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## INHERITANCE OF QUANTITATIVE TRAITS IN THE F<sub>1</sub> GENERATION OF COTTON

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### Abstract

In this article, the inheritance of quantitative traits in F<sub>1</sub> hybrid combinations exhibited various patterns, including absence of dominance, intermediate, complete, and over-dominance. The inheritance of the above-mentioned quantitative traits indicated that they possess a polygenic nature.

It has been proven that, in creating varieties resistant to stress factors, early-maturing, and possessing high fiber yield and quality, conducting all stages of the

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breeding process directly under saline soil conditions and considering the origin of varieties during hybridization yields effective results.

**Keywords:** Cotton, precocity, box weight, productivity, fiber yield, weight of 1000 pieces of seeds, fiber quality, micronaire, breeding, seed production, saline soil, line, variety.

### INTRODUCTION

Today, saline soils are found in more than 100 countries worldwide, covering an area of approximately 1 billion hectares. Soil salinization has become a serious problem worldwide, and salinization processes are rapidly increasing in many regions, on both irrigated and non-irrigated lands. The growing problem of soil salinization leads to the annual withdrawal of 0.3 to 1.5 million hectares of land from cultivation and a decrease in productivity of another 20.0 to 46.0 million hectares. Therefore, today the fight against soil salinization, improvement of soil reclamation conditions of irrigated lands, and development of scientifically based measures aimed at sustainable development of agriculture are urgent tasks (www.FAO.org; Berdiyev, 2018).

### RESEARCH METHODS

The experimental field is located on the Shurazak swamp of Mirzachul, developed from the old and close (1.5-3.0 m) to the groundwater level, the mechanical composition of the soil is an average arable layer, the lower layers are light loam, slightly saline irrigated meadow-gray soils located on loess-like sediments. The Shurazak swamp occupies the southwestern part of the second terrace of the Syrdarya.

The research was carried out on the basis of a breeding system adopted in the conditions of moderately saline soils of the Syrdarya scientific experimental station (irrigation scheme 0-1-0).

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The research studied the heredity and variability of some morphobiological and economic traits in combinations of F<sub>1</sub> hybrids. During the research, phenological observations of morphobiological features were carried out in a field experiment on “Methods of conducting field experiments” (2007). According to the obtained data, a mathematical and statistical analysis was carried out using the B.A.Dospikhov (1985) method.

### RESEARCH RESULTS AND DISCUSSION

The investigations conducted have shown that inheritance, variability of morphobiological, agricultural traits in F<sub>1</sub> hybrids obtained by the method of multiester topcross in moderately saline soils, as a result of analysis using genetic and statistical methods and effective selection conducted in moderately saline soils, leads to rapid maturation, yield, fiber yield and quality fibers and other promising hybrid combinations have been created that embody morphoeconomic features.

In hybrids obtained with the participation of various varieties and ridges, it is also important to inherit morphological features, while studies have studied such features as plant height, height of the branches of the crop, the number of branches of the crop and the number of stems on the plant bush, as well as the main morphological features.

In the study, the parental forms involved in inter-varietal crosses were medium-stature cotton varieties. For this trait, the height of the varieties used as parents ranged from 110.8 to 120.4 cm. The variety Syrdarya-1 had an average plant height of 120.4 cm, while the Poly tex Syrdarya cotton variety had the lowest height, measuring 110.8 cm.

In the F<sub>1</sub> hybrid combinations, plant height ranged from 110.0 to 125.1 cm. In the F<sub>1</sub> Gulistan x Syrdarya-1 combination, a negative heterosis effect was observed, while the F<sub>1</sub> Poly tex Syrdarya x Gulistan combination exhibited intermediate

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inheritance. The remaining combinations were found to inherit through overdominance or showed heterosis.

