ANALYSIS OF THE EARLY MATURITY TRAIT IN HYBRIDS INVOLVING LOCAL COTTON VARIETIES AND THE ECOLOGICALLY AND GEOGRAPHICALLY DISTANT ACCESSION G. STOCKSII

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https://doi.org/10.5281/zenodo.18785069

Abstract: The study analyzed the vegetation period trait in F_2 hybrids and their parental forms developed with the participation of local cotton varieties and the ecologically and geographically distant accession (*G. stocksii x Bukhoro102)*. According to the analysis of the vegetation period, a comparatively high number of early-maturing plants were identified in the combinations F_2 (C-8284 × Barhayot), F_2 (C-2612 × Barhayot), F_2 (C-8284 × C-2612), and F_2 (C-2609 × (*G. stocksii x Bukhoro102)*), relative to the parental forms and other hybrid combinations.

Keywords: cotton, local varieties, *G. stocksii* accession, hybrid, simple hybrid, vegetation period.

Introduction

It is well established that, among the principal agronomic traits of newly developed cotton varieties in the Republic, earliness (early maturity period) is one of the key indicators of practical importance. Numerous studies have been conducted on the vegetation period of progenies derived from various hybridization combinations in cotton. In particular, within cotton germplasm collections, there are biologically early-maturing accessions that outperform standard varieties. These accessions may be effectively utilized as initial breeding material for the development of new promising early-maturing cultivars.

One of the main components determining earliness is the timing of first boll opening. In the studied F_2 plants, this trait ranged from 107.3 to 115.9 days, with a variability amplitude of 4.6–9.4%. According to this indicator, the Termez-202 × Pima S4 combination exhibited the highest degree of earliness (107.3 days) compared to other combinations. In the variation series, the majority of plants were distributed within the 110.0–113.0 day classes, indicating their considerable potential for economic earliness [1].

According to the conclusions of F.U. Rafieva, U.I. Ergashev and co-authors [2], the identification of genotypes with higher fiber yield in F_1 hybrids relative to their parental forms, as well as the preservation and enhancement of these traits in F_2 plants, demonstrates additive gene action in the inheritance of this trait.

Moreover, they recommend the broad use of transgressive forms possessing favorable characteristics, identified during the research, as initial material in genetic and breeding programs.

The performance of simple and double hybrids involving local varieties (C-9070, C-2609, C-6530, Namangan-77, Omad) and foreign varieties (Sikala, Siokra) has also been investigated. Depending on the hybrid combination, earliness in F_1 and F_2 simple hybrids was inherited as overdominant, completely dominant, or intermediate, whereas in F_1 double hybrids involving foreign varieties, this trait was inherited with complete dominance. The authors also reported successful results from double hybrids in terms of valuable breeding traits, including number of bolls, boll weight, and resistance to wilt disease [3].

Materials and Methods

Newly developed cotton varieties and breeding materials in the Republic must combine early maturity, high yield, superior fiber output and quality, as well as resistance to various biotic and abiotic stress factors. The present study was conducted at the Research Institute of Cotton Breeding, Seed Production and Agrotechnologies, under naturally wilt-infested conditions in the "Cotton Entomology and Pathology" laboratory. The earliness of F_2 hybrids derived from local varieties and an ecologically and geographically distant accession was analyzed in comparison with the standard cotton variety C-6524.

Mathematical and statistical analyses were performed according to the methodology of B.A. Dospekhov (1985) [4] and using Microsoft Excel software.

Results and Discussion

In cotton, the opening of 50% of bolls is considered an indicator of biological earliness, whereas the opening of 90–95% of bolls characterizes economic earliness, at which stage harvesting operations are conducted. In the present study, phenological observations were carried out on F_2 hybrid plants obtained through reciprocal crosses of local varieties (Barhayot, C-8284, C-210, C-2612, and C-2609), as well as with the participation of the ecologically and geographically distant accession *G. stocksii*. The degree of variation in the vegetation period was analyzed mathematically in comparison with the parental forms.

Based on the vegetation period trait, the plants were distributed into eight classes, ranging from 96 to 135 days. Among the parental forms, the average duration of the vegetation period varied from 110.8 days in the C-8284 variety to 116.1 days in C-2610. In F_2 hybrids, the values ranged from 110.9 days in F_2 (C-8284 × *G. stocksii*) to 120.5 days in F_2 (C-2609 × Barhayot). The accession *G.*

stocksii exhibited 110.9 days, while the standard variety C-6524 showed 120.7 days.

In the parental forms, the majority of plants were concentrated within the 3rd–6th classes of the variation series, accounting for 76.1% to 93.7% of the plants. Within these classes, Barhayot and C-2610 varieties had a higher proportion of plants compared to other parental forms.

Relatively late-maturing plants, characterized by 50% boll opening after 125 days (7th–8th classes), accounted for up to 15.2% among local varieties. In particular, C-2612 and C-2609 were comparatively later maturing than the other varieties. In contrast, no plants were recorded in these classes for the *G. stocksii* accession. Early-maturing plants (up to 106 days) among parental forms ranged from 2.7% to 15.9%, with the highest proportion observed in C-8284. In the ecologically and geographically distant accession (*G. stocksii x Bukhoro102)*, 21.4% of plants were distributed within the 1st–2nd classes, indicating a shorter growth period relative to local varieties. The coefficient of variation for the vegetation period in parental forms ranged from 5.17% to 8.10% (Table).

