

Determination of The Degree of Fixation of Fibers Style Development

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Abstract: In this article, the Andijan-36 selection varieties currently grown in the Andijan region, as well as 52-4, China-31, China-29 and 52 imported from China, were reviewed, and a method for determining the degree of fiber straightening of various selection varieties was developed and the optimal mass for sampling was recommended.

Keywords: The average value of the distance between the two ends of the fiber in the unaligned state, the level of straightening, the unevenness of the yarn, the amount of defects.

INTRODUCTION:

Textile fibers are soft, thin, and flexible under normal conditions. Therefore, they are arranged randomly in a free state. During the extraction of fibers and the production of products from them, they undergo various bending deformations.

The straightening of textile fibers is of great importance in the process of yarn production. In particular, the higher the degree of straightening of the fibers during the carding process, the lower the unevenness of the yarn, and as a result, yarns with low unevenness and high quality indicators can be obtained from it.

In addition, a low degree of straightening of fibers leads to an increase in the number of hairs in the yarn. The higher the degree of straightening of fibers, the higher the level of elasticity of the yarns obtained from it. This leads to a decrease in the unevenness of the yarn.

In the carding machine, the level of straightening of the fibers in the pile is 60-62%, if the level of fiber straightening after the combing machine does not exceed 82.0%, then the output of the combing pile is reduced.

According to the scientists of the Moscow Institute of

Textile and Light Industry, if the speed of the main drum of the carding machine increases to 255 min⁻¹, the production efficiency for the production of yarn with a linear density of 5.7 ktex increases by 2.8 times, the amount of defects decreases up to 10%, and the degree of straightening of fibers in the carding pile increases up to 70%.

There has been almost no research on the development of a method for determining the straightening of cotton fiber. A wick was prepared by taking about 3-4 g of samples from each selection variety. To determine the bending of cotton fiber, 35-40 mg of staple was prepared from the wick. The length of 100 fibers from the staple was determined using a ruler in 1, 2, 3, 4 and 5 repetitions in the unstraightened and straightened state.

METHODS

The degree of straightening of fibers is determined using the following formula:

$$E = \frac{\sum_{i=1}^n \ell_{10'r}}{\sum_{i=1}^n \ell_{20'r}} \cdot 100\% \quad (1)$$

Here $\sum_{i=1}^n l_{10'r}$ - the average value of the distance

between the two ends of the fiber in the unaligned state, mm; $\sum_{i=1}^n l_{2o'r}$ - the average value of the distance between the two ends of the fiber in the straightened state, mm.

Based on the obtained results, experiments were conducted to develop a method for determining fiber bending, and the results were processed mathematically and statistically.

It is known from mathematical statistics that absolute and relative errors occur when determining random parameters in an experiment.

Absolute error ε a random value determined as a result of the measurement l_2 with real value l_1 is measured by the difference between.

$$\varepsilon = l_2 - l_1 \tag{2}$$

Here: l_2 - the distance between the ends of the fiber in the straightened state, mm; - the distance between the ends in the unaligned state of the fiber, mm.

Relative error is measured by the ratio of the absolute error to the value obtained as a result of the measurement.

$$\delta = \frac{\varepsilon}{E_{o'r}} \cdot 100\% \tag{3}$$

In scientific research, accuracy and reliability are important in the assessment of indicators. The

confidence interval characterizes the accuracy and reliability of the values of the measured indicators.

In the statistical processing of the experimental results, the degree of straightening of fibers was determined in the following order.

The sample $E_{o'r}$ mean is determined using the following formula, like the arithmetic mean:

$$E_{o'r} = \frac{\sum_{i=1}^n \ell_i}{\sum_{i=1}^n n} \tag{4}$$

Here n - repeatability of experience; ℓ_i - measured values of the random variable. The dispersion and coefficient of variation of the obtained results were determined using the formulas (1) and (4) given above.

The results show that the absolute and relative error based on the numerical indicators obtained in determining the degree of fiber straightening, the sample weight Mn and the experimental repeatability significantly affect.

RESULTS

In scientific research, accuracy and reliability are important in the assessment of indicators. The confidence interval characterizes the accuracy and reliability of the values of the measured indicators.

Table 1

Development of Andijan-36 selection grade cotton fiber indicators

No	Number of repetitions	Differentiation of fiber alignment, E,%	Arithmetic mean amount, $E_{o'r}$	Coefficient of variation, $C, \%$	absolute error, ε , mm	relative error, $\delta, \%$
Cotton in the market						
1.	1	64,5	26,0	7,52	1,88	7,23
2.	2	66,0	26,4	7,44	1,76	6,67
3.	3	66,6	27,6	8,36	1,75	6,34
4.	4	66,8	27,8	7,38	1,68	6,04
5.	5	67,4	28,4	7,45	1,26	4,44
	Average	66,26	27,24	7,63	1,63	6,14
After the condenser						

1.	1	65,9	26,8	7,56	1,65	6,16
2.	2	66,8	27,0	7,48	1,56	5,78
3.	3	67,8	27,2	8,11	1,44	5,29
4.	4	68,4	27,7	8,00	1,40	5,05
5.	5	68,7	27,8	7,98	1,18	4,24
	Average	67,52	27,3	7,83	1,42	5,30

