THE CHANGE OF GROWTH PROCEDURE OF COTTON PLANT IN ORDINARY QUADROON OF COTTON AS A RESULT OF INTEREFFECT OF G. *HIRSUTUM* L. IN^{L}-IN^{L}, O_{L}-O_{L}, O_{L}^{S}-O_{L} AND S-S GENES

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Abstract: The article analyzes the growth procedure of the stem as a result of the interaeffect of the genes controlling the leaf shape In^{l}-in^{l}, O_{l}-o_{l}, O_{l}^{s}-o_{l} *and S-s allele genes controlling the harvest branches of the G. hirsutum L. species of the cotton plant from genetic point of view. Growing procedure of the new determinant type were hybridized in different combinations, the observations were made on the growth type in plants* F_{1}, F_{2}, F_{b}, *and their results are discussed.*

Keywords: Gen, hybrid, indeterminate, determinant, phenotype, genotype, backcross, allele, dominant, recessive.

Introduction. The production of cultural types of cotton provides the fiber for the textile industry which is the important branch of modern. Cotton is a perennial plant, but it is grown as an annual plant. Although the cotton plant is planted for the fluffy fiber covering its seed, each organ of the cotton plant performs a specific function in its growth period

It is necessary to pay attention to the compatibility of the elements of the root structure of intensive varieties and the level of growth of cotton plant in cotton industry development. In particular, the type of growth of the main stem, types of cipmodial branching and subspecies, the structure and function of the leaf shape are important. [1. p. 11-13, 2. p. 48, 3. p. 141, 4. p. 3, 5. p. 11-12, 6. p. 267]

One of the most pressing issues of today is the production of low-growing varieties with stable growth characteristics, adapted to intensive planting.

The height of the stalk of the cotton plant is a quantitative sign and reflects the polygenic nature of heredity. [7. p. 323, 8. p. 260, 9. p. 144, 10. p. 49-52]

Depending on the type of cotton plant, the height of the stalk is 0.5-3.0 m, in one- and two-year-old herbaceous species it is about 1-2 m in height with well-branched stalk. [11]

According to a number of authors, the studies on the height characteristics of the main stalk of the cotton plant show intermediate heredity in first-generation hybrids [12. p. 94-99, 13. p. 45].

According to D.A. Mukhamedjanov's [14. p. 78-81], the stunting occurs in the plant due to the shortening of the joint length. Also in stunted forms, such as the height of the first crop branch, its leaf shape and size, fiber yield, cotton weight in a single stalk, do not differ sharply from the previous forms of it.

In the next generation of stunted M2s (M3), a separation is observed in normal and stunted forms along the plant height. The formation of intermediate forms is not observed. In most groups, the separation rate was about 1: 1. This is evident during the flowering phase [14. B. 78-81, 15. B. 21].

The genetic mechanisms and specificity of genetic collections that cause stunting in cotton plants in the presence of inbred ridges in the plant stem., have been studied by under the leadership M.F. Abzalov, the research was conducted at the Laboratory of Private Genetics and Problems of Cotton Plants at Tashkent State University. As a result of long term research, a number of mechanisms for obtaining stunted plant ridges have been developed, and their results are reflected in the work of laboratory staff [16. p. 568, 17. b. 110-119, 18. p. 102-105, 19. p. 145-146, 20. p. 170-176, 21. p. 3].

M.F.Abzalov and Z.R. Hayitova [21. B. 3, 3. b. 141, 22. b. 27-91] reported that the In^l gene had a positive effect on real leaf formation, plant growth, and lateral branch formation up to the detruncating phase.

G.N. in her experiments, G.N. Fatkhullaeva showed that the structure of the leaf shape is controlled by the In^l gene. The intereffect of the allele genes O_l-o_l and

In^l in the dominant homozygous state, which provide the leaf shape, has adversely shown affect to to the plant growth [23. p. 71-85].

