Fiber Consumption and Quality Indicators of Varieties of *G. Hirsutum* L. Type and Interspecific Hybrid Combinations

Jakhongir Ergashev[1(✉)], Guzal Kholmurodova[1], Ramish Egamberdiev[2], and Anisa Barotova[1]

[1] Tashkent State Agrarian University, 2, University Str, Tashkent, Uzbekistan 100140
ejahongir9090@mail.ru

[2] Tashkent Institute of Irrigation and Agricultural Mechanization Engineers, 39, Kori NIyozi Str, Tashkent, Uzbekistan 100000

Abstract. Cotton is a technical crop, from which cotton is a valuable raw material for industry. More than 100 different types of industrial products are produced from cotton fiber. Cotton fiber is widely used in the textile, paper, chemical, furniture, machinery industries. In our article, hybrid F3 (An-Boyovut-2 x Bukhara-8) on all fiber quality parameters of varieties and interspecific hybrid combinations of type G. *hirsutum* L. is recommended as a starting material for improving the characteristics of Sultan variety in optimal irrigation system, Bukhara-6 variety in conditions of water scarcity. O-622, O-125, O-580 families and T-33–35/18, T-25–27/18 ridges, O-125, O-445, O-580 along the fiber length in increasing fiber consumption and the use of the T-54–56/18 ridge has been shown to be effective.

Keywords: Agriculture industry · Fiber · Interspecific hybrid combinations · G. *hirsutum* L. type

1 Introduction

Today, 90% of the cotton fiber grown in the world belongs to the cultivated G. *hirsutum* L. type. One of the important problems in the selection of cotton is the creation of high-yielding, high fiber yield and quality, wide use in the creation and production of early maturing varieties. Due to the growing population of the world, the limited area of irrigated crops, it is important to get high and quality crops suitable for different soil-climatic zones without expanding the area under agriculture in the countries of the world [1–3].

Global climate change, the emergence of new breeds of pathogens and the need to create new varieties of cotton that are resistant to adverse factors of pests indicate the need. This problem can be solved by attracting new donors with unique characteristics to the selection work [4].

Extensive measures are being taken in our country to create new varieties of cotton that are competitive and meet the requirements of the world cotton market. Today in

A. Beskopylny et al. (Eds.): INTERAGROMASH 2022, LNNS 575, pp. 2187–2192, 2023.
https://doi.org/10.1007/978-3-031-21219-2_245

our country it is important to create varieties of cotton that are suitable for different soil and climatic zones, with a fiber yield of not less than 40%, and a number of studies are needed in this regard [5].

The aim of the study was to study the heredity, variability and formation of fiber yield in cotton by intergenerational hybridization, along with some valuable economic characteristics, to bring the best families with high fiber yield, soil-climatic conditions, isolated in the first generation to the ridge level and genetically enriched ridges. Was to create [6].

The object of research is the variety of cotton G. *hirsutum* L. type Bukhara-102, An-Boyovut-2, Bukhara-8, Bukhara-6, Sultan, Mehnat, Dustlik-2, Besh-kahramon, Andijan-36, Chimbay-5018. Families involved in confusion and separated from them were used [7].

Fiber quality parameters are important worldwide. In the international market, of course, the cost increases depending on the quality of the fiber. In this regard, we paid special attention to the quality indicators of fiber [8].

It is known that a micronaire value of a fiber higher than 4.8 leads to its roughness. According to the research, according to the Republican Center "Sifat", all the selected items were at the level of demand for this mark under favorable irrigation conditions, i.e. from 4.5 (Bukhara-102) to 4.7 (Labor), in inter-varietal hybrids - 4.6. From (F3 Andijan-36 x Five-Hero) to 4.7 (F3 Bukhara-102 x Chimbay-5018). In the face of water shortages, some of our hybrids have seen fiber brittleness. In varieties, the micronaire ranged from 3.9 (Bukhara-102) to 4.6 (Bukhara-6) in accordance with international standards, while in some interspecific hybrids, the micronaire showed a slightly negative result (F3 Bukhara-8 x Dustlik-2 -5.3; F3 Bukhara-102 x Chimbay 5018 -5.2; F3 (Andijan-36 × Five-hero) - 4.9) [9].

Among the varieties in terms of specific breaking strength in the optimal irrigation system, Sultan (31.8 g/power tex), all interspecific hybrids showed high results on the mark, ie from 31.4 gs/tex (F3 Bukhara-102 × Chimboy 5018) 32.1 gs/tex was formed in the range F3 (Andijan-36 x Five-hero) (Table 1). In case of water shortage, Chimbay-5018 (33.2 g/power tex), Bukhara-8 (33.8 g/power tex), F3 An-Boyovut-2 × Bukhara-8 (30.0) g/power tex) [10].

