



# FORMATION OF QUALITY INDICATORS OF COTTON LINES OBTAINED BY INTERGENOMIC INTROGRESSIVE METHODS

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## ABSTRACT

The article reveals the data on the positive indicators of all different genomic cotton lines in terms of fiber quality and their full correspondence to the current quality requirements for cotton fiber. One of the main reasons for this was the positive effect of cultivated and wild species involved in the origin of lines on fiber quality, the emergence of transgressive forms of introgressive plants obtained on the basis of experimental polyploidy with high fiber quality and the correct selection process, as well as, the creation of new high-fiber lines.

**KEYWORDS:** cotton plant, plant, genome, hybrid, line, transgressive, introgressive, fiber, micronaire, specific tensile strength, upper half mean length, sample.

## INTRODUCTION

Presently, natural cotton fiber is considered as a source of raw material for light industry. Considering this, it can be said that the technological quality indicators of fiber of many new and promising varieties of cotton created in the world cotton industry play a key role. A lot of research work has been done on fiber quality indicators. In particular, in the research of B.Kh.Amanov, S.M.Rizaeva, A.A.Abdullaev [1-9], a new fine-fiber "Angor" variety was created as a result of cross-hybridization of subspecies *vitifolium* of *G.barbadense* L. species and Karshi-8 variety of cotton. In this variety, the fiber micronaire was 4.1, the specific tensile strength was 43.6 gk / tex, and

upper half mean length was 1.41 inches. In addition, a number of studies on morphological, physiological, biochemical methods in the cotton plant have been conducted [4, 5].

O.Kuchkarov [4] analyzed the characteristics and fiber quality indicators, such as micronaire, fiber length and relative tensile length of the fiber of the parent lines, F<sub>3</sub> hybrids and standard C-6524 variety studied in saline soils.

The CF-1, 045, 06, ИК-2, ИК-3, CF-6 and CF-7 lines have shown superiority over the standard C-6524 variety in terms of their fiber quality. It has proven that they meet the requirements of type IV in terms of fiber quality, even when grown in saline conditions. While all of the studied F<sub>3</sub> hybrids



showed superiority over the standard variety, the IK-3 x 045 hybrid had a fiber yield of 40.1% and a fiber length of 1.27 inches, while the CF-7 x CF-1 hybrid had a micronaire index of 3.8 and were distinguished from other lines and hybrids. The hybrids have been recommended as a primary material to improve fiber quality and to use them in selection-breeding processes.

T.D. Allambergenov [1] determined for the first time to use the variety with fiber of type IV as a paternal form in cross-breeding of medium-fiber cotton varieties, and the dominance of this variety resulted in F<sub>1</sub> combinations with good fiber micronaire and specific tensile strength parameters. Fiber micronaire, upper half mean length, similarity in length and inheritance of indicators of short fiber index in F<sub>1</sub> hybrids as a strong dominance type were proven to be the result of strong effect of allele genes in the heterozygous state, while the specific tensile strength of fiber and the inheritance of

elongation at break at different types were the result of different levels of expression of alleles.

## OBJECT AND THE METHODS OF RESEARCH

Based on intergenomic introgressive forms the T-24, T-PCM, T-138, T-141 lines were obtained.

Scientific studies were performed based on the following methods: mathematical analysis and HVI in "Sifat" center.

## RESEARCH RESULTS

The quality indicators of cotton fiber are analyzed using modern HVI equipment. Therefore, in our research, the quality of new lines obtained based on different genomic species was determined using HVI equipment at the Republican Center "Sifat", and the data on some fiber quality were compared with the fiber of regionalized C-6524 variety (Table 1).

**Table-1**  
**Formation of the trait on quality indicators of the lines obtained based on multi-genome species (reference of "Sifat" center, in 2017-2019).**

