

# Efficiency of navmutant lines in the creation of cotton (*G. hirsutum* L.) varieties

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**Abstract:** According to the article, new promising families and lines of cotton that are resistant to unfavorable climatic conditions have been created. The cotton is fruitful, quick-growing, and has high fiber quality. The study was based on the variability and heredity of the main morpho-economic characters in the hybrid generations obtained between cotton varieties with promising lines of cotton. We investigated the L-203 K line, SML-3882, SML-5531, SML-4042 mutant variety lines, the Bukhara-6 cotton variety, and the connections between the L-203 K line and mutant variety lines in our research. In reciprocal hybrids, the inheritance and variability of features were examined. In the breeding procedure, the maternal form's fully grown flower buds were taken out and the maternal flowers got fertilized the following day after the male pollen grains had reached maturity. The system developed by S. Wright and published in the publications of G. V. Beil and others was employed to determine the degree of character dominance in hybrids of the first syllable. Heritability and variability of traits were studied by comparison with parental samples in the reciprocal hybrids obtained through cross-breeding, including plant height, height of the first harvest branch, time from sowing to flowering, ripening speed, fiber yield, fiber length, cotton weight per boll, number of bolls per plant, etc. Many new families and ridges that were well suited to the soil and climate of the Bukhara region were separated. These families and ridges had high yields, excellent fiber quality, and yields. After extensive breeding over many years, a new cotton variety called "Zhondor Qudrati 1" was produced.

## 1 Introduction state of study of the problem

It is known from the literature that different methods are used to create cotton varieties. In particular, varieties were created by involving in the process of practical selection, cross-breeding of mutant forms. However, these varieties did not meet the production requirements, so they gradually went out of practice. Therefore, it is of great importance to study the heredity of characters in the generations and their stabilization at the last stage, involving the line created by non-traditional methods and hybrids in the process of practical selection. This trend is particularly relevant in the creation of varieties suitable for soil and climate conditions in Bukhara.

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## **2 Scientific novelty of the work**

For the first time, the effectiveness of navmutant lines as a mother was determined in a number of combinations of the characteristics of time from planting to flowering, ripening speed, and fiber length in the hybrid generations obtained with the participation of navmutant lines of cotton. In the hybrids of the first generation, the state of heterosis was observed according to the characteristics of quick ripening, the height of the crop branch, the weight of cotton in one boll, the number of bolls in one plant, and the fiber length. In the hybrids of the second generation, it was observed that the process of wide variation took place, and it was observed that transgressive plants were separated. In the hybrids of the third and fourth generation, it was noted that the indicators of some economic signs were preserved and harmonized.

## **3 Scientific and practical significance of the work**

It was found that the use of navmutant lines in cotton selection has a great effect in increasing the indicators of some valuable economic traits. A number of new families and ridges with high yield and high fiber yield and quality were selected for the soil and climate conditions of Bukhara region [1-5].

## **4 Place and conditions of the experiment**

Experiments were carried out mainly in 2018-2020 in the educational and production field of the experimental farm of Bukhara State University (primary samples were studied and hybridization was carried out) and in the fields of Madaniyat company farm in Bukhara district (experiments on hybrid generations). In the following years, cross-breeding with the navmutant SML-3882 line was carried out to improve the quickness of the new "Zhondor Kudrati 1" variety. At the same time, the work of breeding and bringing the varieties and varieties to the standard continues until the present time [6-14].

## **5 Research method**

In field experiments, when the average daily temperature of the soil at a depth of 10 cm was 12°C, seeds were sown in the order of 60x30-1. The seed is 3 - 4 cm. in the depth, 3-4 plants were planted in each nest, and the seedlings were collected in the natural humidity of the earth. All other agrotechnical activities were carried out in a generally accepted way.

In breeding, the flower buds of the maternal form were harvested, and the next day, when the male pollen was collected, the maternal flowers were pollinated. 100 flowers from each combination were pollinated. In the reciprocal hybrids obtained as a result of crossbreeding, the heredity and variability of characters such as plant height, the height of the first harvest branch, the period from planting to flowering, early ripening, fiber yield, fiber length, the weight of cotton in one boll, the number of bolls in one plant, were studied in comparison with the parental samples.