According to the fiber length in inches, from the hybrid families Dustlik-2 (1.23 inches), Sultan (1.20 inches), Mehnat (1.21 inches), Besh-Kahraman (1.22 inches), interspecific hybrids from complex hybrid families under optimal irrigation conditions. F3 Bukhara-8 × Dustlik-2, F3 An-Boyovut-2 × Bukhara-8, F3 (Sultan × Mehnat) (1.20 inches), in water shortage Bukhara-6 (1.28 inches) Dustlik-2 (1.25 inches), Bukhara-8 (1.24 inches), F3An-Boyovut-2 × Bukhara-8 (1.24 inches), the hybrids showed superiority in character [11].

Thus, in terms of all fiber quality parameters, the hybrid F3 (An-Boyovut-2 × Bukhara-8) in both irrigation systems, the Sultan variety in the optimal irrigation system, and the Bukhara-6 variety in conditions of water scarcity can be recommended as starting materials. Cotton is grown mainly for fiber, and it is important to introduce high-fiber varieties into production. Therefore, when evaluating, selecting or creating a starting material, special attention is paid to fiber consumption.

2 Materials and Methods

Fiber yield is a complex polygenic trait that varies under the influence of various factors and ranges from 25–40% in varieties and specimens. In studying the heredity of fiber loss, most scientists [1–4] have paid special attention to long-term confusion. G. *hirsutum* × G. *arboreum* × G. *raimondi* and G. *hirsutum* × G. *anomalum* hybrids were mixed with varieties Acala –1217 and Acala 4–42 and other local varieties of Uganda to create varieties with very high fiber yield [10].

Mamarahimov et al. [5] studied the inheritance of fiber yield in interspecific hybrids and observed that when hybrids participate as mothers in hybrids, the predominance of the sample with high fiber yield in the F1 joint is shown and the inheritance is intermediate.

Cotton is a technical crop, from which cotton is a valuable raw material for industry. More than 100 different types of industrial products are produced from cotton fiber. Cotton fiber is widely used in the textile, paper, chemical, furniture, machinery industries.

Fiber consumption depends on the weight of the seed, the absolute weight of the fiber in the seed, the number of fibers in the seed, the fiber quality and its index.

It is known that cotton is grown mainly for fiber. Therefore, in the selection process, special attention is paid to the fiber yield of the initial samples involved in the mixing. Due to the effective results of research conducted by scientists of the Republic on the mark, the fiber yield of most varieties currently grown in production is high (35–38%). However, the fiber yield of most varieties is due to small seeds, and our scientists are tasked to create varieties with a high fiber index. Therefore, special attention was paid to the study of fiber consumption of hybrid-families participating in our experiment.

3 Results and Discussion

In our experiment, when analyzing the fiber consumption mark, the range of participants involved as parents ranged from 36% (Sultan) to 42.1% (Besh-kahramon), while in isolated families this figure ranged from 35.4% (O-230) to 39.7. % (F4 (An-Boyovut-2 × Bukhara-8), and in the created ridges from 38.3% (T-54–56/18) to 42% (T-33–35/18) (Table 1). It should be noted that the amplitude of variability of the fiber output signal in isolated families ranged from 3.7% (O-622) to 5% (O-520).

In summary, positive recombinant plants by trait can be found by increasing population size in hybrid combinations and performing larger-scale sampling to determine positive transgression. Therefore, it is advisable to use the T-33–35/18 ridge from the O-445 family in genetic-selection processes to increase fiber yield.

One of the quality parameters of a fiber is the length of the fiber. One of the urgent tasks facing our scientists is to create cotton varieties that meet the world standards of fiber quality [11].

In the study, we performed analyzes on fiber length in interspecific hybrids. According to the results, the families showed results that were equal to or slightly higher than the standard S-6524 and the varieties involved as parents. The highest rate was observed in the O-580 family (36.6 mm), while the fiber consumption was also high (39.4%). The fiber length ranged from 33.7 mm (O-125) to 36.6 mm (O-580), and all isolated families were found to be superior to the standard S-6524 (33.0 mm) variety in character.

Table 1. Fiber consumption and fiber length indicators.

