

# Quantitative and technological quality indicators of the new “Nasib” cotton variety

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**Abstract.** The paper presents the results of the analysis of cotton weight per boll, yield, fiber output, fiber length and fiber quality of the newly created medium-fiber “Nasib” cotton variety, which is studied as the selection test. A three-year analysis of fiber micronaire, hardness, length, uniformity, index of short fibers, elongation at break, soiling, defect count, reflectivity and yellowness is presented.

## 1 Introduction

In clause 3.3 of the Decree of the President of the Republic of Uzbekistan No. PD-4947 dated February 7, 2017 “On the strategy of actions for the further development of the Republic of Uzbekistan”, the tasks on the development and modernization of agriculture, the expansion of scientific research work on the creation and introduction into production of new selection varieties of agricultural crops with high productivity, resistant to diseases and pests, adapted to local soil-climate and ecological conditions are defined [1]. The positive completion of the work of creating a new variety in the selection process depends on the selection of the starting material, in which the feasibility of involving cotton samples with valuable characteristics, i.e. early maturity, high yield, high fiber quality, resistance to diseases and pests, to hybridization is known. Thereupon, the scientists of our country have carried out a number of scientific researches [2,3].

## 2 Literature review

It is impossible to conceive the development of cotton growing without selection or introduction of new varieties created by human. The cotton varieties created by scientists as, S.M. Mirakhmedov [4], B.P. Straumal [5], and others, who made a great contribution to the development of cotton growing, are distinguished by their fertility, quick ripening, high-quality fiber and high fiber output.

Cottonseed farming is important for obtaining high cotton yields. In this connection, a number of scientists have given recommendations in their research on seed selection and quality fiber production. In particular: H. Egamov, T. Komilov, M. Dadajonov [6] stated that the fiber length in the first joint of the hybrids obtained as a result of cross-species and intra-species hybrids is intermediate, and it changes to the parent with more long fibers. When

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long fiber varieties are crossed, heterosis is observed for this character, that is, their fiber may be longer than that of the parents. In the hybrids of the second joint, the fiber length is intermediate compared to the parental form. Generally, second generation hybrids tend to have shorter fibers than first generation hybrids.

Creating varieties resistant to diseases and pests is an important issue in obtaining high yields of cotton. Because of research on the development of cotton bollworm-resistant starting material, M. Yusupova [7] found that the hybrids obtained by crossing disease- and pest-resistant varieties were resistant.

Based on the results of a two-year research, M. Khaliqova and H. Saydaliev [8] recommended to use samples of the collection number 06773, 06776, 06777, 06781, 06785, 06788, 06792, (Uzbekistan), 07627 (USA), 07633, 07635 (India) that are not affected by thrips, aphids and spider mites, and are not strongly infected with wilt.

Sh. Namazov, G. Kholmurodova, U. Kurbanov [9] established that it is appropriate to use O-965-966, O-357-362 and O-117-120 families, which are resistant to black root rot, root rot and gommosis, as starting materials for improving resistance to the above diseases.

According to the information of Sh. Khojaev, R. Ochilov, A. Sadullaev [10], it has been scientifically proven that if 6 out of 100 cotton bushes are infected with aphids, thrips and spider mite during the cotton-picking period, the yield of this field is 1 centner less per hectare.

F. Tolipov, L. Shvetsova [11] established that spider mite-resistant cotton varieties are resistant when the leaves are hairy. In addition, in their experiments, they found that resistant cultivars had 1.25 times more RNA in their leaves.

According to Sh. Namazov, R. Yuldasheva and others [12], BC<sub>3</sub>S<sub>1</sub>-1-6-3-15 sample and F<sub>5</sub>BC<sub>3</sub>S<sub>1</sub>-1-6-3-15 x C-6530 and F<sub>5</sub>BC<sub>3</sub>S<sub>1</sub>-1-6-3-15 x C-6524 hybrids with a high content of (+)-gossypol in the seeds were found to be resistant to wilt disease (*Verticillium dahliae* Kleb.) in the field by artificial inoculation.