Genetic analysis of the leaf forms of the cotton plant, the In^l mutant gene controlling the leaf forms, inhibits the activity of the O_l^s, O_l, o_l alleles in the leaf form in the dominant homozygous state provides whole round leaf for $In^lIn^lo_lo_l$, whole egg-shaped leaf for $In^lIn^lO_l$-, $In^lIn^lO_l^s$ and whole lanceolate leaf for $In^lIn^lO_l^sO_l^s$. [24. p. 10-13].

The presence of a restricted or unrestricted type of fruiting branches is a hereditary trait and is controlled by S-s allele genes. In the recessive homozygous (ss) case, the formed (sympodial) branches are limited in terms of phenotypic appearance, and the formed branches show an unrestricted type of phenotypic appearance in the SS, Ss genotype, [18. p.164]

U.K. Najmimov stated that in experiments with the low-lying (fascia) L-501 ridge, plant growth control was regulated by two or more genes in addition to the In^l gene, and that tall forms were not observed in plants with a single leaf shape [25. p. 138-145].

Materials and Methods

The research was carried out in the experimental field of the Institute of Genetics and Experimental Biology of the Uzbekistan Academy of Sciences in 2012-2016 in the framework of the fundamental project number F5-T027. During the experiments, the determinant growth type of the cotton plant with uniform leaf shape and limited number of branches such as, the determinant species of cotton stalk as "Determinant-1", "Determinant-2", "Determinant-3", "Determinant-4" and the ridges with the indeterminate appearance by growth as Gulbahor ", "Namangan -77 ", " Omad ", " Ishonch " varieties, as well as F1, F2 plants obtained by simple hybridization of 'Omad x Determinant-1', 'Gulbahor x Determinant-3', 'Namangan-77 x Determinant-4' and 'Ishonch x Determinant-2' combinations and their hybrids were studied as the research object.

Dospekhov's method χ^2 was used to analyse the practical and theoretical ratios of the species growth inheritance in hybrid plants F1, F2, Fb, and Fisher's table to determine the probability number (P) in it. [26. p. 201, 27. b. 134].

Research results and their analysis. We analyzed F_1, F_2, F_b plants with five indented indeterminate cotton varieties and whole leaf-shaped (lanceolate, round, ovoid), cross-hybridized 0-type determinant ridges during the experiment (Table 1).

Table 1

Inheritance of growth type in simple hybrid plants F_1, F_2, F_b of G. *hirsutum* L. variety of cotton

	The object of research		Growth ratio		Theoretical ratio	χ	*P*
			Indeterminant	Determinant			
	Omad	1	2				
	F_1(Omad x Determinant-1)	7	7				
	F_2(Omad x Determinant-1)	46	37		15:1	0.002	0.98-0.95
	F_b(Omad x Determinant-1) x Determinant-1	9	5	4	3:1	0.051	0.95-0.90
	Determinant-1	6		6			
	Gulbahor	1	1				
	F_1(Gulbahor x Determinant-3)	6	6				

	F_2(Gulbahor x Determinant-3)	5	7		1 5:1	0 .764	0.80 -0.70
	F_b (Gulbahor x Determinant-3 x Determinant-3	8	1	7	3 :1	0 .427	0.70 -0.50
0	Determinant 3	7		7			
1	Namangan-77	1	1				
2	F_1(Namangan-77 x Determinant-4)	5	5				
3	F_2(Namangan-77 x Determinant-4)	18	11		1 5:1	0 .02	0.90 -0.80
4	F_b(Namangan-77 x Determinant-4) x Determinant-4	4	7	7	3 :1	0 .083	0.60 -0.70
5	Determinant-4	0		0			
6	Ishonch	1	1				
7	F_1(Ishonch x Deterinant-2)	7	7				
8	F_2(Ishonch x Determinant-2)	9	5		1 5:1	0 .306	0.70 -0.50
9	F_b(Ishonch x Determinant-2) x Determinant-2	4	2	2	3 :1	0 .222	0.70 -0.50
0	Determinant-2	3		3			

Our observations indicated that the phenotypic homogeneity in all F_1 plants obtained by hybridization of the combinations Omad x Determinant-1, Gulbahor x Determinant-3, Namangan-77 x Determinant-4 and Ishonch x Determinant-2.