Varieties and families		Fiber consumption			Fiber length		
		M ± m	Σ	V, %	M ± m	Σ	V%
Varieties							
Bukhoro-102		37.33 ± 0.66	1.9	2.9	35.86 ± 0.48	2.1	2.3
Chimboy-5018		36.41 ± 0.83	1.4	3.9	34.03 ± 0.66	1.1	3.4
Bukhoro-8		39.4 ± 0.85	1.8	2.1	33.7 ± 0.58	1.9	2.1
Dustlik		41.2 ± 3.16	1.3	1.3	35.04 ± 0.64	1.2	2.0
An-Boyout-2		40.9 ± 0.98	1.7	2.1	36.4 ± 0.1	0.1	0.4
Bukhoro-6		37.8 ± 1.53	1.0	2.6	34.8 ± 0.56	1.4	2.5
Sulton		36.0 ± 0.80	1.2	2.0	34.1 ± 0.42	1.2	2.0
Mekhnat		40.1 ± 0.25	0.1	0.4	35.0 ± 0.12	0.1	0.4
Andijan-36		37.2 ± 0.36	1.4	2.5	34.2 ± 0.54	1.4	2.5
Besh-kakhraman		42.1 ± 0.52	1.2	2.0	35.2 ± 0.42	1.2	2.1
Origin of families	Families						
F_4 (Bukhoro-102 × Chimboy 5018)	O-230	35.46 ± 0.98	1.69	4.7	34.6 ± 1.18	2.0	6.2
F_4 (Bukhoro-8 × Dustlik-2)	O-125	37.55 ± 1.18	1.67	4.4	33.7 ± 0.69	0.9	3.2
F_4 (An-Boyout-2 × Bukhoro-8)	O-445	39.7 ± 0.83	1.66	4.1	34.7 ± 0.49	0.9	3.0
F_4(Sulton × Mekhnat)	O-580	39.4 ± 1.67	6.9	4.5	36.6 ± 0.35	1.4	4.3
F_4 (Andijan-36 × Besh-kakhraman)	O-455	38.7 ± 1.34	1.89	5.0	35.2 ± 0.10	0.8	2.4
F_4 (Bukhoro-102 × Chimboy 5018)	O-622	36.4 ± 0.45	1.37	3.7	34.5 ± 0.67	2.0	6.2
F_4 (Bukhoro-8 × Dustlik-2)	O-520	38.7 ± 1.34	1.89	5.0	35.2 ± 0.10	0.8	2.4
	Ridges						
O-125	T-33–35/18	42.0 ± 1.7	2.44	2.79	34.8 ± 0.80	1.13	2.7
O-445	T-25–27/18	38.4 ± 0.55	2.28	2.93	35.7 ± 0.49	2.02	2.3
O-622	T-54–56/18	38.3 ± 1.01	1.74	23.56	36.7 ± 1.07	1.85	2.8
Default variety C-6524		36.60 ± 1.16	1.62	4.24	33.0 ± 0.56	1.26	2.5
	ECF_{05}	1.05			0.75		

In the created ridges, the index for this mark ranged from 34.8 mm (T-33–35/18) to 36.7 mm (T-54–56/18). According to the amplitude of the variability, it can be concluded that they are stable (2.3% -2.8%). Hence, the O-580 family in terms of fiber length, the T-54–56/18 ridge can be used to improve the mark in genetic-selection processes.

The results of our research for the next year showed that the fiber yield of the varieties involved in crossbreeding ranged from 35.1% (Bukhoro-8, Dustlik) to 38.3% (An-Boyovut-2). In isolated families, the rate of the mark ranged from 36.7% (O-580) to 39.2% (o-622). Hence, O-125, O-622, O-445 families can be used to improve the mark in selection processes.

The results of the fiber length analysis of isolated families in 2017 showed that the fiber length ranged from 33 mm (Friendship) to 34.3 mm (Five-Hero) in the parental varieties, while 32 mm (O-230) in the separated families to 35.3 mm (O-125). So, according to the results of this year, it is advisable to use the O-125, O-445 families in the selection process in improving the brand.

According to the results of a continuous study on fiber consumption and fiber length indicator, in 2018, as shown in Table 2, fiber consumption was higher than 38.1% in isolated families. This indicates that families and ridges with a high fiber yield of at least 1.2% were excluded from the standard S-6524 variety. That is, the highest fiber consumption was 39.5 (O-580) in families and 41.6 (T-33–35/18) in ridges. In terms of fiber length, only O-230 and O-445 have slightly lower fiber lengths of 31.6 mm and 32.1 mm, respectively, while the remaining families have a fiber length of 34.8 (O-580) -34.9 (O-455, O-622) mm. In the systems, this year, the fiber length was found to be 33.8 mm (T-25–27/18) to 35 mm (T-54–58/18).

Table 2. Fiber yield and fiber length indicators, 2018.

