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Performance of Fiber Output and Fiber Length in Inter Variety Hybrid Families of Middle Fiber Cotton

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Abstract: Purposefulness of using the performed families O-445, O-580, O-455 in the genetic and breeding researches for improving of fiber output and the families of O-580, O-455, O-520 to improve the fiber length on the dependence of their genotypes has been presented in this paper. In general, similarity of a high dominance of varieties in the positive indexes on the fiber output and fiber length in combination of various soil-climatic zones was noted.

Keywords: cotton plant, genotype, hybrid, inter variety, family, fiber output, fiber length.

INTRODUCTION

Today, 90 percent of the world's produced cotton fiber belong to domesticated species of *G.hirsutum* L. Annually 20-22 million tonnes of fiber is harvested and exported in 86 cotton growing countries of the world. Development of high productive, high output and fine quality of fiber, short season varieties and use widely them in the production is considered as the one of important problems in cotton breeding. Getting of high and quality crop in the correspondence of various soil-climatic zones without broadening of agricultural plantations in the countries of the world in reason of increasing of population over the world and decreasing of watering land plantations has become an actual question.

Global climatic change in the world, emerging of new disease causing races and increasing damage by the pest insects have shown the necessity of creation of resistant new cotton varieties to adverse factors. This problem can be decided by the attraction of new donors possessing unique traits.

Widely covering measurements on the development of competitive new cotton varieties with fiber output to meet world's market requirements are being implemented in our republic. Today, the creation of cotton varieties resilient to various soil-climatic zones, fiber output is not less than 40% is a topical question in our country and should be conducted a range of researches.

The aim of the research is to create the strains (lines) enriched with genetic valuable properties of various high fiber output varieties on the base of analysis the formation of fiber output in combination with other economic desirable traits in the materials developed by the inter variety hybridization of cotton.

G.hirsutum L. cotton varieties of Bukhara-102, An-Bayout-2, Bukhara-8, Sultan, Mekhnat, Dustlik-2, Beshqakhranon, Andijan-36, Chimbay-5018 introduced into production in different regions of our republic and cotton families and strains taken by their participation were used as **the research source**.

Study of valuable recombinants enriched by genetic features on traits and properties which were developed through application of the method of inter variety crossings, study of inheritance of fiber output, variation, formation and correlative relations within some of economic traits, determination of a trait transgression in the materials taken on the base of inter variety crossing method are considered as the **subject of research**.

METHODS AND MATERIALS

The scientific researches have been conducted according to the method of “Methods on the carrying out of field experiments” [1] accepted in the UzPITY. The methods of inter variety crossing, phenologic observations, defining of wilt resistance, selection works, carrying out of sample pickings, mathematic, variation and correlation analyzes were used. Quality indexes of the fiber by contemporary HVI system and digital results taken from the experiments have been analyzed by the method of B.A.Dospekhov [2].

LITERATURE REVIEW

Cotton plant is mainly cultivated for its fiber and introduction of varieties with high fiber output has a great importance. That is why, a special attention is paid on the fiber output at the evaluation of initial material, at its selection or development.

Fiber output is a complicated polygene trait and it varies under the influence of different stresses and contains of 25-40% in the varieties and accessions. A special attention by many scientists [3; 101-6., 4; 34-39-6., 5; 214-6., 6; 349-6.]. 3; 101-6., 4; 34-39-6., 5; 214-6., 6; 349-6.] was focused on crossings of remote species in the studies of fiber output inheritance.

N.Z.Innes [7; 46-48-6.] has developed varieties with a very high fiber output through crossing of hybrids (*G.hirsutum* x *G.arboreum*) x *G.raimondi* and *G.hirsutum* x *G.anomalum* to other local varieties of Uganda.

B.I.Mamarakhimov, M.Khalikov and others [8; 67-71-6.] studied inheritance of fiber output in inter species hybrids and noted that the dominance of high fiber output and intermediate inheritance in the accession at the F₁ generation are presented when the varieties have been participated in hybrids as maternal forms.