№	Lines	Number of plants	mic (micronaire)				Relative t standard ± difference
			$\bar{x} \pm S$ $\bar{x}$	Limit	S	V %	
<b>In 2017</b>							
1	T-24	50	4,3±0,05	4,1-4,5	0,14	2,7	± -0,1
2	T-PCM	50	4,6±0,06	4,2-4,6	0,16	2,3	± +0,2
3	T-138	50	4,4±0,07	4,0-4,6	0,34	5,8	± 0,0
4	T-141	50	4,6±0,06	4,2-4,7	0,21	2,9	±+0,2
5	st. C-6524	50	4,4±0,04	4,3-4,5	0,11	2,1	
<b>In 2018</b>							
1	T-24	50	4,5±0,08	4,1-4,8	0,24	4,8	± 0,0
2	T-PCM	50	4,2±0,10	3,6-4,5	0,32	6,5	±-0,3
3	T-138	50	4,5±0,06	4,2-4,7	0,18	2,7	± 0,0
4	T-141	50	4,4±0,11	3,6-4,7	0,34	7,7	±-0,1
5	st. C-6524	50	4,5±0,03	4,3-4,6	0,10	2,4	
<b>In 2019</b>							
1	T-24	50	4,7±0,10	4,4-4,8	0,15	2,8	±+0,2
2	T-PCM	50	4,1±0,09	3,6-4,5	0,29	6,4	±-0,4
3	T-138	50	4,4±0,07	4,0-4,8	0,23	5,3	±-0,1
4	T-141	50	4,8±0,10	4,2-5,2	0,30	6,3	±+0,3
5	st. C-6524	50	4,5±0,06	4,3-4,6	0,13	2,2	

It is known that one of the most important quality indicators of fiber is micronaire (mic) that indicates the thinness and maturity of the fiber depending on the air permeability of cotton fiber sample. It should be noted that the micronaire index

may change depending on agrotechnical measures when studied comparatively during the years. In international classifications, the micronaire index is analyzed according to the following criteria and presented in most literature as the follows, i.e. the



interval between 3.7-4.2 is "premium interval", 3.5-3.6 mic and 4.3-4.9 mic interval is "main interval", if less than 3.4 mic and more than 5.0 mic, then is "deductible from the price".

In the new studied lines, the micronaire index ranged from 4.1 to 4.8 mic when analyzed at the "Sifat" center in 2017-2019. In 2017, the most positive result on this trait was found in the line T-24 (4.3 mic), which was found to meet the "main interval" criteria. The micronaire index of cotton fiber is in the range of 4.6 mic in 2 of the 4 lines, which makes 50.0% of the total lines studied. Only one T-138 line analyzed had an indicator of 4.4 mic, which was found to be equivalent to the standard C-6524 variety. The micronaire index, which is one of the qualitative characteristics of the fiber, of less than 3.4 mic and higher than 5.0 mic that meet the "deductible from the price" criteria were not recorded in different genomic lines (see Table 3.5).

According to the second and third year data, analog indicators on the micronaire index were recorded. For example, in the T-PCM line analyzed under this trait, a slight positive change was observed over the years, that is, according to the results of the

study in 2018-2019, we can see that the this line showed 4.1 mic interval of "premium interval" indicator that is superior to all lines on this trait.

The obtained data showed that the micronaire index of the analyzed lines was significantly positive than that of C-6524 in terms of micronaire index, which fully complied with the requirements for type III-IV type cotton fiber belonging to medium-fiber cotton varieties (Table 1).

In our study, the specific tensile strength (Str) - strength of cotton fiber from the fiber quality indicators was also analyzed. The strength of the fiber is expressed in the HVI Calibration Cotton in g/tex (cH /tex). In accordance with the data of 2017, the specific tensile strength trait in all analyzed lines with multi-genomes ranged from 32.1 gs /tex (T-141) to 35.4 gs/ tex (T-35.4), and the difference from the standard variety was 7.8. -11.1 gs /tex. In 2018-2019 also a positive rate was recorded in all multi-genomic lines in terms of specific breaking strength (Str). The specific tensile strength of the standard variety C-6524 was equal to 24.3-27.0 gs /tex (Table 2).

**Table-2**  
**Formation of the trait on qualitative indicators fiber of the lines obtained based on multi-genome species (Reference of "Sifat" centre, in 2017-2019).**

№	Lines	Number of plants	Str (specific tensile strength) g/ tex				Relative to standard ± difference
			$\bar{x} \pm S \bar{x}$	Limit	S	V %	
<b>In 2017</b>							
1	T-24	50	34,6±0,33	32,8-36,1	1,04	3,02	± 10,3
2	T-PCM	50	34,0±0,43	31,2-35,6	1,37	4,02	± 9,7
3	T-138	50	35,4±0,32	33,6-37,0	1,02	2,87	± 11,1
4	T-141	50	32,1±0,16	31,3-33,1	0,51	1,59	± 7,8
5	st. C-6524	50	24,3±0,38	22,0-27,0	1,09	3,9	
<b>In 2018</b>							
1	T-24	50	27,6±0,38	25,2-30,0	1,09	4,9	± 0,6
2	T-PCM	50	34,6±0,45	30,0-36,0	1,23	4,3	± 7,6
3	T-138	50	32,9±0,50	29,0-36,0	1,34	4,1	± 5,9
4	T-141	50	33,3±0,30	29,0-35,0	1,31	4,8	± 6,3
5	st. C-6524	50	27,0±0,41	25,0-29,0	1,06	4,3	
<b>In 2019</b>							
1	T-24	50	32,1±0,43	29,8-35,4	1,35	4,20	± 5,9
2	T-PCM	50	32,9±0,33	31,5-34,5	1,05	3,20	± 6,7
3	T-138	50	30,2±0,57	27,0-32,4	1,81	6,01	± 4,0
4	T-141	50	30,6±0,62	26,5-33,1	1,95	6,36	± 4,4
5	st. C-6524	50	26,2±0,41	21,0-29,0	1,27	4,1	