The degree of dominance of characters in hybrids of the first syllable was calculated according to the formula of S. Wright presented in the works of G. V. Beil and R. E. Atkins (1965). The results obtained in the research were subjected to statistical processing based on the manual of BA Dospikhov (1979). Determining fiber quality indicators of the families isolated as a result of the tests was carried out in the Bukhara "Sifat" laboratory, at the "HVI" measuring equipment.

## 6 Research results Heritability and variability of plant height trait in F<sub>1</sub>-F<sub>2</sub> plants

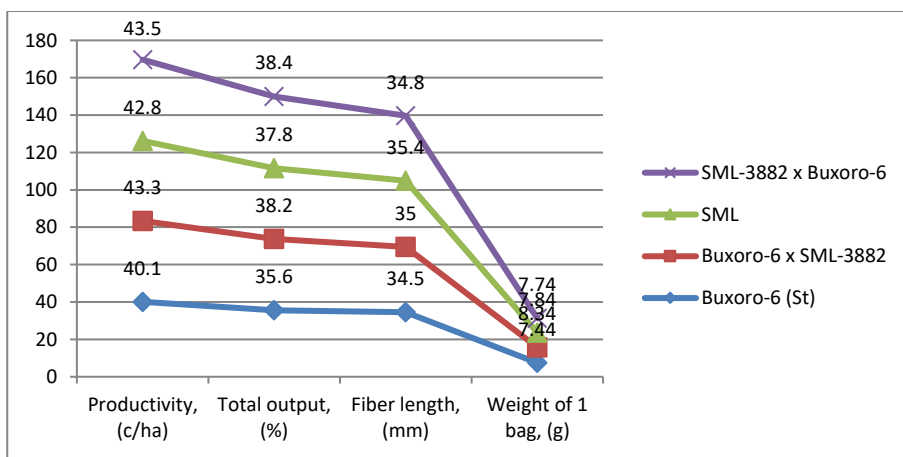
Of the first-generation reciprocal hybrid offspring, negative heterosis ( $hp=-5.33$ ) was observed for the inheritance of this trait when the SML-5531 line participated as a mother only in the L-203K x SML-5531 combination. Average indicator  $x=107.4$  cm. was equal to and was shorter than both parental samples. When the SML-5531 line was used as a parent and in the reciprocal combinations of Bukhara-6 x SML-3882, L-203K x SML-3882, L-203K x SML-4042, inheritance was shown to be intermediate. ( $hp= -0.18$  to 41).

Positive heterosis was observed in Bukhara -6 x SML-5531 reciprocal hybrids ( $hp=3.5$ ; 11.5). It was found that their average scores were higher than the parents' samples. ( $x=109.7$ ; 110.5 cm.). In the reciprocal hybrid combinations of Bukhara -6 x SML -4042, it was observed that inheritance took place in the dominance of the relatively tall Bukhara -6 variety ( $hp=0.56$ ; 0.63), that is, a positive dominance.

Among the second-generation reciprocal hybrid combinations obtained between the Navmugant ridges and the Bukhoro-6 variety, the Bukhoro-6 x SML-3882 combination showed a wide separation process, and most of the plants were placed in the classes between the parental forms in the range of variability (from 66 cm to 101 cm). Average indicator  $x=87.2$  cm. was equal to Among hybrid plants of the combination SML-3882 x Bukhara -6, a class of plants with a lower index than the parental forms was distinguished. Average indicator  $x=83.2$  cm. was equal to A similar separation process was observed in Bukhara -6 x SML-4042 reciprocal hybrid combinations. Leftward transgression was observed in both reciprocal combinations (61-65 cm). Their average scores were also close to each other. ( $x=86.4$ ; 85.9 cm). It was observed that the inheritance passed in the dominance of navmugant ridges with low stature.

In Bukhara-6 x SML-5531 reciprocal hybrid combinations, bilateral transgression was observed (from 81 cm to 125 cm). It was noted that a class of short and tall recombinant plants, which were not found in the parental forms, was isolated.

Based on the obtained results, it can be noted that short height trait prevailed in the hybrids obtained between short plants and relatively tall plants. In this case, it was found that heredity is late in the predominance of navmugant ridges (fig.1).