Table 2

52-4 selection grade cotton fiber straightening indicators

No	Number of repetitions	Differentiation of fiber alignment, E,%	Arithmetic mean amount, E_{or}	Coefficient of variation, $C, %$	absolute error, ε , mm	relative error, δ , %
Cotton in the market						
1.	1	64,5	27,0	8,11	1,90	7,03
2.	2	66,7	26,9	7,56	1,78	6,62
3.	3	66,9	26,8	7,88	1,56	5,82
4.	4	66,4	28,2	7,69	1,45	5,14
5.	5	66,7	28,0	7,45	1,32	4,29
	Average	66,24	27,38	7,74	1,60	5,78
After the condenser						
1.	1	76,8	27,2	7,23	1,67	5,88
2.	2	77,7	27,8	7,48	1,60	5,76
3.	3	77,7	27,6	7,56	1,50	5,43
4.	4	68,9	27,0	7,69	1,42	5,26
5.	5	71,7	28,0	7,60	1,15	4,11
	Average	74,6	27,5	7,50	1,50	5,29

Table 3

Properties of China-31 selection grade cotton fiber

No	Number of repetitions	Differentiation of fiber alignment, E,%	Arithmetic mean amount, E_{or}	Coefficient of variation, $C, %$	absolute error, ε , mm	relative error, δ , %
Cotton in the market						
1.	1	67,0	26,5	7,38	1,88	7,09
2.	2	69,0	26,8	7,56	1,75	6,53

3.	3	65,0	27,2	8,00	1,61	5,92
4.	4	64,5	27,4	7,36	1,45	5,29
5.	5	66,8	28,8	7,28	1,28	4,44
	Average	66,5	27,3	7,51	1,59	5,85
After the condenser						
1.	1	72,1	27,0	7,88	1,68	6,22
2.	2	74,0	27,4	7,68	1,49	5,44
3.	3	70,0	27,6	7,54	1,42	5,14
4.	4	73,8	26,8	7,67	1,36	5,08
5.	5	70,0	28,0	7,66	1,10	3,93
	Average	72,0	27,4	7,69	1,41	5,16

Table 4

Properties of Chinese-29 selected cotton fiber

No	Number of repetitions	Differentiation of fiber alignment, E,%	Arithmetic mean amount, $E_{o'r}$	Coefficient of variation, C,%	absolute error, ε , mm	relative error, δ , %
Cotton in the market						
1.	1	68,9	26,3	7,40	1,89	7,19
2.	2	65,4	26,5	7,30	1,83	6,91
3.	3	66,0	27,2	8,12	1,60	5,88
4.	4	68,9	27,6	7,56	1,40	5,01
5.	5	69,0	28,0	7,60	1,27	4,54
	Average	67,6	27,1	7,60	1,60	5,90
After the condenser						
1.	1	70,8	26,9	7,38	1,52	5,65
2.	2	71,2	27,3	7,30	1,50	5,49
3.	3	70,6	27,5	7,80	1,49	5,42
4.	4	70,5	27,8	8,04	1,31	4,71
5.	5	70,4	27,9	7,80	1,15	4,12
	Average	70,7	27,5	7,66	1,39	5,08

Table 5

Properties of 52 selected cotton fiber

No	Number of repetitions	Differentiation of fiber	Arithmetic mean	Coefficient of variation,	absolute error, ε ,	relative error, δ
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		alignment, E,%	amount, E_{or}	$C, \%$	mm	,%
Cotton in the market						
1.	1	65,4	27,4	7,90	1,83	6,69
2.	2	68,4	26,5	7,70	1,80	6,79
3.	3	68,0	26,6	7,65	1,60	6,02
4.	4	67,6	27,8	7,50	1,48	5,32
5.	5	69,2	28,2	7,60	1,26	4,47
	Average	67,7	27,3	7,07	1,59	5,86
After the condenser						
1.	1	70,0	27,8	7,40	1,70	6,12
2.	2	71,2	27,5	7,50	1,60	5,82
3.	3	73,6	27,4	7,60	1,41	5,15
4.	4	72,1	27,0	7,08	1,38	5,11
5.	5	70,8	27,6	7,60	1,16	4,20
	Average	71,5	27,5	7,44	1,45	5,28

CONCLUSION

The analysis of the obtained results showed that, compared to the parameters of Andijan-36 selection grade cotton fiber, the difference of cotton fiber straightening in several repetitions after the condenser increased to 2.1%, the absolute error decreased to 12.9%, and the relative error decreased to 14.8%, and the difference of cotton fiber straightening in the remaining selection varieties was from 6.6% to 17.1%. increased, absolute error decreased from 7.1% to 19.6%, relative error decreased from 8.5% to 21.4%.

As can be seen from the results of the research, it was found that the relative error in determining the level of fiber straightening in all types of selection varieties after the condenser compared to the index of cotton fiber in the ghee was 3.93% to 4.24% in 5 repetitions, and it was recommended that the number of repetitions for the test method be 5 times.

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