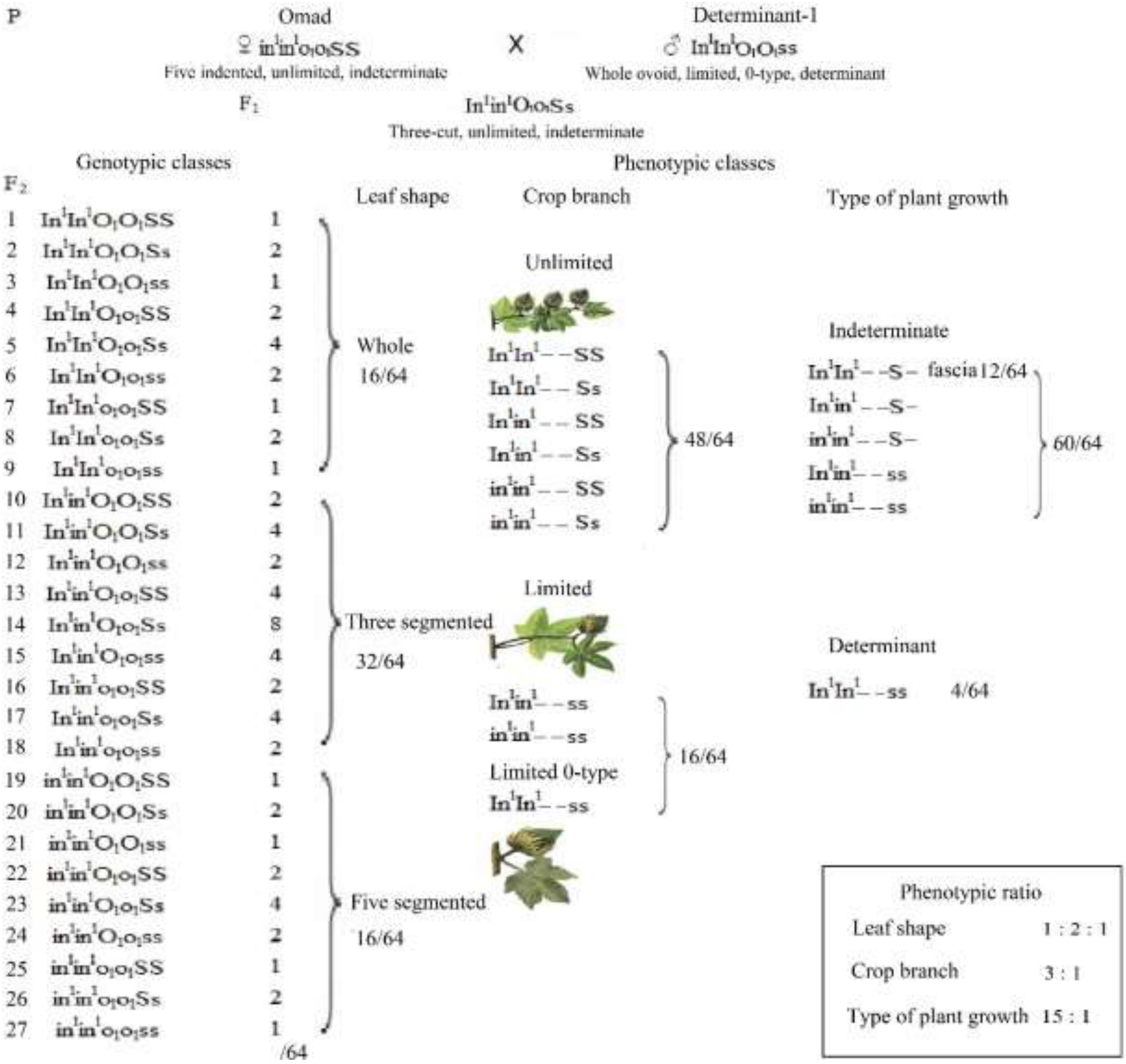

Figure 1. Omad x Determinant-1 Inheritance of combinations in F_1 and F_2 generations