Similarly, in F_2 hybrids, the majority of plants were concentrated within the 3rd–6th classes of the variation series, ranging from 80.4% in F_2 (C-2610 × *G. stocksii*) to 91.6% in F_2 (Barhayot × C-8284). Early-maturing plants (up to 106 days) in F_2 hybrids ranged from 2.04% to 14.0%, with a considerable number of early segregants identified. Late-maturing plants (50% boll opening after 125 days) in F_2 hybrids reached up to 14.3%, while the coefficient of variation ranged from 6.98% to 8.03%.

Analysis of the vegetation period trait in F_2 hybrids demonstrated that combinations involving local varieties—F_2 (C-8284 × Barhayot), F_2 (C-2612 × Barhayot), F_2 (C-8284 × C-2612)—as well as the combination involving the *G. stocksii* accession, F_2 (C-2609 × (*G. stocksii x Bukhoro102)*), exhibited a higher frequency of early-maturing plants compared to the parental forms and other hybrid combinations.

Conclusion

Under naturally wilt-infested conditions, the study evaluated F_2 hybrids and their parental forms derived from local varieties and the ecologically and geographically distant accession (*G. stocksii x Bukhoro102)* for the earliness trait. Based on the variation series for the vegetation period, plants located on the right side of the distribution curve (6th–8th classes), representing relatively late-maturing genotypes, were discarded. In contrast, plants positioned on the left side

of the distribution, with a vegetation period of up to 120 days, were selected as promising early-maturing forms for further breeding work.

Variability Analysis of the Vegetation Period Trait in F_2 Hybrids Involving *Gossypium hirsutum* L. and *Gossypium stocksii*

№	Parental Forms and F_2 Hybrids	K=5 кун.								n	M±m	δ	V%
		96-100	101-105	106-110	111-115	116-120	121-125	126-130	131 135				
1	Barkhayot		1	3	15	21	6	2		48	115,9±2,97	9,39	8,10
2	C-8284	2	5	19	11	6	1			44	110,8±5,24	7,42	6,70
3	C-2610		2	4	20	13	5	3	2	49	116,1±6,50	9,20	7,92
4	C-2612		3	6	18	12	4	2		45	115,9±6,43	9,10	7,85
5	C-2609		4	8	15	7	5	4	3	46	113,5±6,12	8,65	7,62
6	(*G.Stocksii* M x Bukhoro102)	3	6	18	7	5	3			42	110,9±4,05	5,73	5,17
7	F_2 (Barkhayot x C-8284)	1	2	9	22	8	5	1		48	115,0±6,36	8,99	7,82
8	F_2 (C-8284 x Barkhayot)	2	4	11	20	9	3			49	112,2±5,54	7,83	6,98
9	F_2 [Barkhayot x (*G.Stocksii* M x Bukhoro102)]		3	17	13	7	4	2	1	47	111,3±6,16	8,71	7,82
10	F_2 (C-8284 x *G.Stocksii* M x Bukhoro102)	2	5	20	11	6	5	1		50	110,9±5,45	7,71	6,95
11	F_2 (C-2610 x C-2612)		2	5	18	12	7	3	1	48	116,2±5,86	8,30	7,14
12	F_2 (C-2610 x *G.Stocksii* M x Bukhoro102)		3	7	9	15	6	5	1	46	116,0±6,16	8,71	7,51
13	F_2 (C-2612 x *G.Stocksii* M x Bukhoro102)	1	2	5	21	13	4	1		47	115,8±6,28	8,88	7,66
14	F_2 (C-2612 x Бархаёт)		4	9	16	8	5	2	1	45	115,7±6,02	8,51	7,35
15	F_2 (Barkhayot x C-2612)	1	3	5	9	18	8	4		48	117,2±6,25	8,84	7,54
16	F_2 (C-2609 x Бархаёт)		1	3	6	19	13	5	2	49	120,5±6,84	9,67	8,03
17	F_2 (C-2609 x *G.Stocksii* M x Bukhoro102)	1	4	12	21	5	2	1		46	112,4±5,96	8,43	7,50
18	F_2 (Barkhayot x C-2610)		2	2	14	18	7	3	1	47	116,5±6,36	9,00	7,72
19	F_2 (C-2610 x Barkhayot)		3	5	7	19	8	4	1	47	117,2±6,22	8,80	7,51
20	F_2 (C-8284 x C-2612)	2	4	11	20	6	3	2		48	112,3±5,85	8,27	7,36
	St. C-6524			2	5	21	11	4	1	44	120,7±3,73	5,28	4,38

References:

1. Matyoqubova E., Khalikova M., and Akhmedov O. Proceedings of the International Scientific and Practical Symposium on “Achievements, Innovations, Technologies and Development Prospects of Agricultural Science and the Textile Industry”. Tashkent, 2022, pp. 83–86.
2. Rafieva F.U., Ergashev U.I., et al. “Participation and Prospects of Women Scientists in the Scientific and Innovative Development of Solutions to Agricultural Problems”. International Symposium, March 24, 2021, Tashkent, pp. 84–88.

3. Siddiqov A.R. Inheritance of breeding-valuable traits in simple and double hybrids of Gossypium hirsutum L. // Modern Problems of Genetics, Biotechnology and Plant Breeding. Proceedings of the II International Conference of Young Scientists (May 19–23, 2003). Kharkiv, 2003, pp. 85–86.
4. Dospekhov B.A. Methodology of Field Experimentation. Moscow: Agropromizdat, 1985. 351 p..