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Inheritance of Fiber Length and Fiber Output on Interspecies Hybrids F_1 and F_2 of *G. Mustelinum* Miers ex Watt with Interspecies Diversity of *G.Hirsutum* L.

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Abstract: ***Wild G.mustelinum Miers ex Watt. is one of the five tetraploid cotton species, and it spread in the northeastern part of Brazil. Studies of the genetic potential of this species are very rare, because for several decades, as the genetic resources collected to assess the possibilities and use. One of the biological features of this species is to be a large number of substances such as aldehyde and terpenoid in the structure in comparing with other species of plants [8]. In addition, there are number of scientific papers about hydrating elite cultivars of G.mistelinum species in order to improve commercial indices of cultivars [10]. In our research, G.mustelinum Miers ex Watt. species of genetic-breeding research was conducted in order to take advantage of. As a result, the forms of the high cost of fiber length and fiber expenditure were selected.***

Keywords: cotton, species, fiber length, fiber output

1. Introduction

Cotton is one of the more expensive and most important plants. It had been provided human with clothes and some other expensive materials. In early period scientists paid attention to cotton, that's why this plant passed natural and artificial process. There are some important indices in cotton, they are length and output. It's known that, the degree of heredity of characters taken into account during selecting work in breeding process. Length and output of fiber is quantitative character, this characters change according to factors of genotype and environment. If the characters of giving degree generation to generation were strong in this process, the selection works also gets effective [9]. In increasing of the cotton productivity the breeders should know the full information about degrees of relationship, average productive indices of forms which were selected as an object and various agrotechnic events with correlation [7]. According to hereditary potential and condition of producing the length of fiber can be 10 mm to 55 mm in cotton species and interspecies diversity [4]. X.Ashirbekov and E. Muqomov said that, the length of fiber depends on properties of cultivar and agrotechnics which are used in experiments, and characters passed generation to generation with hereditary, it will be smoothly in higher link then inceptive link [3]. Hereditary of the length of fiber were noted according to distance than parents' forms in F_1 hybrids [2].

The ratio of fiber weight to cotton weigh is called fiber output. It depends on fiber's weight and quantity. The fiber output can be 12-15% to 43-44% in different cotton forms [4].

As a quantity character the fiber expenditure surfaced effects of polygene genes and external factor also effected significantly [7].

The main aim of the researches is to learn characteristics of heredity of indices of fiber plant and fiber output in interspecies diversity of G.*hirsutum* L. species and length of hybrid generation of *G.mustelinum* Miers ex Watt. species and to separate expensive forms for practical breeding.

2. Material and Methods

Scientific research had been made during 2011-2015 in laboratory condition and experimental area of Laboratory of Cotton Systematics and Introduction in Institute of Genetic and Plant Experimental Biology of Academy of Science of the Republic of Uzbekistan.

In research wild *ssp.mexicanum var.nervosum* of interspecies diversity of *G.hirsutum* L. tetraploid belonging to *Magnibracteolata* Tod. em.m section of subgenus of *Karpas Raf.* ampl.m. of *Gossypium* L. genus, ruderal *ssp.punctatum*, *ssp.purpurascens var.el-salvador* (West India), cultivated tropic *ssp.paniculatum*, *ssp.glabrum var.marie-galante* (Mexico Ahaco Anonta) and cultivated subtropic «Beshqahramon» cotton cultivar, wild *G.mustelinum* Miers ex Watt. species and F_1, F_2 hybrids which are taken on the basis of interspecies diversity hybrids of *G.hirsutum* L. with *G.mustelinum* Miers ex Watt. species were used as an object.

Perseverance of *G.hirsutum* L. interspecies diversity and *G.mustelinum* Miers ex Watt. species to photoperiod were different, that's why for providing access to blossom and blossoming at the same time and for crossbreeding the artificial short day condition were created, and then plants were growth in Wagner pail and nurtured in short day condition (10 hours lightening) in special photoperiodic houses. Crossbreeding works were carried out in generally accepted methods.