RESULTS AND DISCUSSION

Cotton plant is a technical crop and the fiber taken from is considered as a valuable raw source for cotton industry. More than 100 different industrial commodities are reproduced from cotton fiber. Cotton fiber is extensively used in the textile, paper, chemical, furniture, machine construction industries. The fiber output depends on weight of seed, absolute weight of fiber on the seed, the number of fiber on the seed, quality of fiber and its index.

It is known that cotton plant is mainly grown for its fiber. That is why, the great attention at the breeding process is paid to the fiber output of initial accessions participating in the crossings.

Due to efficiency of researches on the trait conducted by the scientists of our republic, the most varieties in the production are considered as the varieties of a high fiber output (35-38%).

But, fiber output of many varieties is on account of small seed and the scientists were charged with the task to develop varieties of high fiber output. For this reason, a special attention has been paid on fiber output of hybrid-families participated in our researches.

In our experiments, fiber output analysis shown that fiber output of parental varieties had been ranged from 36% (Sultan) to 42,1% (Beshqakhramon) and the fiber output of separated families made of from 35,4% (O-230) up to 39,7 % (F₄ (AN-Bayaut-2 x Bukhara-8) (have a look at table 1).

Positive recombinant plants over this trait can be found through carrying out of large size selection works.

Table 1: Fiber output and fiber length indexes of varieties and families, in 2016.

Varieties and families		Fiber output, %			Fiber length, mm			
		M±m	σ	V,%	M±m	σ	V, %	
Навлар								
Bukhara-102		37.33±0.66	1,9	2,9	35,86±0,48	2,1	2,3	
Chimbay-5018		36.41±0.83	1,4	3,9	34,03±0,66	1,1	3,4	
Bukhara-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-Bayaut-2		40.9±0.98	1,7	2,1	36,4±0,1	0,1	0,4	
Bukhara-6		37.8±1.53	1,0	2,6	34,8±0,56	1,4	2,5	
Sultan		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	
Beshqakhramon		42,1±0,52	1,2	2,0	35,2±0,42	1,2	2,1	
Origin of families		Families						
F ₃ (Bukhara-102 x Chimbay 5018)		O-230	35,46±0,98	1,69	4,7	34,6±1,18	2,0	6,2
F ₃ (Bukhara-8 x Dustlik-2)		O-125	37,55±1,18	1,67	4,4	33,7±0,69	0,9	3,2
F ₃ (AN-Bayaut-2 x Bukhara-8)		O-445	39.7±0.83	1.66	4.1	34.7±0.49	0.9	3.0
F ₃ (Sultan x Mekhnat)		O-580	39.4±1.67	6.9	4,5	36.6±0.35	1.4	4.3
F ₃ (Andijan-36 x Beshqakhramon)		O-455	38.7±1,34	1.89	5.0	35.2±0,10	0.8	2.4
F ₃ (Bukhara-102 x Chimbay 5018)		O-622	36.4±0.45	1.37	3.7	34.5±0.67	2.0	6.2
F ₃ (Bukhara-8 x Dustlik-2)		O-520	38.7±1,34	1.89	5.0	35.2±0,10	0.8	2.4
Control variety S-6524			36.60±1.16	1.62	4.24	33.0±0.56	1.26	2.5
	LSD ₀₅	1.05				0.75		

So, to employ the family 0-445 in genetic-breeding processes is considered purposeful. This is perfectly approved by the dependence of inheritance and formation with parents genotypes of this family, in which the fiber of Beshqakhramon was higher and Andijan-36 also has relatively positive.

At this, it is necessary to say that if we pay attention to an average arithmetic inclination (σ), it was from 1,37 (O-622) to 6,9 (O-580) and the variation amplitude in the separated families was reported as 3,7 % (O-622) to 5 % (O-520).