According to Table 1, no sharp differences were observed between the parental forms in terms of the trait “height of the fruiting branch attachment.” In the early-maturing variety Syrdarya-1, this indicator was 6.4 cm, while in the medium-maturing varieties Poly tex Syrdarya and S-5707 it measured 7.2 cm. It can be seen that in the hybrid combinations the average height of the fruiting branch attachment ranged from 6.8 to 7.3 cm. Negative heterosis was observed in the hybrid combinations  $F_1$ Gulistan x Syrdarya -1 ( $hp=-0.6$ ), Syrdarya-1 x Gulistan ( $hp=-0.3$ ), and  $F_1$ Poly tex Syrdarya x Gulistan, while no dominance was detected in the remaining hybrids.

One of the main traits that determine yield is the number of fruiting branches on the plant, and the formation of this trait depends on both environmental conditions and the genotype of the variety. In the study, the parental forms showed fruiting branch numbers ranging from 12.8 (in the variety S-5712) to 12.1 (in the variety Poly tex Syrdarya). In the hybrid combinations, the average number of fruiting branches ranged from 13.1 to 15.2. It was determined that in the hybrid plants, the number of fruiting branches is inherited with the superiority of the parental genotypes, along with the manifestation of heterosis.

The parental forms involved in inter-varietal hybridization differed from one another in terms of the number of bolls per plant. The average values of the parental forms ranged from 16.4 to 18.1 bolls, and all hybrid combinations exhibited positive heterosis in the inheritance of this trait.

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**Table 1 Inheritance of morphobiological traits in the F<sub>1</sub> generation**

T/p	Name of combinations	Plant height		Fruiting branch position		Number of fruiting branches		Number of bolls per plant	
		sm	hp	(hs)	hp	pcs	hp	pcs	hp
1	Gulistan	115,4	-	7,1	-	12,7	-	18,1	-
2	Poly tex Syrdarya	110,8	-	7,2	-	12,1	-	17,5	-
3	Syrdarya -1	120,4	-	6,4	-	12,4	-	16,4	-
4	S-5707	114,4	-	7,2	-	12,8	-	17,4	-
5	Gulistan x C-5707	116,0	2,2	7,0	0	13,1	4,0	20,1	6,0
6	S-5707 x Gulistan	110,0	9,8	7,3	0	15,2	25,0	19,7	5,0
7	Gulistan x Syrdarya -1	110,0	-3,1	6,9	-0,6	13,2	3,5	20,4	3,5
8	Syrdarya x Гулистон	125,1	2,8	6,8	-0,3	13,8	4,3	22,1	5,4
9	Gulistan x Poly tex Syrdarya	125,1	5,2	7,3	0	13,5	3,6	20,3	8,3
10	Poly tex Syrdarya x Gulistan	120,2	0,9	7,0	-1,0	14,1	4,6	24,1	9,2

In the F<sub>1</sub> hybrid combinations, inheritance was identified for valuable agronomic traits such as days to emergence and flowering, vegetation period, single boll cotton weight, productivity, fiber yield, fiber length, and 1000-seed weight.

In the study, the emergence–flowering period varied among the parental forms, ranging from 56 to 62 days. The earliest flowering was observed in the early-maturing cotton variety Syrdarya-1, while in the medium-maturing variety Gulistan this period was found to be 62.0 days. For this trait, the F<sub>1</sub> hybrid combinations exhibited different modes of inheritance. Among the six hybrids presented in Table 2, two combinations showed negative inheritance.

In the studied parental forms, the average vegetation period ranged from 110.4 to 122.0 days. It was determined that the medium-maturing cotton variety Gulistan had a vegetation period of 122.0 days, while the early-maturing variety Syrdarya-1 had a period of 110.4 days, demonstrating its earlier maturation compared to the other varieties.

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For this indicator, the  $F_1$  hybrid combinations ranged from 115.5 to 122.5 days. It was observed that in three of the  $F_1$  combinations the inheritance of the vegetation period showed an intermediate pattern, while in the other three combinations negative heterosis was identified.

Regarding single boll weight, among the parental forms the largest bolls were found in the Gulistan variety, with 6.9 grams, while the Syrdarya-1 variety showed a slightly lower value of 6.4 grams. In the  $F_1$  hybrid combinations, the single boll cotton weight ranged from 5.5 to 7.5 grams, exhibiting various modes of inheritance. For this trait, only the hybrid combination  $F_1$  Poly tex Syrdarya x Gulistan ( $hp = 4.0$ ) demonstrated overdominance or heterosis, while the remaining hybrids showed negative dominance in their inheritance.