It is known that another characteristics of fiber quality is **upper half mean fiber length**

(UHM). Based on the three-year data, we analyzed the upper half mean length index (2017-2019). The upper half mean length strength is a sign of the mean



length of the longest fibers, which is half the mass of the sample being determined. This indicator is calculated in inches or mm. The fiber length trait of multi-genomic lines was analyzed in laboratory conditions, and the analysis of mm parameters of this trait were presented above. The fiber length index

was determined on the HVI equipment, the degree to which the lines confirmed their indicators under laboratory conditions according to the defined trait was noted, and the data obtained were analyzed (Table 3).

**Table-3**  
**Formation of the trait on qualitative indicators fiber of the lines obtained based on multi-genome species**  
**(Reference of "Sifat" centre, in 2017-2019).**

№	Lines	Number of plants	UHML (upper half mean length) inch				Relative to standard ± difference
			$\bar{x} \pm S \bar{x}$	Limit	S	V %	
<b>In 2017</b>							
1	T-24	50	1,11±0,01	1,05-1,16	0,03	2,9	±-0,02
2	T-PCM	50	1,14±0,01	1,09-1,19	0,03	2,7	± 0,01
3	T-138	50	1,09±0,01	1,05-1,12	0,02	1,9	±-0,04
4	T-141	50	1,08±0,01	1,04-1,12	0,03	2,3	±-0,05
5	st. C-6524	50	1,13 ±0,01	1,09-1,16	0,02	2,1	
<b>In 2018</b>							
1	T-24	50	1,18±0,01	1,12-1,23	0,03	2,5	± 0,06
2	T-PCM	50	1,18±0,01	1,15-1,23	0,02	2,0	± 0,06
3	T-138	50	1,14±0,01	1,11-1,17	0,02	1,7	± 0,02
4	T-141	50	1,15±0,01	1,12-1,21	0,03	2,1	± 0,03
5	st. C-6524	50	1,12±0,02	1,08-1,17	0,03	2,3	
<b>In 2019</b>							
1	T-24	50	1,20±0,01	1,12-1,28	0,05	3,9	± 0,06
2	T-PCM	50	1,18±0,02	1,12-1,27	0,05	4,2	± 0,04
3	T-138	50	1,13±0,01	1,10-1,18	0,02	1,9	±-0,01
4	T-141	50	1,19±0,01	1,15-1,25	0,03	2,4	± 0,05
5	st. C-6524	50	1,14 ±0,01	1,08-1,16	0,04	2,5	

In accordance with the analysis of the results, it was noted that the indicators of multi-genome lines were significantly positive in the second and third years compared to the standard C-6524 variety, but in the data of 2017, only one T-RCM line was found to be superior to the standard variety (1.14 inches) (Table 3).

If we look at the results of 2018-2019, the best results in almost all of the studied multi-genomic lines on the upper half mean length (UHM) trait were observed in T-24 (1.18 inches), T-RCM (1.18 inches), T-138 (1.14 inches), T-141 (1.15 inches) in 2018. While in the results of 2019, T-24 (1.20 inches), T-RCM (1.18 inches), T-141 (1.19 inches) were also noted to be positive. Such results were also proved by the index of the lines analyzed. In general, the upper half mean length index was found to be significantly higher than C-6524 variety belonging to the type IV used as a standard. One of the most important indicators of cotton, the fiber length trait,

was noted to be analog to the indicator and data detected in the HVI equipment at the "Sifat" center.

## CONCLUSION

Analysis of the results obtained on the quality indicators of cotton fiber shows that all indicators of different genomic lines are positive in terms of fiber quality and fully meet the current requirements for the quality of cotton fiber. One of the main reasons for this was the positive effect of cultivated and wild species involved in the origin of lines on fiber quality, the emergence of transgressive forms of introgressive plants obtained on the basis of experimental polyploidy with high fiber quality and the correct selection process, as well as, the creation of new high-fiber lines.

Research work and studies are being conducted to bring these lines analyzed comparatively to the varietal level and introduce them into production.

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