Fiber length is considered as the one of fiber quality parameters. One of the topical objects standing in front of our scientists is to develop cotton varieties of fiber quality meeting the world standards. We carried out analysis on the fiber length in the inter variety hybrids. According to the results, the families were equal to the standard C-6524 and also to the varieties, participating as the parental varieties or presented a little higher results. The most high index (36,6 mm) belong to the family of O-580 and at this the fiber output either was higher (39,4%). The index of the fiber length was from 33,7 mm (O-125) to 36,6 mm (O-580) which presents the superiority of all separated families on the trait than standard variety C-6524 (33,0 mm).

Mean arithmetic inclination (σ) of families was from 0,8 (O-455) to 2 (O-230) and the variation amplitude (V,%) from 2,4 (O-455, O-520) to 6,2 (O-230, O-622) and these permit the possibility to do conclusion about their stability.

According to the data of the table 2, the outcomes of our experiments conducted in the following years shown that the fiber output of the varieties, took participation in the experiments has ranged from 35,1% (Bukhara-8, Dustlik) to 38,3% (AN-Bayaut-2). The index on this trait in the separated families was from 36,7 % (O-580) to 39,2 % (O-622) and reported the superiority of all separated families than standard variety (37,2%).

Table 2: The indexes on the fiber output of separated families, in 2017.

Varieties and families	n	K-2,0							M $\pm$ m	σ	V, %
		30,1-32,0	32,1-34,0	34,1-36,0	36,1-38,0	38,1-40,0	40,1-42,0	42,1-44,0			
Bukhara-102	51		6	21	10	8	6		36,5 $\pm$ 0,3	2,7	7,5
Chimbay-5018	56				12	12	8		36,0 $\pm$ 0,8	3,4	9,5
Bukhara-8	54	5	13	17	14	5			35,1 $\pm$ 0,3	1,4	4,1
Dustlik	57	6	13	17	14				35,1 $\pm$ 0,6	2,4	7,1
AN-Bayaut-2	55		1	11	14	15	14		38,3 $\pm$ 0,6	2,3	6,1
Bukhara-6	58		2	12	12	19	9	4	38,1 $\pm$ 0,3	2,5	6,6
Sultan	50		4	15	16	12	3		36,4 $\pm$ 0,1	3,1	8,7
Makhnat	56		7	6	13	19	11		37,6 $\pm$ 0,6	3,6	9,6
Andijan-36	50		10	16	15	7	2		36,0 $\pm$ 0,6	3,0	8,0
Beshqakhramon	56		7	15	14	11	9		37,5 $\pm$ 0,7	3,5	9,4
O-230	52		4	12	16	15	3	2	37,5 $\pm$ 0,7	3,2	8,7
O-125	57			12	18	19	5	3	38,9 $\pm$ 0,43	2,2	5,7
O-445	56		8	12	12	12	10	2	38,6 $\pm$ 0,91	3,6	9,4
O-580	53		1	20	15	15	2		36,7 $\pm$ 0,46	2,2	6,0
O-455	51			8	19	14	4	6	38,4 $\pm$ 0,53	2,9	7,7
O-622	59		2	4	10	20	15	8	39,2 $\pm$ 0,32	2,4	6,3
O-520	50			8	13	15	10	4	38,0 $\pm$ 0,53	2,0	6,7
C-6524 (St)	57		2	12	17	14	12		37,2 $\pm$ 0,56	2,3	6,2

We note as the inference that the families O-125, O-622, O-445 might be employed to increase the trait in breeding processes.

Results of analysis on the fiber length of separated families in 2017 (table 3) exhibited that the fiber length of varieties participated as parental varieties had from 33 mm (Dustlik) to 34,3 mm (Beshqakhramon) and the separated families' fiber length had ranged from 32 mm (0-230) to 35,3 (0-125). At that time, the standard variety S-6524 had made of 31,9 mm. Some plants with the fiber length of 38,1-40 mm occurred in the varieties of AN-Bayaut-2, Bukhara-6 and families of 0-125, 0-445. Except of the family 0-230, plants with fiber length of 36,1-38 mm occurred in all separated families.

So, according the results of this year, using of the families 0-125 and 0-445 in the breeding process to improve the trait is purposeful.

According to the consequences of continues researches as shown in the table 3, the fiber output of the separated families in 2018 was higher than 38,1 mm.