Fiber length was implemented according to measure of each example seeds fiber in special velvet lap-board. Fiber output were found according to accounting ratio of fiber weight and raw materials of cotton in percentage.

Coefficient of dominant was accounted with following G.M.Beil, R.E.Atkins [11] formula in first link hybrids for traits:

$$hp = (F_1\text{-MP})/P\text{-MP};$$

here *hp* -dominate coefficient;
F_1- average arithmetic indices of trait in first link;
MP- average arithmetic indices of trait of parents' form;
P- average arithmetic indices of best paternal or maternal forms;

Trait hereditary were evaluated us follows in first link hybrid: Dominant position not observed (distance) $hp = 0$; A little dominant $0 < hp < 1$; Completely dominant $hp = 1$; Extremely dominant $hp > 1$;

Indices of trait giving to generation were accounted according to S.N.Warner [12] formula in second link hybrid:

$$h^2 = \frac{\delta^2 F2 - \frac{\delta^2 F1 + \delta^2 P1 + \delta^2 P2}{3}}{\delta^2 F2}$$

δ^2F_1- dispersion of F_1 hybrids
δ^2F_2- dispersion of F_2 hybrids
δ^2P_1- dispersion of maternal forms
δ^2P_2- dispersion of paternal forms.

3. Results

Fiber length. For this trait the highest indices *ssp.glabrum var.marie-galante* (35,3 ± 0,7 mm) and «Beshqahramon» cultivar in interspecies diversity of *G.hirsutum* L. species, the lowest indices *ssp.mexicanum var.nervosum* (25,5 ± 0,3 mm) were noted. The fiber length was 34,5 ± 0,5 mm in *G.mustelinum* Miers ex Watt species. Trait variation was small in all parent forms, and it preformed 4,2-7,7% (Table 1).

Various results were taken for fiber length of hybrid plants F_1 which were taken crossbreeding the interspecies diversity of *G.hirsutum* L. species with *G.mustelinum* Miers ex Watt. For example, in F_1 combination of *ssp.mexacanum var.nervosum* x *G.mustelinum* the fiber length was 34,5 ± 0,3 mm, and trait will heridited like completely dominant of higher indicator *G.mustelinum* (*hp* = 1,0). In reciproc combination of F_1 *G.mustelinum* x *ssp.mexicanum var.nervosum* the fiber length was relatively short (31,8 ± 0,4 mm), the heredity through tened in the way of incomplete dominant of *ssp.mexicanum var.nervosum* (*hp* = 0,4). In F_1 *ssp.punctatum* x *G.mustelinum* combination according to fiber length the low indicator maternal form *ssp.punctatum*'s complete dominance (*hp* = -1,0), in reciproc F_1 *G.mustelinum* x *ssp.punctatum* combination incomplete dominance of highest indices maternal forms were noted (*hp* = 0,7). *G.mustelinum* species and «Beshqahraman» cultivar were mutually crossbreed in reciproc F_1 combination for fiber length extremely dominance were observed, and positive heterosis made 105,8-109,3%.

Heredity of fiber length in extremely dominant condition were noted in F_1, *var.el-salvador* x combination, *hp* = 7,33, heterosis was 105,5 in reciproc F_1, *G.mustelinum* x *var.el-salvador* combination contrarily revealed the presence of negative extremely dominance. The trait of fiber length were hereditied in distance of paternal or maternal forms, none of them were preponderant in *G.mustelinum* species combination with *var.marie-galante* (*hp* = 0,0) were seen, in opposite combination it noted positive extreme dominant (*hp* = -2,50).