Varieties and hybrids	Fiber consumption			Fiber length		
	M ± m	σ	V,%	M ± m	σ	V,%
C-6524	36.9 ± 1.21	4.2	11.34	33.5 ± 0.50	1.75	5.22
O-230	38.6 ± 1.28	2.56	6.62	31.6 ± 0.53	1.07	3.38
O-125	39.1 ± 0.88	1.53	3.91	34.5 ± 0.89	1.78	5.17
O-445	38.6 ± 0.93	1.61	4.18	32.1 ± 0.83	1.44	4.50
O-580	39.5 ± 0.89	1.54	3.90	34.8 ± 0.70	1.70	4.10
O-455	38.1 ± 0.98	1.96	5.14	34.9 ± 1.30	1.84	5.26
O-622	39.8 ± 0.94	1.58	3.98	34.9 ± 0.75	1.80	4.12
T-33–35/18	41.6 ± 0.71	1.59	3.82	34.1 ± 0.98	2.41	7.50
T-25–27/18	41.0 ± 0.91	1.83	4.47	33.8 ± 0.29	0.50	1.48
T-54–56/18	37.4 ± 1.92	3.34	8.91	35.0 ± 0.67	1.17	3.54
ECF_{05}	1.8			2.0		

In conclusion, the results of the analysis of fiber yield and fiber length formation in cotton families showed that positive recombinant plants can be found by increasing the

size of populations and conducting larger sampling to determine positive transgression. O-622, O-125, O-580 families and T-33–35/18, T-25–27/18 ridges, O-125, O-445, O-580 and T- The use of the 54–56/18 ridge has been shown to be effective.

4 Conclusions

In the creation of selection items of medium-fiber cotton varieties adapted to different soil-climatic conditions, it is indicated that the varieties involved in crossbreeding were formed in accordance with the parental genotype. In terms of all fiber quality parameters, the F3 (An-Boyovut-2 × Bukhoro-8) hybrid in both irrigation systems, the Sultan variety in the optimal irrigation system, and the Bukhoro-6 variety in water-scarce conditions can be recommended as starting materials in character improvement. The results of the analysis of fiber yield and fiber length formation in cotton families showed that positive recombinant plants by character can be found by increasing the size of the populations and conducting larger sampling studies to determine positive transgression. In order to increase fiber consumption, O-622, O-125, O-580 families and T-33–35/18, T-25–27/18 ridges, O-125, O-445, O-580 and T- The use of the 54–56/18 ridge has been shown to be effective.

References

1. Oymatov, R., Safayev, S.: Creation of a complex electronic map of agriculture and agro-geo databases using GIS techniques. E3S Web Conf. **258**, 03020 (2021)
2. Aslanov, I., Mukhtorov, U., Mahsudov, R., et al.: Applying remote sensing techniques to monitor green areas in Tashkent Uzbekistan. E3S Web Conf. **258**, 04012 (2021)
3. Matyakubov, B., Goziev, G., Makhmudova, U.: State of the inter-farm irrigation canal: in the case of Khorezm province Uzbekistan. E3S Web Conf. **258**, 03022 (2021)
4. Iqbal, N., Khan, N.A., Ferrante, A., et al.: Ethylene role in plant growth, development and senescence: interaction with other phytohormones. Front Plant Sci. **8**, 475 (2017)
5. Narbaev, S., Abdurahmanov, S., Allanazarov, O., et al.: Modernization of telecommunication networks on the basis of studying demographic processes using GIS. E3S Web Conf. **263**, 04055 (2021)
6. Oymatov, R.K., Mamatkulov, Z.J., Reimov, M.P., et al.: Methodology development for creating agricultural interactive maps. IOP Conf. Series: Earth Environ. Sci. **868**(1), 012074 (2021)
7. Khasanov, S., Juliev, M., Uzbekov, U., et al.: Landslides in Central Asia: a review of papers published in 2000–2020 with a particular focus on the importance of GIS and remote sensing techniques. GeoScape **15**(2), 134–144 (2021)
8. Gerts, J., Juliev, M., Pulatov, A.: Multi-temporal monitoring of cotton growth through the vegetation profile classification for Tashkent province Uzbekistan. GeoScape **14**(1), 62–69 (2020)
9. Aslanov, I., Kholdorov, S., Ochilov, S., et al.: Evaluation of soil salinity level through using Landsat-8 OLI in Central Fergana valley Uzbekistan. E3S Web Conf. **258**, 03012 (2021)
10. Kulmatov, R., Khasanov, S., Odilov, S., Li, F.: Assessment of the space-time dynamics of soil salinity in irrigated areas under climate change: a case study in Sirdarya province, Uzbekistan. Water Air Soil Pollut. **232**(5), 216 (2021)
11. Lehoczky, M., Abdurakhmonov, Z.: Present Software of photogrammetric processing of digital images. E3S Web Conf. **227**, 04001 (2021)