In the combinations of F_1 Omad x Determinant-1 and Gulbahor x Determinant-3, plant hybrids of leaf-shaped three-segmented (three-cut In^{l}in^{l}O$_l^s$o$_l$Ss, In^{l}in^{l}O$_l$o$_l$Ss), unstructured type of crop structure, growth-type indeterminant-shaped plant hybrids were formed. In the combinations F_1 Namangan-77 x Determinant-4 and Ishonch x Determinant-2, plant hybrids of leaf-shaped three-segmented (three-lobed In^{l}in^{l}o$_l$o$_l$Ss), unlimited type of branch structure, growth-type indeterminant-shaped hybrid plant were formed.

The differenciation was observed in plants formed in F_2 when the obtained hybrid plants were re-hybridized for each other in combination. The plants formed in the first Omad x Determinant-1 combination were divided into 27 genotypic classes and the genotypic ratio was 1:2:1:2:4:2:1:2:1:2:4:2:4:8:4:2:4:2:1:2:1: :2:4:2:1:2:1.

Phenotypically, there was a division into 3 classes according to the shape of the leaves, 2 according to the stalk, and 2 according to the type of growth of the plant. Theoretically, the ratio was 1:2:1 on the shape of the leaf, and 3:1 on the structure of the stalk (Fig. 1).

Of the 146 plants observed, 137 were indeterminate-type unlimited branch structure, and 9 were determinate-type with limited number of branches. In the structure of the plant growth type, the theoretical ratio was 15:1, χ^2 - 0.002, and P - 0.98-0.95. Here, characterization occurred as a result of the effect of the In^l-in^l mutant gene on alleles of the O_l-o_l genes that provide plant leaf shape and the S-s genes that provide the crop branch. In 16/64 plants, growth was halted in two phenotypic appearances, 12/64 of which were formed by fascia and 4/64 by determinant types.

The second combination, in the combination of Gulbahor x Determinant-3 the same picture was observed. As a result of hybridization, the plants formed in F_2 were divided into 27 genotypic classes and genotypically in 1:2:1:2:4:2:1:2:1:2:4:2:4:8:4:2:4:2:1:2:1:2:4:2:1:2:1 ratio. Phenotypically, there were 3 phenotypic classes according to leaf shape, 2 according to the stalk, and 2 according to the type of growth of the plant. It showed a 1:2:1 ratio on the leaf shape and a 3:1 ratio on the crop branches. Of the 95 plants observed in the experiment, 87 had an indeterminate, unrestricted number of branches, 8 had a determinant, number restricted 0-type phenotypic appearance. The theoretical ratio for the structure of the plant growth type was 15:1, the χ^2 index was 0.764, and the R - 0.80-0.70. Here, too, a difference occurs as a result of the interaction of three gene alleles, i.e., the effect of the In^l mutant gene on the O_l^s- leaf-forming gene and the S gene, which provides the crop branch.

In the third Namangan-77 x Determinant-4 combination, a phenotypic differenciation was observed in F_2. Of the 118 plants obtained, 111 were of the indeterminate type, with an unlimited number of deciduous branches, and 7 were of the 0-type, determinant type with limited branches. The theoretical ratio was 15:1 with χ^2 0.02 and R was 0.90-0.80.

