ANALIZING FORMATION OF FIBER THE LENGTH OF SELECTION MATERIALS CREATED BY MEANS OF SEVERAL TYPES OF HYBRIDIZATION METHODS IN BREEDING G. HIRSUTUM L. VARIETIES

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Abstract: Basic information in this article illustrates comparison results of analyzing some technological index of fiber of selection materials created by means of convergent and complex hybridization of G. hirsutumL.varieties. Hybridization by means of convergent methods is very perspective in cotton breeding. That is why obtained materials by this method consider better index of the length of fiber in O-325/26, O-32/35, O-85/90, O-388/91 and O-521/25 families, the higher index of specific tensile strength in O-329/30, O-388/91, O-630/32 O-32/35 and O-521/25 families, the highest average length was reported in O-388/91, O-32/35 families, according to the index of uniformity of fiber in O-32/35, O-521/25 families, according to the index of fiber in O-32/35, O-388/91, O-85/90 families' traits and they are definitely refer to use in the sequel breeding process.

Key words: cotton, family, selection, breeding, quality of fiber, convergentbreeding, complex breeding, complex traits, individual selecting

Introduction

About 20% of the total cotton produced in the world comes from China, 18% to the US, 13% to India, 8% to Pakistan, 8% to the CIS countries, 5% to Uzbekistan. According to the International Cotton Advisory Committee (ICAC), cotton production has declined by 1%, despite a 4% increase over the last decade (Ergashev, et al., 2019).However, the cotton plant is producing not only for fiber raw product, but also for its seed products. 86 cotton producer countries growing, collecting and exporting 24-26 mln. tons of fiber every year. Due to the increasing population and limited area of irrigated fields very important producing high qualified crops without expanding the area under crops. Reducingwateruseinirrigatedagriculturehasbecomea global priority because of the growing problems of recurringdroughtsanddecliningnonrenewablewaterresources (Chen et al., 2020). In this regard, one of the first priorities is increasing fiber yield of cotton plant.Cotton is a technical crop and cotton is a valuable raw material for the 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, and machine-building industries. Fiber yield depends on the weight of the seeds, the absolute weight of the fiber on the seeds, the number of fibers on the seeds, the quality of the fiber and its index (Ergashev, et al., 2019). Fiber quality traits generally include fiber length, fiber uniformity, fiber strength, fiber elongation, and microneire value (Babar, et al., 2019). Fiber strength and fiber length are considered as the most important properties affecting yarn quality (Yang, et al., 2016). Fiber strength is very important for advanced spinning technologies in the textile industry (Felker, 2001). The micronaire value, a measure of fiber fineness and fiber maturity, influences the fiber processing and dyeing consistency (Rodgers et al., 2017).By 1500, cotton was known all over the world, and in the next 200 years it became a very profitable industry as its demand increased, particularly in America and Europe. The beauty of cotton as a textile is its breathability and smoothness as a fabric, the finenessandqualityofthe fibersandthenumberof fibers that are produced per plant (Kim L. 2020).One of the fiber quality parameters is the length of the fiber. Creating cotton varieties that meet the world standards is one of the most important challenges facing our scientists. Scientists like (Mirjuraev, et al., 2009).Cotton is the purest source of cellulose. Cotton fibers mainly consist of α-cellulose (88-96.5%). Cotton cellulose has high molecular weight and structural order, i.e., it is highly crystalline, oriented and fibrillar (Ismail, et al., 2020).

At the end of each season, cotton was harvested from thethreetreatmentsbyapicker-harvester,andgrabsamples were sent to the Texas A&M AgriLife Research and Extension Center in Lubbock, TX, for ginning to determine lint and seed yield. Samples of the cleaned cotton lint were sent to the Texas Tech University Fiber and BiopolymerResearchInstituteinLubbockforhighvolume instrument analysis. Based on the fiber quality parameters, the Commodity Credit Corporation upland loan valuesforeachtreatmentwere estimated inU.S.dollarsusing the2019/2020UplandCottonLoanCalculatorfromCotton Incorporated (Blessing, et al., 2020).

Materials & Methods

Indexes of the length of fiber

table-1

№	Species and varieties	The length of fiber, mm		
		M±m	σ	V, %
C-6524control species		33.7±0.58	1.93	6.11
Families obtained by concept of transgressiv recombination				

1.	O- 32/35	35.86±0.48	2.16	6.38
4.	O- 85/90	35.04±0.64	1.29	4.05
5.	O-325/26	36.4±0.1	0.14	0.41
6.	O-329/30	34.8±0.56	1.48	4.50
	$TLD_{0,5}$=	0.95		
Convergent families obtained by non full value hybridization and principles of united transgressive recombination				
10.	O-388/91	35.67±0.35	1.46	4.33
11.	O-521/25	35.2±0,10	0.14	0.45
12.	O-630/32	34.5±0.67	2.03	6.24
14.	O-634/35	34.7±0.49	2.02	6.39
	$TLD_{0,5}$=	0.75		

TLD – the least difference

Experiments carried out on behalf of UZPITI (research institute) located in Kibray district (Uzbekistan). In order to determine productivity, the methods of selection conducted with two different hybridization by means of convergent and complex crossbreeding for obtaining fiber and comparison analysis of them. O-632/36, O-634/35, O-329/30, O-325/26,O-32/35, O-85/90, O-388/91, O-521/26 middle fiberfamiliesinvolvedasthe subject of research. As the control variety was chosen C-6524 cotton cultivar. Determining quality and comparison fiber features of cotton families by means of application of complex and convergent hybridizations was the main aim of this research. Experiments was conducted by methodology of Dospekhov B. and observed the next process and positions: cotton families, phenological observations, resistance to wilt, selection process, selection samples from each site of fields, mathematic and variation statistics and correlation. Fiber features analyzed in according to O'zDSt 604-2001 (Uzbekistan Standart. Org.)