F_2 generation of hybrid which are getting with crossbreeding of *G.mustelinum* Miers ex Watt. species and *G.hirsutum* L. growth interspecies diversity were growth by growing 176 and 200 plant in the open field condition according to 10 combination. Getting results were learned with dividing into 5 class, from 20,1-25,0 mm till 40,0-45,0. The highest indices was 36,2 ± 0,7 in combination of «Beshqahramon» cultivar x *G.mustelinum* according to fiber length through learned 10 combination. In this, degree of giving traits generation to generation were higher (h^2 = 0,62). F_2 «Beshqahramon» cultivar x *G.mustelinum* combination depend on fiber length 35,1-40,0 mm plants 64%, from reciproc *G.mustelinum* x «Beshqahramon» cultivar combination the plant which fiber length was 35,1-40,0 mm 44,6%, 40,1-45,0 mm plants arranged 5,9%, and then they were taken for the next researches.

According to fiber length the lowest result were noted in F_2 *G.mustelinum* x *var.el-salvador* combination (30,2 ± 0,9 mm). Degree of giving generation to generation the trait was resulted middle (h^2 = 0,42).

In directly and indirectly combination of *ssp.mexicanum var.nervosum*, *ssp. paniculatum*, *var.el-salvador*, *ssp.glabrum var.marie-galante* interspacies diversity of *G.hirsutum* L. and Beshqahramon cultivar with *G.mustelinum* species there were reciproc difference. Like situation were not seen in directly and indirectly combination of this spies with *ssp.punctatum*. We must say that, in combination which had noted reciproc difference, *G.mutelinum* species as a maternal form were shown low indices. As a result using of *G.mutelinum* species as a paternal in crossbreeding is more effective (Diagram 1).

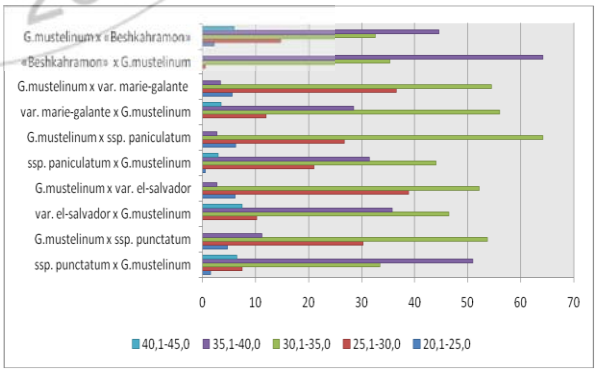

Diagram 1: Variation of fiber length in interspecific hybrids F_2, %

Fiber output

The highest indices of trait of fiber output through diversity of *G.hirsutum* L. was *ssp.punctatum* (36,9 ± 1,2%), and in «Beshqahramon» cultivar (36,5 ± 0,1%) the lowest indices

were noted like *var.nervosum* (17,4 ± 0,4%) form. The fiber output of *G.mustelinum* Miers ex Watt. species were arranged 26,4 -2,0 %. The highest indices of trait of fiber output in F_1 hybrid which are taken crossbreeding of *G.hirsutum* L. interspecies diversity of *G.mustelinum* with each other were noted in F_1 *G.mustelinum* x *ssp.punctatum* (38,6 ± 1,0%) and «Beshqahramon» cultivar x *G.mustelinum* (38,6 ± 0,6%) combinations, the lowest indicator were noted in reciproc combination with *var.nervosum* of *G.mustelinum* (19,2 ± 0,6% and 22,7 ± 2,2%). The lowest indicator were seen in F_1 combination which are taken *var.marie-galante* form and «Beshqahramon» cultivar that using *G.mustelinum* as a maternal form as compared indirectly combination, but in F_1 directly combination which were taken *var.nervosum* and *ssp.punctatum* the highest indices were seen as compared with indirectly combination. For fiber output reciproc differences were defined in directly and indirectly combination of *G.mustelinum* species with *ssp. paniculatum* and *var.el-salvador*.

The fiber expenditure trait were hereditied like positive extreme dominant in F_1 hybrid and maternal form. For example, in F_1 *ssp.puctatum* x *G.mustelinum* combination incomplete dominant of high indicator *ssp.punctatum* on the contrary combination positive extremere dominant were noted. In complete dominant of low fiber output of *ssp.mexicanum var.nervosum* were seen in F_1 *var.nervosum* x *G.mustelinum* combination and on the contrary combination incomplete dominant of high fiber output *G.mustelinum* were seen. Positive heterosis results were noted combination of *G.mustelinum* x *ssp.paniculatum*, *ssp.paniculatum* x *G.mustelinum*, *var.marie-galante* x *G.mustelinum, G.mustelinum* x *var.marie galante* (13,9%; 132,2%; 137,3%; 120,1%).