**Fig.1.** Changes in yield and fiber yield in hybrid F<sub>2</sub> plants

## 7 Inheritance and variability of early ripening trait in F<sub>1</sub>-F<sub>3</sub> plants

The heredity analysis in the first-generation reciprocal hybrid combinations of the quickness trait showed negative heterosis phenomenon ( $hp = -1.18$  to  $-2.47$ ). Average indicators of hybrids were around  $x = 101 - 104$  days.

In the combinations obtained between navmugant ridges and the Bukhara-6 variety, when navmugant ridges participated as a mother, the speed of ripening was 1-2 days shorter than when they participated as a father, and it shows that the efficiency of navmutant ridges was higher. A similar situation was observed in the first generations of navmutant strains obtained with the L -203 K strain. Only in the hybrids obtained between the SML -4042 ridge and the L - 203 K ridge, the average indicator was the same,  $x = 103$  days.

Reciprocal F<sub>2</sub> plants showed super-fastness in average values in all combinations. A state of left-sided transgression was observed in them. In particular, the plants of Bukhara-6 x SML-3882 reciprocal hybrid combination obtained between the Bukhara-6 variety and the navmutant lines are located between the classes from 96 days to 125 days in the range of variability, and their average values are  $x = 106, 109$  days. (Figure 1).

Similar results were observed in hybrid combinations obtained between navmutant lines and the L-203 K line. In all hybrid combinations, a case of left-sided transgression was noted. The plants of combination L -203 K x SML-3882 were located in classes between 91 days and 125 days of variation series. In this combination, very fast-ripening plants were isolated (91-100 days). The average indicator was equal to  $x = 106.7$  days. (Fig. 2).

Hybrids of the third generation were mainly obtained from classes with non-mutant lines of variation series. The variability observed in them was short compared to the separation process in F<sub>2</sub> plants, and it was 4-5 classes in the range of variability. It should be noted separately that SML-3882 x Bukhara-6, SML-5531 x Bukhara-6, SML-4042 x Bukhara-6, SML-3882 x L-203K have a growing period of 96-100 days. families separated.

Thus, as a result of the involvement of fast navmutant lines in the hybridization, in the first generation, the extreme predominance of navmutant lines (negative heterosis) was observed, while in the F<sub>2</sub> generation, the process of wide separation was reflected. As a result, a state of transgression to the left was observed, and fast and very fast plants were separated. In the third generation, it was observed that this trait slowly stagnated and the rapid genotypes were separated.

Inheritance and variability of fiber yield trait in F<sub>1</sub>-F<sub>3</sub> plants.

In the first generation hybrids, the inheritance of the fiber yield trait was different. In the reciprocal hybrids of the first generation obtained between Bukhara-6 variety and navmutant lines, a situation ranging from intermediate inheritance to occurrence of heterosis was observed. In particular, reciprocal F<sub>j</sub> plants crossbred with SML-3882 and SML-5531 navmutant lines and the Bukhara-6 variety showed that, when the navmutant lines were used as a mother in both combinations, the average index for this character was higher than the parental samples, and a state of heterosis was observed. ( $hp = 2.0; 1.67$ ).

On the contrary, in the combination of Bukhara -6 x SML-3882, a complete negative dominance of the Bukhara -6 variety ( $hp = -10$ ) was observed, while in the hybrid of Bukhara -6 x SML-5551, it was confirmed that the heredity was intermediate ( $hp = -0.33$ ).

In the reciprocal hybrids obtained between navmutant lines and the L-203 K line, it was observed that this trait was inherited in a positive dominance of the navmutant lines in all combinations, unlike the hybrids obtained with the Bukhoro-6 variety ( $hp = 0.5$  to  $1.33$ ).

In our opinion, the inheritance of the fiber yield sign in F<sub>2</sub> plants in this way can be explained by the fact that in the parental forms, this sign is less different from the allelic states of the leading genes, and their average indicators are very close to each other. It should be noted that the inheritance of this trait is biased towards non-mutant lines.