Lately, Sh. Namazov, R.A. Yuldasheva, I.G. Amanturdiyev, T.A. Rahimov carried out a number of researches on the selection of cotton varieties with high content of (+)-gossypol in their seeds. In particular, for the first time in the republics of Central Asia, a number of research on creation of initial cotton materials with a high content of (+)-gossypol in the seed (with the participation of R.A. Yuldasheva), resistance of varieties and hybrids with different amounts of (+)-gossypol to diseases (with the participation of T.A. Rahimov) and bollworm resistance (with the participation of I.G. Amanturdiyev) were carried out in the "Cotton Genetics and Cytology" laboratory of the Scientific Research Institute of Cotton Breeding and Seed Breeding. In particular, Sh. Namozov and others [16], R. Yuldasheva and others [15-16], Sh. Namazov and others [16-17] studied the amount of (+)-gossypol in the seeds of some foreign cotton samples and local cotton varieties.

In the research of Babadjanov F.A., Megamed M. [18], it has been established that inheritance of boll weight in hybrids is related to the rate of maturity of the parent samples involved in the crossbreeding, and when forms close to each other due to their bollness are involved in crossbreeding, the size of the boll in hybrids is close to the average, or vice versa, when samples of different speed are crossed, their hybrid progeny have a large grain weight bias towards the parent or parent forms. Early ripening of cotton is an important factor in high quality cotton fiber [18].

Z. Bekjanov, Sh.E. Namazov and others [19] noted that in the creation of medium-fiber cotton varieties with complex hybridization, it was possible to isolate recombinants specific to fine-fiber cotton varieties in terms of fiber length.

### 3 Research methodology

In order to give an objective assessment of the new “Nasib” variety, which is superior to the cotton variety (S-6524) included in the State Register of valuable agricultural traits, it is important to conduct a selective variety test of promising varieties in the experimental farm at the Namangan Scientific Research Institute of Cotton Selection, Seeding and Cultivation Agrotechnologies. Experimental options were placed in four rows in four repetitions with an area of each option of 50.4 m<sup>2</sup> in this experimental field, and experiments were carried out.

During field experiments, all biometric measurements were carried out according to “Methods of conducting field experiments” [20], “Methodology of field experiments” [21]. Planting was planted in the 90x10 - 1 system. Monitoring and reporting on the growth and development of cotton was carried out: the work on 100% germination of cotton seedlings, seedling thickness (before picking), determination of the degree of wilt disease (on September 15), determination of purity of the variety (during full flowering and ripening), 50% maturity of the boll, determination of fiber quality (for picking cotton samples from 100 pieces), determining the cotton harvest until September 30 and before frost (1st harvest 30.09., second harvest 20.10.) were completed.

In order to evaluate the variety in the test, medium-fiber variety S-6524 (type IV fiber) was used as a sample. Land treatment activities were carried out based on recommendations of the “Cotton Selection, Seeding and Cultivation Scientific-Research Institute of Agrarian technologies”.

The scientists of the Namangan Scientific-Experimental Station of the Scientific-Research Institute of Cotton Selection, Seeding and Cultivation created a new “Nasib” cotton variety suitable for the region’s soil and climate conditions. “Nasib” variety belongs to the khirzutum type. It has been created by Kh.Boltabaev, T.Karimov and others by single selection many times by crossing the forms (Toragorgon-3xL-48)x5873 in a hybrid obtained. Since 2019, it has been submitted to the State Variety Testing Branches for testing.

The bush is conical in shape, 110-115 cm tall, the stem is strong, does not lie down, weakly hairy. Branching belongs to the 1.5 subtype; the first harvest branch comes out of 6 joints. The growing season is 118-120 days. The leaves are medium-sized, 3-5-offset, moderately hairy, light green in color. The flowers are medium in size. The leaves of the flower are pale yellow. The pods are medium in size, pointed, oval in shape, 5-offset, opens well. The harvest does not spill. The weight of cotton in one boll is 6.0-6.5 g. The seed is medium in size, hairy. The weight of 1000 pieces is 118-120 g, the fiber is white, the length is 35.0-36.0 mm, the fiber yield is 37.5-38.5%, the metric number is 6130, the hardness is 4.6 g/k, the relative breaking length is 26.8 kg/tack, micronaire is 4.3, the fiber belongs to type IV.

### 4 Analysis and results

Table 1 below shows some quantitative parameters of the Nasib variety. As can be seen from the table, the weight of cotton per boll was 6.1 grams in 2020, 6.2 grams in 2021 and 5.9 grams in 2022. The three-year average of cotton weight per bag was 6.1 grams. The three-year average of the control variety S-6524 was 5.4 grams. It was established that the weight of cotton per boll of the new variety is 0.7 grams heavier than the control.