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In the parental forms, the yield trait ranged from 106.6 g to 124.8 g, while in the  $F_1$  hybrids it ranged from 111.6 g to 149.2 g. This trait also showed variation: among the six hybrid combinations, four exhibited overdominance, one displayed intermediate inheritance, and one hybrid showed negative inheritance.

The fiber yield trait in the parental forms ranged from 36.5% to 38.5%, with the highest value observed in the Gulistan variety (38.5%) and the lowest in the Syrdarya-1 variety (36.5%). In the  $F_1$  hybrids, fiber yield varied from 35.3% to

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39.7%. For this trait, only the F<sub>1</sub>Gulistan x S-5707 hybrid combination exhibited negative dominance (hp=-5.4). The remaining combinations showed intermediate inheritance or heterosis.

According to Table 2, the fiber length of the parental forms involved in hybridization ranged from 35.1 mm to 37.0 mm, while in the hybrids it ranged from 36.5 mm to 38.4 mm. In the hybrid combination F<sub>1</sub> Syrdarya-1 x Gulistan (hp=0), no dominance was observed; in F<sub>1</sub>S-5707 x Gulistan (hp=0.2), intermediate dominance was recorded; and in the remaining hybrids, full or overdominance was identified.

For the 1000-seed weight trait, the lowest value among the parental forms was observed in the variety Syrdarya-1 at 126.6 g, while the highest was recorded in the variety Gulistan at 131.1 g, with the other varieties falling between these two. In the F<sub>1</sub> hybrids, this trait ranged from 125.2 g to 138.2 g. Inheritance for this indicator also varied: among the six hybrids, two exhibited intermediate inheritance, two showed negative inheritance, and two demonstrated overdominance

**Table 2 Inheritance of selected valuable agronomic traits in F<sub>1</sub> hybrid combinations**

№	Combination name	Flowering		Vegetation period		One boll weight		Productivity		Fiber output		Fiber length		1000 seed weight	
		day	hp	day	hp	g	hp	g	hp	%	hp	mm	hp	g	hp
1	Gulistan	62,0	-	122,0	-	6,9	-	124,8	-	38,5	-	37,0	-	131,1	-
2	Poly tex Syrdarya	61,0	-	120,1	-	6,8	-	119,0	-	37,0	-	36,1	-	128,2	-
3	Syrdarya -1	56,0	-	110,4	-	6,5	-	106,6	-	36,5	-	35,2	-	126,6	-
4	S-5707	60,0	-	120,4	-	6,7	-	116,5	-	37,6	-	35,1	-	129,2	-
7	Gulistan x C-5707	60,0	-1,0	121,4	-0,2	6,6	-2,0	132,6	2,8	35,3	-5,4	37,5	1,0	129,9	-0,2
	S-5707 x Gulistan	60,0	1,0	122,5	-1,6	6,1	-7,0	120,1	0,5	39,7	3,4	37,8	0,2	124,5	1,0
8	Gulistan x Syrdarya -1	59,0	0	115,5	0,1	6,4	-1,5	130,5	5,7	38,1	0,6	37,8	1,8	130,0	0,5
	Syrdarya x Гулистан	58,0	0,3	115,8	0,06	6,1	-3,0	134,8	2,0	38,5	1,0	36,1	0	125,2	-1,5
9	Gulistan x Poly tex Syrdarya	60,0	3,0	121,0	0,05	5,5	-13,0	111,6	-3,5	38,3	0,7	38,4	2,5	130,5	0,6
10	Poly tex Syrdarya x Gulistan	59,0	-0,2	116,5	-0,2	7,5	4,5	149,2	5,8	37,1	1,3	36,5	1,8	138,2	13,5



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### CONCLUSIONS

It has been demonstrated that, in creating varieties that are resistant to stress factors, early-maturing, and possess high fiber yield and quality, conducting all stages of the breeding process directly under saline soil conditions and paying close attention to the origin of varieties used in hybridization leads to more effective results.

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