Fiber output of F_2 generation of F_1 hybrid which were taken crossbreeding of *G.hirsutum* L. interspecies diversity with *G.mustelinum* Miers ex Watt. species were divide into 7 classes from 20,1-25,0% to 50,0-55,0%.

Table 1: Fiber length and fiber output

Parental forms and hybrid combinations	Fiber length, mm				Fiber output, %			
	$\bar{x} \pm S\bar{x}$	limit	V %	-	$\bar{x} \pm S\bar{x}$	limit	V %	-
1	2	3	4	5	6	7	8	9
Parental forms								
ssp.mexicanum var.nervosum	25,5 ± 0,3	24,0-27,0	4,2	-	17,4 ± 0,4	15,3-20,0	8,4	-
ssp punctatum	33,8 ± 0,8	30,0-38,0	7,7	-	36,9 ± 1,2	33,3-43,7	10,6	-
var.el-salvador	33,9 ± 0,7	31,0-39,0	7,2	-	31,8 ± 0,01	28,1-35,4	10,0	-
ssp.paniculatum	31,6 ± 0,6	29,0-36,0	6,5	-	25,3 ± 0,7	22,7-28,9	9,1	-
ssp. glabrum var.marie-galante	35,3 ± 0,7	32,0-38,0	6,4	-	26,8 ± 0,7	23,0-31,5	8,5	-
Beshkahramon cultivar	34,3 ± 0,4	32,0-37,1	4,4	-	36,5 ± 0,1	33,3-42,4	9,3	-
G.mustelinum Miers ex Watt.	34,5 ± 0,5	32,3-37,0	5,0	-	26,4 ± 2,0	15,5-35,5	24,6	-
F_1 (*G.hirsutum* L. x *G.mustelinum* Miers ex Watt.)								
ssp.mexicanum var.nervosum x *G.mustelinum*	34,5 ± 0,3	32,5-36,3	2,7	1,00	19,2 ± 0,6	14,2-22,2	10,8	-0,60
G.mustelinum x *ssp.mexicanum var.nervosum*	31,8 ± 0,4	29,6-33,6	4,3	0,40	22,7 ± 2,2	10,0-33,3	31,9	0,24
ssp.punctatum x *G.mustelinum*	33,8 ± 0,8	30,0-36,6	7,5	-1,00	33,1 ± 0,8	29,4-37,0	8,1	0,28
G.mustelinum x *ssp.punctatum*	34,4 ± 0,5	32,1-38,3	5,0	0,71	38,6 ± 1,0	30,0-42,4	8,9	1,32
var.el-salvador x *G.mustelinum*	36,4 ± 1,0	31,0-40,6	9,0	7,33	30,9 ± 1,5	23,4-38,4	15,7	0,67
G.mustelinum x *var.el-salvador*	33,5 ± 0,6	31,0-36,6	6,2	-2,33	33,2 ± 0,9	29,4-37,1	8,5	1,52
ssp.paniculatum x *G.mustelinum*	33,5 ± 0,6	30,0-36,6	6,2	0,31	36,4 ± 2,0	22,8-42,5	17,9	19,1
G.mustelinumx ssp.paniculatum	30,6 ± 1,6	23,6-35,6	16,5	-1,69	34,9 ± 1,0	30,0-40,7	10,5	16,4
ssp.glabrum var.marie-galante x *G.mustelinum*	33,9 ± 0,5	31,0-36,6	4,8	-2,50	36,8 ± 0,9	30,7-42,8	8,1	51,0
G.mustelinum x *ssp.glabrum var.marie-galante*	34,9 ± 0,3	33,3-36,3	3,0	0,00	32,2 ± 0,4	30,7-33,3	4,1	28,0
Beshkahramon cultivar x *G.mustelinum*	37,7 ± 0,4	36,6-40,6	3,4	33,0	38,3 ± 0,6	34,2-40,9	5,5	1,36
G.mustelinum x Beshkahramon cultivar	36,5 ± 0,5	34,3-39,0	4,6	21,0	34,6 ± 0,7	30,3-37,8	6,5	-0,62
F_2 (*G.hirsutum* L. x *G.mustelinum* Miers ex Watt.)								
ssp.punctatum x *G.mustelinum*	35,1 ± 1,1	23,5-43,0	10,2	0,60	34,1 ± 1,6	24,1-48,2	14,5	0,24
G.mustelinum x *ssp.punctatum*	31,1 ± 1,0	23,6-38,5	10,1	0,07	35,0 ± 1,8	21,4-48,1	16,2	0,38
var.el-salvador x *G.mustelinum*	34,9 ± 1,0	28,3-42,5	9,2	0,38	32,2 ± 1,5	24,2-42,9	15,3	0,10
G.mustelinum x *var.el-salvador*	30,2 ± 0,9	23,7-35,3	9,7	0,42	32,5 ± 1,4	21,8-42,0	13,4	0,07
ssp.paniculatum x G.mustelinum	33,4 ± 1,1	24,3-41,2	11,2	0,73	34,1 ± 1,5	21,4-50,8	14,5	0,08
G.mustelinum x *ssp.paniculatum*	31,0 ± 0,9	22,6-35,7	9,8	0,14	30,0 ± 1,4	20,6-43,6	15,3	0,10
ssp.glabrum var.marie-galante x *G.mustelinum*	33,5 ± 1,0	27,2-41,7	9,4	0,67	32,2 ± 1,4	20,2-41,9	14,3	0,24
G.mustelinum x *ssp.glabrum var.marie-galante*	30,4 ± 0,9	24,2-36,8	9,4	0,59	30,0 ± 1,1	21,8-39,5	11,9	0,11
Beshkahramon cultivar x *G.mustelinum*	36,2 ± 0,7	30,0-39,9	6,5	0,62	41,2 ± 1,8	30,2-52,6	14,4	0,61
G.mustelinum x Beshkahramon cultivar	34,5 ± 1,3	24,3-40,5	12,0	0,06	37,6 ± 1,7	26,0-52,1	14,7	0,50

