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INHERITANCE OF MORPHOLOGICAL CHARACTERS IN F_1, F_2, F_1B_1 PLANTS OBTAINED FROM HYBRIDIZATION OF SOME POLYMORPHIC SPECIES CORRESPONDING TO THE SECTION *MAGNIBRACTEOLATA*

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ABSTRACT
In this article the analyzed F_1 plants of hybrid combinations studied on inheritance of fiber color, in interspecific F_1 subsp. paniculatum x subsp.ruderale f.parnat (tan fiber) combination, an intermediate, i.e light tan color fiber was observed, while in F_2-plants 1:2:1 ratio was noted by fiber color. In studied reciprocal F_1, subsp. paniculatum x subsp.ruderale f.parnat (tan fiber) hybrid plants, analogical results were noted. F_2 plants, a separation was observed in terms of day length requirement at a ratio of 15:1, the plants of the 15th part were observed as long-day non-demanding plants, and in the 1st part the plants were long-day demaning. In hybrid plants where such a separation rate was studied, it was also found that the polymer genes were inherited under the non-cumulative effect.
KEYWORDS: *cotton, fiber color, morphological traits, dominant, wild, semi-wild, subspecies, photoperiod, demanding plants, not demanding plants.*

It is known that the fiber color of the cotton can be white, tan, light tan, reddish brown, golden, green, light pink, bluish-green, dark brown. Several scientists have conducted research on this character [4; 7; 8]. While one group of scientists reported that the fiber color marker is inherited monogenically, others noted that it is inherited polygenically.

B.Kh Amanov [1] conducted research on the inheritance of morphological traits of cotton. *G.barbadense* L., selected as the primary source, was observed to be in tan color by semi-wild *f.pisco* mark, while cultural Karshi-8 variety was observed to be in white color. In F_1 Karshi-8 x f.*pisco* reciprocal combinations from F_1 plants, the color was intermediate, i.e in light tan color. Of the 214 plants of the analyzed F_2 Karshi-8 x *f.pisco* combination, 104 were light tan colored fibers, 54 were tan, and 56 were white fibers. Inheritance by fiber color was 1:2:1 (x^2= 0.71, 0.95> R> 0.80), with incomplete dominant, monogenic inheritance.

In the researches of H.A.Muminov [3] determined in his research that in terms of fiber color, this trait was intermediate, i.e in light tan color in F_1f.*sanguineum* x var.

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Table-1
Inheritance of initial sources and interspecific F_1, F_2, F_1B_1-plants by their fiber color

№	Initial sources and and F_1, F_2, F_1B_1 combinations	Number of studied plants, pcs	white		tan		light tan		ratio	X^2	P
			Pcs	%	pcs	%	pcs	%			
	Initial sources										
	subsp. *paniculatum*	5	5	100,0	-	-	0,0				
	subsp.ruderale f.*parnat* (brown fiber)	5	-	-	5	100,0	0,0				
	«Kelajak» variety	5	5	100,0	-	0,0	0,0				
	F_1-plants										
	subsp. *paniculatum* x subsp.*ruderale* f.*parnat* (brown fiber)	10	-	-	-	-	10	100,0			
	subsp.ruderale f.*parnat* x subsp. *paniculatum*	10	-	-	-	-	10	100,0			
	«Kelajak» variety x subsp.ruderale f.*parnat* (brown fiber)	10	-	-	-	-	10	100,0			
	subsp.ruderale f.*parnat* (brown fiber) x «Kelajak» variety	10	-	-	-	-	10	100,0			
	F_2-plants										
	subsp. *paniculatum* x subsp.ruderale f.*parnat* (brown fiber)	200	48	24,0	46	23,0	106	53,0	1:2:1	0,76	0,80-0,50
	subsp.ruderale f.*parnat* x subsp. *paniculatum*	195	46	23,6	60	30,8	89	45,6	1:2:1	6,26	0,05-0,01
	«Kelajak» variety x subsp.*ruderale* f.*parnat* (brown fiber)	215	63	29,3	49	22,8	103	47,9	1:2:1	1,345	0,80-0,50
	subsp.ruderale f. *parnat* x «Kelajak» variety	220	53	24,1	62	28,2	105	47,7	1:2:1	1,19	0,80-0,50
	F_1B_1-plants										
	(subsp.*paniculatum* x subsp.*ruderale* f.*parnat* (brown fiber) x subsp. *paniculatum*	30	30	100,0	-	-	-	-	1:0		
	(subsp. *paniculatum* x subsp.ruderale f.*parnat* (brown fiber)) x subsp.ruderale f.*parnat* (brown fiber)	30	-	-	30	100,0	-	-	1:0		
	(Kelajak x subsp.*ruderale* (brown fiber) x Kelajak	30	30	100,0	-	-	-	-	1:0		
	(subsp.*ruderale* f.*parnat* (brown fiber) x Kelajak) x subsp.*ruderale* f. f.*parnat* (brown fiber)	30	-	-	30	100,0	-	-	1:0		

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nanking plants obtained on the basis of hybridization of tropical f.*harga* (white fiber) and wild subsp.*nanking* (tan fiber) intraspecific forms of *G.arboreum* L. In F_2 plants, the trait is inherited in a 1:2:1 ratio and divided into 3 phenological classes, i.e., some hybrid plants have tan fiber, some have light tan, and some plants have white fibers. The results of the study showed that this trait is inherited in an incompletely dominant monogenic type.