When analyzed for cotton yield, “Nasib” variety yielded 39.0 quintal/ha in 2020, 38.7 quintal/ha in 2021 and 39.8 quintal/ha in 2022. Based on the three-year results, the average total cotton yield of the “Nasib” cotton variety was 39.2 quintal/ha. The total cotton productivity was determined by comparison with the control S-6524 variety. Based on the three-year results, the average total cotton yield of the control S-6524 cotton variety was 35.7 quintal/ha. It was found that the new medium fiber “Nasib” cotton variety, created as a result

of the conducted research, is more productive than the control, including 3.5 quintal/ha (109.8%) higher yield than the control.

**Table 1.** Quantitative indicators of the type of fate

Indicators	Nasib variety				Control C-6524 variety				difference from the control variety
	2020	2021	2022	Average	2020	2021	2022	Average	
Weight of cotton in one boll, g.	6.1	6.2	5.9	6.1	5.2	5.5	5.5	5.4	+0.7g.
Cotton yield, quintal/ha	39.0	38.7	39.8	39.2	35.2	35.3	36.4	35.7	109.8%
Fiber yield, %	38.1	38.5	38.3	38.3	37.0	36.8	37.3	37.0	+1.3%
Fiber length, mm	34.4	33.2	34.3	34.0	32.8	32.3	32.5	32.5	+1.5mm

It has been established that the yield of new medium-fiber “Nasib” cotton variety, created based on the results of the research on the heredity of fiber, was 38.1% in 2020, 38.5% in 2021, and 38.3% in 2022. Based on the results of three-year laboratory analysis, it has been determined that the average fiber yield of the “Nasib” cotton variety is 38.3%. When we compared it to the control, it has been established that the average fiber yield of the control S-6524 cotton variety was 37.0% based on the results of the three-year experiment. Because of the conducted research, it has been established that the new medium-fiber “Nasib” cotton variety has a higher fiber yield than the control. This indicator was reflected in the results of scientific research that the fiber output was 1.3% higher than the control.

Based on experiments conducted on another of the indicators of quantitative characters, i.e. heredity of fiber length, it has been determined that the fiber length of the newly created medium-fiber “Nasib” cotton variety was 34.4 mm in 2020, 33.2 mm in 2021, and 34.3 mm by 2022. Based on three-year results, the average fiber length of “Nasib” cotton variety was 34.0 mm. When we compared it to the control, it has been determined that the average fiber length of the control S-6524 cotton variety was 32.5 mm. Because of the conducted research, it has been established that the newly created medium-fiber “Nasib” cotton variety is more productive than the control, the fiber output is higher and the fiber length is positive, including the fact that the fiber length is 1.5 mm higher than the control.

Fiber was extracted from 100 cotton samples taken to determine fiber quality and technologically analyzed in “Sifat” regional laboratory.

Cotton fiber quality was evaluated in the HVI system. The USTER HVI 900 SA semi-automatic system measures specified physical characteristics: fiber length, maturity, length uniformity, elongation, microneur, color, contamination indicators. All these characteristics are important in determining the quality of the fiber and improving the preparation of the mixture for weaving. The fiber testing system on the HVI 900 SA allows accurate, reliable and automated work with computer-assisted calibration and diagnostic control.

The data obtained from the results of the analysis are presented in Table 2. The table shows the results of the analysis of the main technological parameters of the fiber: microneur, maturity, length, uniformity, index of short fibers, elongation at break, dirtiness, defect number, grade, reflection coefficient and yellowness levels.

It should be noted that if the microneur index is less than 3.0, the fiber is “very thin”, when 3.0-3.6 – “thin”, 3.7-4.7 – “moderately thick”, 4.8-5.4 – “thick” fiber is formed. In the experiment, the microneur index of the Nasib variety was 3.9; 4.4 in 2021 and 4.3 in 2022, and in the control variety, this indicator in accordance with the above by years was equal to 4.6, 4.9 and 4.8.

Maturity indicator in “Nasib” variety in 2020 was equal to 38.2, in 2021 was equal to 34.7 and in 2022 was equal to 34.9; in the control variety, this indicator in accordance with the above by years was equal to was equal to 34.7, 29.6 and 31.9.