Results and discussions

Intensity and quantity fibers on seed directlyforming the fiber yield and it is the main quantitative feature of cotton plant. In our researches control variety C-6524 had 6,5 gr per one fruitcase and this meaning are less than all materials derived by convergent hybridization and transgressive recombination. O-325/26, O-329/30 and O-32/35 (convergent families with transgressive recombination) families had an average values from 7,2 gr to 7,5 gr. O-521/25 and O-388/91 families (transgressive recombination and inferioritybreeding) illustrates the ranges from 6,8 to 7,4 gr respectively (table-2).In comparison with control variety C-6524, the best results according to the lenght of fiber were observed in O-325/26, O-32/35, O-85/90, O-388/91 and O-521/25 families, which means implementing this families in the subsequent breeding process.

The best results in according to specific tensile strength were observed in O-329/30, O-388/91, O-630/32 O-32/35 and O-521/25 families, the highest average length index was observed in O-388/91, O-32/35 families, by the uniformity index of fiber the best results performed by O-32/35, O-521/25families (table-1).

Basicdirection of the researches considers creation of initial breeding materials with high quality and yield of fiber material for consequence selection processing. That is why all observed new families and lines of cotton plant analyzed in the Centre of cotton quality of the Republic in according to modern standards and requirements. By the way middle fiber cotton varieties should
have the rate of microneire between 3,5-4,8 measurement range. Otherwise the the highest rate of microneire than 4,9 and lowest than 3,5 performing decreasing of the price for this product. O-85/90, O-325/26 and O-329/30 families participated in the research processing has shown the rate of microneire4,1 and 4,2 which is considering very mild material in comparison with control cultivar. Only O-32/35 family has shown the rate of microneire 4,4 which do not response nowadays demanding and processing (table-2).

Indexes of fiber quality in complex and convergent cotton families

table-2

№	Families	Microneire (Mic)	Specific tensile strength, гс/текс (Str)	The highest average length, inches (Len)	Longitudinal homogeneity index. % (Unf)	Fiber index, (g).
	C-6524 (St) Control variety	4.3	37.4	1.28	87.5	6,5±0,11
Convergent families based on the principle of transgressive recombination						
1	O-32/35	4.4±0,04	42.9±0,28	1,28±0,19	88.3±0,15	7.5±0,14
2	O-85/90	4.1±0,05	37.6±0,31	1,21±0,18	87.4±0,13	7.3±0,12
3	O-325/26	4.1±0,04	41.8±0,27	1.26±0,17	87.9±0,18	7.2±0,11
4	O-329/30	4.2±0,09	43.0±0,28	1.20±0,13	86.7±0,17	7.2±0,11
	TLD$_{0,5}$ =	0,80	1,60	0,40	0,51	0,35
Convergent families based on the principle of combined transgressive recombination and incomplete rebreeding						
7	O-	4.2	43.1±	1.31±	88.7±	7.4±0,

	388/91		0,27	0,32	0,11	10
8	O-521/25	4.0	40.2±0,17	1.25±0,33	89.3±0,14	6.8±0,12
9	O-630/32	4.2	42.0±0,24	1.20±0,11	87.5±0,17	7.2±0,10
10	O-634/35	4.3	39.3±0,31	1.21±0,13	86.2±0,15	6.9±0,11
	TLD$_{0,5}$ =	0,85	1,55	0,42	0,50	0,40

TLD – the least difference

The results based on identifying the highest index of specific tensile strength were observed in O-85/90 (37,6 g.pow/tex) and O-329/30 (43,0 g.pow/tex) families created by means of transgressive recombination;O-634/35and O-388/91 families created by means of principles of combined transgressive recombination and inferioritybreeding showed 39,3 (g.pow/tex) and 43,1 (g.pow/tex)respectively. All analyzed families performed the best results in comparison C-6524 cotton cultivar (25 g.pow/tex).

Determined high average length index of fiber equal to 1,20 inches in O-329/30 family and 1,28 inches O-32/35 family (families based on principles of transgressive recombination). families based on the principles of combined transgressive recombination and inferioritybreeding ranges from 1.20 inches (O-630/32) to 1,31 inches (O-388/91) respectively. In the convergent cotton families based on principles of transgressive recombination the fiber uniformity index ranges from 86,7 (O-329/30) to 88,3%(O-32/35); in convergent families based on the principles of combined transgressive recombination and inferioritybreeding ranges from 86,2% (O-634/35) to 89,3%(O-521/25). Index of uniformity in O-32/35and O-521/25 considers implementing this material as the initial samples and application them in breeding process.

Information illustrated below shows comparative effectiveness in improvement of fiber quality based on different principles of convergent hybridization and confirmed that the convergent breeding method is relatively productive method.

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