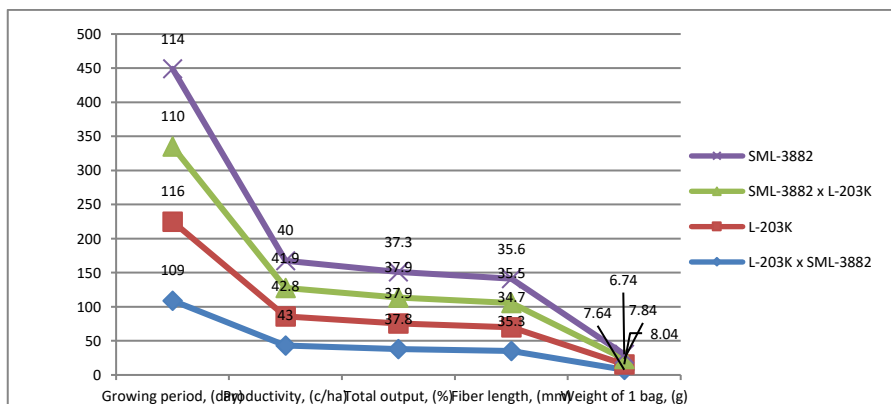
In most F3 reciprocal hybrid combinations, a right-sided transgression phenomenon was observed, with average values of 35-36%. In hybrid combinations SML - 4042 x Bukhara - 6, SML -3882 x L - 203K, SML -5531 x L-203K, families with 38 - 39% fiber yield were separated when navmutant lines participated as mothers, and their average values were equal to 36% .

Based on the obtained results, it should be noted that the characteristics of the non-mutant lines with the output of yudori fiber remain in the hybrid generations. Therefore, these results indicate that navmutant strains are capable of generating forms with high fiber output.

### 8 Inheritance and variation of fiber length trait in F<sub>1</sub>-F<sub>3</sub> plants

From the F1 plants obtained with Navmutant lines Bukhoro-6, in the combination of Bukhoro-6 x SML-3882, complete dominance of the SML-3882 line ( $hp= 0.89$ ) was observed, with an average index of  $x=37.4$  mm. was equal to, the average indicators of all other reciprocal combinations were higher than the indicators of both parental samples (from 37.4 mm. to 37.7 mm.) and a positive heterosis condition was observed ( $hp= 1.11$  to 2.27). In all the reciprocal hybrids obtained between the L-203 K line in the navmutant lines xdm, a state of positive heterosis was observed ( $hp=1.$  from 18 to 1.93). Average indicators of hybrids are 37.3 mm. from 37.9 mm. it was until Mean numbers of hybrids were higher when navmutant lines were used as maternal compared to when they were used as paternal lines. Maternal efficiency was observed in the inheritance of the fiber length trait of navmutant strains.

In the reciprocal hybrid combination Bukhara - 6 x SML - 3882 F2, a range of variation was observed that reached a wide separation process compared to the parental samples, and the plants were placed in 6 classes (from 32 mm to 37 mm) ( $x =34.4$  mm.). The plants of the Bukhara-6 variety and the SML-3882 ridge were located in the same 3 classes of the variation series (from 34 mm to 36 mm). In these second-generation hybrids, a phenomenon of double transgression was observed, that is, plants with lower or higher values from the parental samples were isolated. (Figure 3). In the second generation reciprocal hybrid combinations obtained with navmutant lines of the L-203 K line, a bilateral weak transgression was observed (from 32 mm to 37 mm). In particular, the average indicators of reciprocal combinations of L-203 K x SML-3882 are close to each other ( $x=34.7$ ; 34.4 mm), it was found that the inheritance of this trait was shifted to the side of the L-203 K ridge. (Fig. 2).



**Fig.2.** Changes in the growth period and fiber yield in F2 hybrid plants

All F3 reciprocal hybrid families were placed in 4 classes of the variation series. From the Bukhara -6 x SML- 3882 combination families, the classes with lower average values of the initial samples ( $x=32$  mm.) were distinguished. Bukhara -6 x SML -4042 reciprocal combination families, as well as all reciprocal hybrids of navmutant lines with L-203 K line, were within the range of parental forms. Positive transgressive families (36 mm.) were isolated only from the Bukhara -6 x SML-5531 hybrid combination. In general, in F3 families, compared to F2 plants, average values of fiber length were slightly increased. The results of the experiments showed that it is possible to improve the fiber length indicators with the correct implementation of the selection work.