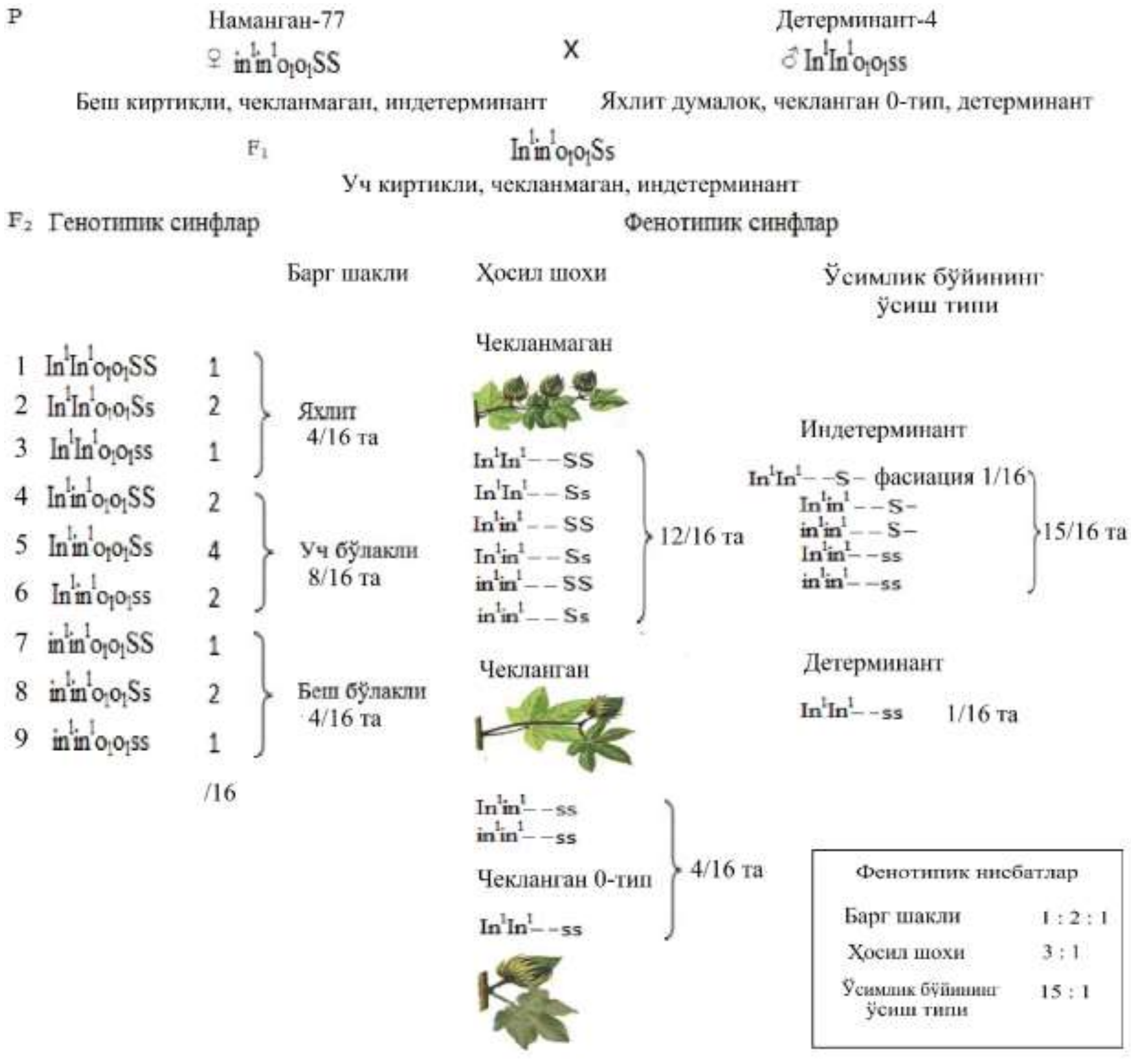

Figure 2. Inheritance of Namangan-77 x Determinant-4 combinations in F_1 and F_2 generations

In this combination, 9 classes were genotypically formed and the ratio was 1:2:1:2:4:2:1:2:1. The plant was divided into 3 phenotypic classes according to the structure of the leaf shape, forming plants with a single, three-lobed and five-lobed leaf shape, the ratio of which was phenotypically 1:2:1. The phenotypic ratio was

3:1 as a result of the formation of 2 classes on the structure of the crop branch. Differenciation into 2 phenotypic classes according to plant growth type was observed and showed a 15:1 ratio (Fig. 2).

