08	3,03

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