Intraspecific diversity of the primary sources *G.hirsutum* L. and *G.barbadense* L. on which research were conducted on the inheritance of morphological traits of cotton, i.e., fiber color trait of subsp.ruderale f.*parnat* (tan fiber) was found to be in tan color, while subsp. *paniculatum* subspecies and cultural “Kelajak” variety was in white color. In the interspecific F_1 "Kelajak" variety x subsp.ruderale *f.parnat* (tan fiber) reciprocal combinations from the analyzed F_1 plants, the trait manifested an intermediate, i.e light tan color. Out of 215 plants of interspecific F_2 "Kelajak" variety x subsp.ruderale f.paranat (tan fiber) combination, 103 had (48,9 %) light tan color, 49 had (22,8 %) tan color, 63 had (29,3 %) white color fiber. In plants of this combination, the ratio of fiber color inheritance was 1:2:1 (x^2= 1,345, 0.80> R> 0.50), and in plants of the above hybrid combination, fiber color inheritance was incompletely dominant, monogenic inheritance was observed (Table 1).

From F_1 plants of hybrid combinations studied on inheritance of fiber color, in interspecific F_1 subsp. *paniculatum* x subsp.*ruderale* f.*parnat* (tan fiber) combination, an intermediate, i.e light tan color fiber was observed, while in F_2-plants 1:2:1 ratio was noted by fiber color. In studied reciprocal F_1, subsp. *paniculatum* x subsp.*ruderale* f.*parnat* (tan fiber) hybrid plants, analogical results were noted.

The results obtained in the analyzed F_1B_1 hybrid generations (Table 1) are further confirmed by the data presented in the literature. That is, according to B.Kh.Amanov [2019], N.G.Simongulyan, U.Kh.Mukhamedkhanov [1973], the fiber color trait is controlled by three pairs of genes, two of which are primary complementary genes and one is an additional gene that enhances their effects.

The evolution of photoperiodism in plants is inextricably linked with the moving of cotton to tropical regions for early ripening, to the northern regions with naturally long days (photoperiod). Due to the polymorphism of the initial day length requirement in cotton, various mutations and natural and artificial selections resulted in the formation of forms with low sensitivity to day length, precocious and almost neutral to day length [5]. In particular, the use of wild species, intraspecific diversities and forms of cotton in genetic and selection research has attracted the attention of local scientists in the analysis of the inheritance of traits such as typical morphobiological traits of species, i.e, their requirement for length of the day, their fiber color, anthocyanin spot on the petals, branching type, hair color, hairlessness, lack of fiber and chlorophyll, male infertility features, and there is little research in this area [2].

B.Kh. Amanov [2] analyzed the inheritance of photoperiodic reaction of intra- and interspecific F_2 plants obtained on the basis of hybridization of wild *G.barbadense* L. species and wild *G.darwinii Watt* species. For example, when analyzing F_2Ash-8 x f.*brasiliense* reciprocal hybrid combinations, 196 out of 207 hybrids (hs = 4-15) were neutral for long-day, 11 (hs = 15-20 and above) required photoperiod, and photoperiodic reaction was observed to be inherited under the non-cumulative effect of polymer genes in a 15: 1 ratio.

In the research of F.U.Rafieva [4], *G.mustelinum* x “Beshqahramon” hybrid combinations obtained on the basis of interspecific hybridization of tetraploid cotton species showed a wide range of variability in long-day conditions in F_2 hybrids according to analysis of the inheritance of the trait of requirement for day length. The inheritance of 15:1 ratio of the studied trait determined that the polymer genes were controlled by the nocumulative effect.

Inheritance of the trait of requirement for day length in F_2 plants obtained by hybridization of intraspecific *G. hirsutum* L. and *G. barbadense* L. diversities and wild *G.darwinii* species was analyzed. *G.hirsutum* L. subs.*mexicanum* var.*nervosum*, *G.hirsutum* L. subs.*paniculatum, G.barbadense* L. subs. *ruderale* f.*parnat* forms and *G.darwinii* species which were selected as initial source were found to require day length, their first yielding branches appeared at the 15-28 nodes on the long day, while on short day at 3-9 nodes. *G.hirsutum* L. and *G.barbadense* L. intraspecific diversities and *G.darwinii* species demand the day length, the first fruiting branches locate at 23-30 nodes on the long day (13-15 hours), while in the artificial short day (10 hours) they locate at 9-10 nodes (Table 2).