Average indicator of trait was from 32,9 ± 1,6% to 41,2 ± 1,8%, variation coefficient was 14,0-15,5%. The highest fiber output were seen in F_2 «Beshqahramon» and reciproc combination of *G.mustelinum* species in directly combination average indicator was 41,2 ± 1,8%, changing degrees of trait was 14,4%, on the contrary combination it was 37,6 ± 1,7% and 14,7%. The higher length and output of fiber of expensive genotype were chosen in research and nowadays it is used in genetic and breeding research (Diagram 2).

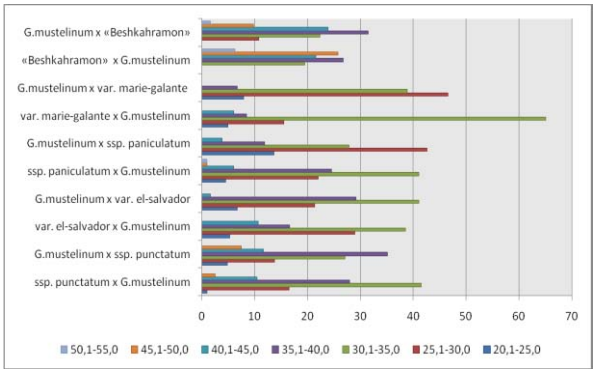

Diagram 2: Variation of fiber output in interspecific hybrids F_2. %

4. Conclusion

To sum up we have to emphasis that by conducted experiment of heredity traits (fiber output and fiber length) giving from generation to generation mainly by atom have dominant feature and by effect of cytoplasm leads recessive gene control.

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