Fiber length in “Nasib” variety in 2020 was equal to 1.25, in 2021 was equal to 1.24 and in 2022 was equal to 1.20; in the control variety, this indicator in accordance with the above by years was equal to was equal to 1.17, 1.11 and 1.09.

**Table 2.** Technological quality indicators of fiber of “Nasib” variety.

No.	Indicators	2020		2021		2022	
		C-6524	Nasib	C-6524	Nasib	C-6524	Nasib
1	Microneur	4.6	3.9	4.9	4.4	4.8	4.3
2	Strength (gf/tack)	34.7	38.2	29.6	34.7	31.9	34.9
3	Length (inch)	1.17	1.25	1.11	1.24	1.09	1.20
4	Uniformity index (%)	83.0	83.3	82.8	85.5	83.9	85.6
5	Short fibers index SFI (%)	5.3	3.4	8.2	2.9	7.7	4.5
6	Elongation at break, EIg (%)	7.5	8.7	2.0	9.5	8.6	9.3
7	Trash	1	0	2	4	1	0
8	Number of defects Tr Cnt	4	3	5	7	4	3
9	Trash Area	1.0	1.1	1.2	1.0	1.3	1.0
10	Refraction coefficient Rd (%)	78.9	79.4	73.3	84.3	77.8	79.5
11	Yellowing coefficient +b (%)	6.1	6.1	7.2	7.0	7.1	7.0

If the uniformity index is less than 77, the fiber is characterized as “very low”, 77-80 is “low”, 81-84 is “moderate”, 85-87 is “high”, and if is greater than 87, the fiber is characterized as “very high”. The uniformity index in the studied “Nasib” variety in 2020 was equal to 83.3, in 2021 was equal to 85.5 and in 2022 was equal to 85.6; in the control variety, this indicator in accordance with the above by years was equal to 83.0, 82.8 and 83.9. Therefore, the uniformity index of fiber in the Nasib variety is characterized as “moderate” and “high”.

Short Fiber Index (SFI) – fibers shorter than 0.5 inches are generally not included in the production of raw yarn and are discarded as waste during the spinning process. The

percentage (by mass) of fibers shorter than 0.5 inches in length is defined as the short fiber content. This amount varies from 2% to 20% in cotton varieties. A short fiber index of less than 6 is characterized as “very low”, 7-9 is “low”, 10-13 is “moderate”, 14-17 is “high”, and if it is greater than 18, the fiber is characterized as “very high”. The amount of short fibers in the studied Nasib variety in 2020 was equal to 3.4; in 2021 was equal to 2.9 and in 2022 was equal to 4.5; in the control variety, this indicator in accordance with the above by years was equal to 4.5, 8.2 and 7.7. Therefore, the short fibers index in the Nasib variety is characterized as “very low”.

## 5 Conclusion

The variety has been submitted in 2019 to the State variety testing branches for testing. The bush is conical in shape, 110-115 cm tall, the stem is strong, does not lodge, weakly hairy. Branching belongs to the 1.5 subtype; the first harvest branch comes out of 6 joints. The growing season is 118-120 days. The leaves are medium-sized, 3-5-offset, moderately hairy, light green in color. The flowers are medium in size. The leaves of the flower are pale yellow. The pods are medium-sized, beaked, oval-shaped, 5-offset, open well. The harvest does not spill. The weight of cotton in one boll is 6.0-6.5 g. The seed is medium in size, hairy. The weight of 1000 pieces is 118-120 g, the fiber is white, the length is 34.0-35.0 mm, the fiber yield is 37.5-38.5%, the metric number is 6130, the hardness is 4.6 g/k, the relative breaking length is 26 ,8 kg/tack, microneur is 4.3. Fiber belongs to type IV. The “Nasib” variety received a patent in 2021. Patent number NAP 00377.

In accordance with results of the research, it has been established that the newly created medium-fiber “Nasib” cotton variety has a comprehensive superiority in terms of quantitative characteristics compared to the control, and, according to the data obtained from the fiber quality analysis, high results have been obtained in all technological indicators. This variety fully meets the requirements of the light industry in terms of fiber quality, and the production of this variety will achieve high economic efficiency if it is widely introduced in cotton-growing farms. Since high fiber quality and yield is a very important indicator in the development of the textile industry in farms of agricultural cluster, this ensures high economic efficiency.

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