Interspecific F_1, F_2f.*parnat* x Kelajak combination was analyzed. The studied F_1 plants were able to easily form buds, flower, to form bolls and ripen on the long day, while the F_2 generation plants were found to be widely variable on long day conditions. The variability of the first fruiting branch (hs) was determined at 4-5, at 25 and in the upper nodes. Of the 185 hybrids of F_1 plants, 173 (hs = 4-15) were neutral for long-day and 12 (hs = 15-25 and above) were long-day-demanding plants.

The results of the genetic analysis performed showed that the results obtained in practice were determined close to the expected theoretical parameters. The inheritance of the trait of the requirement for long day at 15:1 ratio was found to be controlled by the non-cumulative effect of polymer genes, the demand of the semi-wild f.*parnat* form for the photoperiod was noted in the literature, [2; 7] neutral reaction for the long-day with 3 recessive genes ph_1, ph_2, ph_3, shows that it is controlled by two dominant genes, Ph_1, Ph_2, and one recessive ph_3 gene. In this case the results were between χ^2=0,017, P=0,80-0,50.

When F_2 *G.darwinii* x Kelajak combination was analyzed, 189 out of 202 hybrid plants (hs = 4-15) were identified as not demanding a long day, 13 (hs = 15-25 and above) were identified as long day demanding-plant, and the demanding reaction to the length of the day was found to be inherited at 15:1 ratio under the cumulative effect of polymer genes.

Of 35 plants of F_1B_1 *(*f.*parnat* x Kelajak*)* x f.*parnat* backcross combination, 16 were found as long day demanding plants (45,7 %), 19 were (54,3 %) found as long day not demanding plants, the inheritance of this trait was noted at 1:1 (x^2=0,257, 0,95>P>0,80) ratio.

In this hybrid combination, 1 group plants were found as long day demanding, 1 group as long day not demanding plants. In addition, out of 30 plants of F_1B_1 (Kelajak x *G.darwinii*) x Kelajak backcross combination, 30 (100%) long-day non-demanding plants were observed and the inheritance of the day length demanding trait was at 1:0 ratio.

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Table-2

The inheritance of interspecific F_1, F_2, F_1B_1-plants according to photoperiod-demanding trait

№	Initial sources and F_1, F_2, F_1B_1 hybrid combinations	Number of studied plants, pcs	photoperiod				ratio	X^2	P
			demanding plants, number		not demanding plants, number				
			pcs	%	pcs	%			
Initial sources									
1	*G.hirsutum* L. subs.*mexicanum* var.*nervosum*	10	10	100,0	-	-			
2	*G.hirsutum* L. subs. *paniculatum*	10	-	-	10	100,0			
3	*G.hirsutum* L. subs.*euhirsutum* "Kelajak" variety	10	-	-	10	100,0			
4	*G.barbadense* L. subs. *ruderale* f.*parnat* (brown fiber)	10	10	100,0	-	-			
5	*G.barbadense* L. subs. *eubarbadense* (Surkhan-9)	10	-	-	10	100,0			
6	*G.darwinii* Watt	10	10	-	-	-			
F_1-plants									
1	f.*parnat* x "Kelajak"	10	-	-	10	100,0			
2	"Kelajak" x f.*parnat*	10	-	-	10	100,0			
3	*G.darwinii* x "Kelajak"	10	-	-	10	100,0			
4	Kelajak x *G.darwinii*	10	-	-	10	100,0			
F_2-plants									
1	f.*parnat* x "Kelajak"	185	12	6,5	173	93,5	1:15	0,017	0,80-0,50
2	"Kelajak" x f.*parnat*	190	14	7,3	176	92,6	1:15	0,405	0,80-0,50
3	*G.darwinii* x "Kelajak"	202	13	6,5	189	93,5	1:15	0,95	0,50-0,20
4	"Kelajak" x *G.darwinii*	195	11	5,6	184	94,3	1:15	0,12	0,80-0,50
F_1B_1-plants									
1	(f.*parnat* x "Kelajak") x f.*parnat*	35	16	45,7	19	54,3	1:1	0,257	0,95-0,80
3	("Kelajak" x f.*parnat*) x "Kelajak"	16	-	-	16	100,0	1:0	-	-
4	(*G.darwinii* x "Kelajak") x *G.darwinii*	30	14	46,7	16	53,3	1:1	0,133	0,95-0,80
5	("Kelajak" x *G.darwinii*) x "Kelajak"	30	-	-	30	100,0	1:0	-	-

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The analysis of the initial studies showed that the complete dominance of long-day non-demanding plants in F_1-plants was observed in the interspecific species f.*parnat* x Kelajak, *G.darwinii* x Kelajak combinations which were studied on the inheritance of the trait of demand for day length. Consequently, in the analyzed F_2 plants, a separation was observed in terms of day length requirement at a ratio of 15:1, the plants of the15th part were observed as long-day non-demanding plants, and in the 1st part the plants were long-day demaning. In hybrid plants where such a separation rate was studied, it was also found that the polymer genes were inherited under the non-cumulative effect.

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