Table 3: Fiber length indexes of separated families, in 2017.

Families	n	Classes							M±m	σ	V, %
		26,1-28,0	28,1-30,0	30,1-32,0	32,1-34,0	34,1-36,0	36,1-38,0	38,1-40,0			
Varieties and families											
Bukhara-102	58	2	8	25	16	4	3		33,7±0,28	2,1	2,8
Chimbay-5018	23	2	6	7	5	2	1		33,1±0,53	2,5	2,1
Bukhara-8	36	3	12	11	8	2			33,1±0,35	2,1	2,8
Dustlik	27	4	6	7	6	4			33,0±0,50	2,6	2,3
An-Bayaut-2	31	1	9	14	2	2	2	1	34,3±0,49	2,7	2,7
Bukhara-6	51			12	11	17	9	2	34,1±0,32	2,3	3,7
Sultan	15		1	3	6	4	1		34,1±0,53	2,0	3,2
Mekhnat	17			5	7	2	2		33,5±0,59	1,8	3,0
Andijan-36	30	1	8	12	3	3	3		34,0±0,40	1,7	3,7
Beshqakhramon	51			12	11	17	9	2	34,3±0,32	2,3	6,7
O-230	20		2	9	6	3			32,0±0,40	1,7	5,5
O-125	14			1	2	7	2	2	35,3±0,58	2,2	6,2
O-445	17		1	2	5	6	2	1	34,0±0,59	2,4	7,2
O-580	22	1	3	4	8	4	2		32,5±0,55	2,6	8,0
O-455	16		4	6	4	1	1		32,6±0,57	2,2	7,2
O-622	16			5	7	2	2		33,1±0,49	1,9	6,0
C-6524	17		4	4	6	3			31,9±0,52	2,1	6,7

This evidences about the separation of families and lines which have at least 1,2% higher fiber output than check variety S-6524. The highest fiber output in families made of 39,5 (0-580) and in the lines it accounts for 41,6 (L-33-35/18) percentage. The highest fiber output than 38% in all families remarks the existed high fiber outputs in the created lines L-33-35/18 (41,6 %), L-25-27/18 (41 %).

Table 4: Fiber output and fiber length indexes, in 2018

Varieties and hybrids	Fiber output			Fiber length		
	M±m	Σ	V, %	M±m	σ	V, %
S-6524	36.9±1.21	1.2	3.34	33.5±0.50	1.75	2,22
O-230	38.6±1.28	1.56	4.62	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
L-33-35/18	41.6±0.71	1.59	3.82	34.1±0.98	1.41	3.50
L-25-27/18	41.0±0.91	1.83	4.47	33.8±0.29	0.50	1.48
L-54-56/18	37.4±1.92	1.34	4.91	35.0±0.67	1.17	3.54
LSD ₀₅	1,8			2,0		

So, the varieties participated in the crosses have a great importance and it was obvious that the development of families and lines takes place in the dependence of parental genotypes. Because, the fiber output of all crossed varieties was high.

Inconsiderably low indexes of fiber lengths were noted only in the families of O-230 and O-445 correspondingly 31,6 and 32,1 mms and in the rest lines the fiber output were 34,8 (O-580)-34,9 (O-455, O-622) mms. But, in the lines, according to this year data, the fiber lengths from 33,8 mm (L-25-27/18) to 35 mm (L-54-58/18) were determined.

CONCLUSIONS

It is necessary to underline that the analysis of fiber output and fiber length formation in the cotton families exhibit the possibility to find positive recombinant plants on the trait through broaden the size of population and to take a large size selection works to determine positive transgression. Efficiency of using families O-622, O-125, O-580 and lines L-33-35\18, L-25-27\18 to increase fiber output and on the fiber length O-125, O-445, O-580 and L-54-56\18 was presented. The inheritance of these families in comparison of their parental genotype found its evidence and it proves its superiority on the trait. In general, it was obvious that the positive results of superiority on the fiber output and fiber length in integration with suitability of varieties to different soil-climatic region were noted.

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