## 9 Heritability and variability of cotton weight in one boll in F<sub>1</sub>-F<sub>3</sub> plants

A positive heterosis condition was observed in all hybrid combinations obtained with the Bukhara -6 variety and the L-203 K line with the navmutant lines. ( $h_p=1.31$  to 5.0). The highest average indicators include Bukhara -6 x SML -5531 ( $x=7.8$  g.), Bukhara - 6 x SML-3882, SML-5531 x Bukhara-6, L-203 K x SML-3882 ( $x= 7.6$  g.) combinations were obtained. In the remaining combinations, the average values of the weight of cotton per boll are 7.3 g. from 7.5 g. it was observed that it was between Inheritance of this trait was observed in all combinations, regardless of which of the initial forms participated as a mother, the Bukhara-6 variety with high indicators and the L-203 K ridge dominated.

In F2 plants, a wide separation process is observed, the weight of cotton in one boll is 5 g. from to 8 - 9 g. plants separated, that is, two-sided transgression was observed.

In reciprocal hybrids, the average indicators were close to each other. Only 0.3 g in reciprocal hybrid combinations L -203 K x SML - 5531. it was found that there was a difference to It should be noted that the average values of SML-3882, SML-4042 navmutant lines are 6.3 g. was equal to 7.0 g. was no less than In particular, in the combination of Bukhara -6 x SML -3882, plants have 5.1 g of the range of variation. from to 8.5 g. ( $x=7.2$  g.), when SML-3882 navmutant line is used as a mother, plants are 5.1 g.-9.0 g. ( $x=7.1$  g.) were placed in the classes. (Fig. 5). A similar situation was observed in the reciprocal combinations obtained between navmutant sequences and the L-203 K sequence. For example, L -203 K x SML -3882 reciprocal hybrid plants were located between the classes of the range of variation from 5.1 g. to 8.5 g. (Fig. 6).

In the F3 generation Bukhara -6 x SML -3882, Bukhara -6 x SML -5531 reciprocal hybrid families, families with higher indicators than the parental forms were separated. Their bag weight is 8 - 8.5 g. became It was observed that the indicators of Bukhara -6 x SML-4042 reciprocal combination families were within the range of the indicators of parental samples.

A similar state of heredity was observed in F3 reciprocal families obtained from the L - 203 K line with navmutant lines, that is, families with higher indicators than the parental forms were separated. One bag of cotton weighs 7.6-8.0 g. it was until

It was observed that the average indicators of hybrid families of F3 generation were slightly lower compared to the indicators of F2 generation. The average indicators of families did not have a significant difference from the indicators of parental forms. However, it is of great importance for further research that families with high indicators have been separated from paternal and maternal forms.

## 10 Conclusions

1. It was found that the efficiency of the navmutant lines used in our experiments was high in obtaining fast-ripening, productive, fiber-quality lines. It was noted that some dollars showed positive and negative heterosis.

2. Inheritance of the period sign from germination to flowering in reciprocal hybrids of the first generation took place under the complete dominance of navmutant lines. Negative heterosis was noted in all first-generation females. The predominance of navmutant ridges was also determined in the second generation reciprocal hybrids, and a case of leftward transgression was observed.

3. It was found that the first-generation reciprocal hybrids were extremely fast-ripening (101 - 104 days). Negative heterosis was observed in all combinations. In the hybrids of the second generation, this trait was also inherited with the dominance of non-mutant lines. A left-sided transgression was noted, and very fast-growing plants were separated. In the families of the third generation, the separation process took place in the same way, and most of the families were placed in the classes of non-mutant ranges of the mutation series. It was observed that the characteristic of quick cooking was preserved in families.

4. In the reciprocal hybrids of the first joint, it was observed that the inheritance of the fiber yield sign was in the state of intermediate, dominant, positive and negative heterosis. In the second generation, a weak transgression was observed, and the main plant group was within the range of the parental samples for this character. The yield of fiber in the third generation hybrid families was higher than that of the parents and was almost close to the indicators of the second generation.

5. All first-generation reciprocal hybrids were higher than parental samples in terms of cotton weight in bolls, and positive heterosis was observed. In the hybrids of the second generation, a wide separation process was shown, and in the process of separation, a bilateral transgression was detected. Although these indicators were observed to decrease in the next generation, families with high udder weight were separated.

6. Maternal efficiency of navmutant lines was determined in the first generation hybrids according to the period from germination to flowering, quick ripening, fiber length.

7. As a result of the research, a number of promising families (109, 113, 128, 187, 244, 251, 84, 106, etc.) have been developed, which combine quick-ripening, productive, valuable economic characteristics and high indicators of fiber quality. was extracted.

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