In the last fourth Ishonch x Determinant-2 combination, 9 hybrids of 1:2:1:2:4:2:1:2:1 ratio were formed in F_2 plants. The plant was divided into 3 phenotypic classes according to the structure of the leaf shape, forming plants with a single, three-lobed and five-lobed leaf shape, the ratio of which was phenotypically 1:2:1. The ratio of plants with a phenotypically unrestricted and limited type of crop branch was 3:1. The plant was divided into 2 phenotypic classes according to the type of growth. Of the 49 plants observed, 45 were indeterminate-type, with unrestricted number of branches, and 4 plants were determinant-type, with 0-type restricted branches. Phenotypically, the theoretical ratio was 15:1, χ^2 0.306, and P – 0.70-0.50.

We can see that in all hybrids formed by F2 in the last two combinations of Namangan-77 x Determinant-4 and Confidence x Determinant-2, the o_l gene that provides the leaf form is in a recessive homozygous (o_lo_l) state. However, there is a differenciation into three different (monolithic, three-lobed, five-lobed) phenotypic classes in plants by leaf shape,. This is due to the effect of the In^l mutant gene on the dominant homozygous (In^lIn^l), heterozygous (In^l in^l) and recessive homozygous (in^lin^l) genes for the o_lo_l allele. The effect of In^l-in^l mutant genes on S-s alleles results in the formation of two types of phenotypic appearances of the crop branches, with unrestricted and restricted types.

It can also be seen from the data in Table 1 that when backcross hybridization was performed in all of the above combinations, the same 3:1 feature was observed in all of the resulting plants.

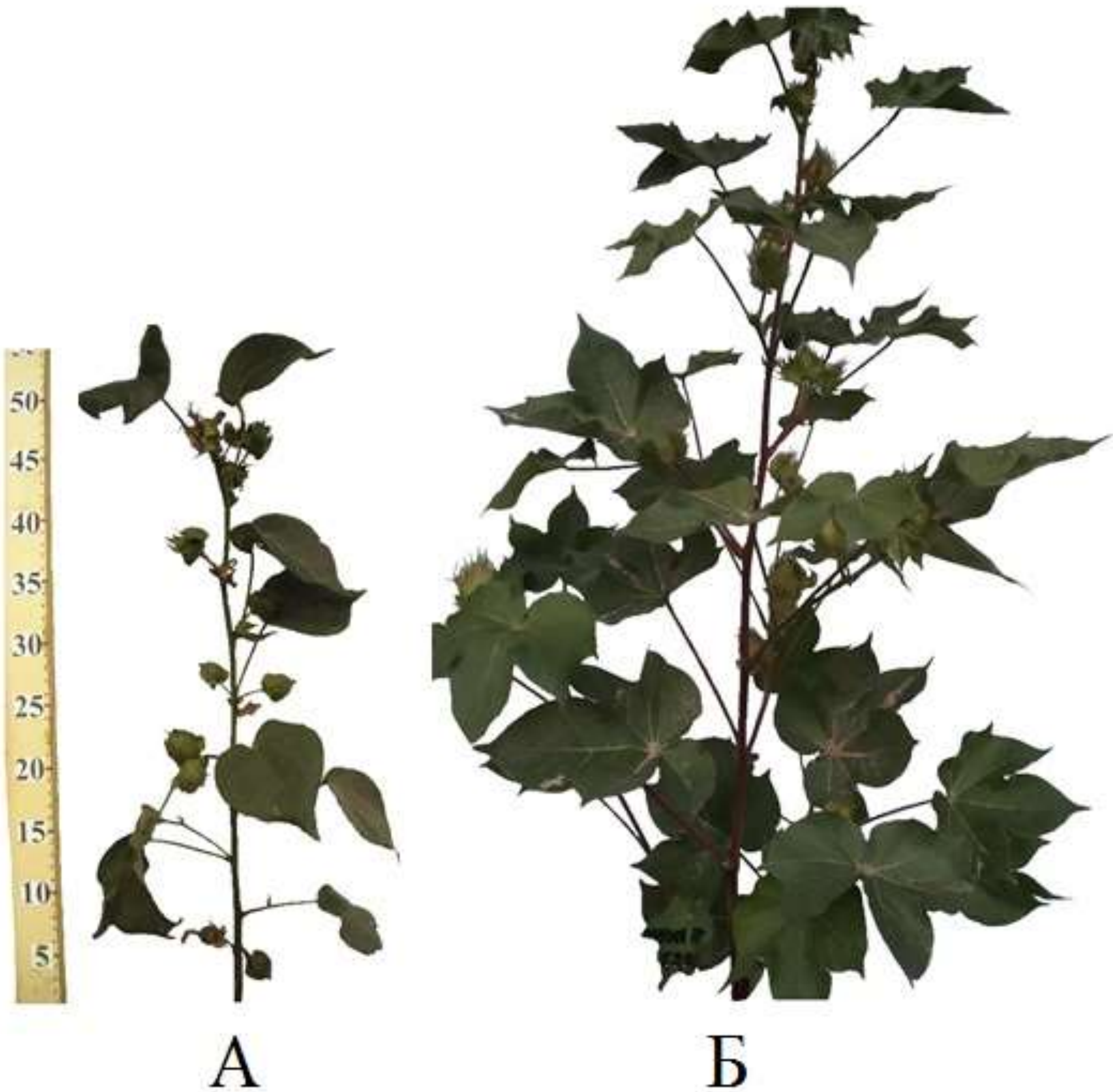

Figure 3. A - Determinant-2 variety of cotton plant growing in determinant type. B - Namangan-77 variety of cotton plant growing in indeterminate type

The intereffect of nonallel ноаллел In^l-in^l and O_l^s, O_l, o_l genes in the formation of leaf shape in a plant leads to phenotypic differentiation of leaf shape (monolithic, three-lobed, five-lobed) in different combinations. The presence of an unrestricted or restricted type of crop pranches in a plant also depends on two pairs of non-allelic genes. Their first pair is the S-s gene. The dominant allele of this gene ensures that in the SS and Ss state, the resulting branch is of an unrestricted type. This allows the gene to be of a limited type in the recessive ss state. The second In^l-in^l mutant gene, which is not allelic to it, prevents the phenotypic expression of the S-s gene. In the dominant state, the In^l gene has almost no effect on the dominant S gene, and in the In^lIn^lS- state, it has an unrestricted branch. But according to the type of growth, fascia is formed in the growing part of the stem. As a result of the effect of the dominant In^l gene on recessive s expression, in the In^lIn^lss case the resulting branch has a limited 0-type appearance, forming determinant-type plants by growth type (Fig. 3 - A). The In^l mutant gene has no effect on other genes in the recessive homozygous state. As a result, the S gene forms undefined horns in the dominant in^lin^lS- state, and the s gene forms indeterminate forms of type I, II, III, IV in the recessive in^lin^lss state (Fig. 3 - B).

Conclusion. Phenotypic homogeneity was observed in F_1 plants obtained by hybridization in all combinations. The result was a leaf shape (three-lobed, three-cut), an unrestricted branch, and indeterminate-type forms. It was observed that the resulting plants were inherited in an intermediate state relative to the parent forms.

F_2 differenciation was observed as a result of the epistasis effect of the In^l gene on the O_l^s, O_l, o_l genes in the obtained plants. The integrity of the leaf shape in the determinant forms by growth type is due to the limitation of the activity of alleles of the ss genes in the O_l and recessive homozygous states under the inhibitory effect of the In^l gene in the dominant homozygous state. As a result, a new determinant (In^lIn^l--ss) type was formed. In the inheritance of the growth type, a phenotypic 15:1 differenciation occurred in the F_2 gene.

The phenotypic structure of the crop branch is unrestricted and all plants with a restricted crop branch have phenotypic classes with a single, three-lobed and five-lobed leaf shape. This, of course, means that the O_l and S genes independently reflect the law of inheritance.

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