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RESULTS OF THE FIRST BACKCROSSING OF F_2 HYBRIDS WITH GENETIC MALE STERILITY (GMS) FOR INDICATORS OF ECONOMICALLY VALUABLE TRAITS

BOTIR BALKIBAEVICH AMANTURDIEV
candidate of agricultural sciences.
(Tashkent State Agrarian University)

ALISHER BALKIBAEVICH AMANTURDIEV
doctor of agricultural sciences.
(Research institute for breeding, seed production and agricultural technology for cotton growing.

And

SHAVKAT BALKIBAEVICH AMANTURDIEV
candidate of agricultural sciences.
(Doctoral student, Tashkent State Agrarian University

Abstract

The article presents the results of the first backcrossing of F_2 hybrids with genetic male sterility (GMS) for indicators of economically valuable traits. The influence of the genotypes of our varieties was very significant. The backcrossing results were analyzed according to the length of the growing season, the yield of fiber, the length of the fiber, the mass of raw cotton in one box, micronaire and the susceptibility to wilt involving backcrossing hybrid combinations or involving domestic cotton varieties C-6524, C-2609, Omad, An-512, An Bayavut-2, 108-F, Bukhara-6 and Indian variety specimens with a sign of genetic male sterility S-5001, S -5003, S-5007, S-5095, S-5097. The researchers set the goal of studying the effect of genotypes after the first backcrossing in F_2. The best of the 35 combinations studied, the 34th combination with the participation of the Omad variety was the most precocious, in combination with fiber No. 2, 7, 24 and 28 they showed a rather high yield at the level of 34-35%., in combination with No. 7 along the fiber length , 14, 21, 23 had a fiber length of 34 mm and above. The most large-boxed plants were hybrid combinations under No. 7, 8, 15, 21, 22 and 29, in which this indicator was higher than 6 g. By micronaire in our studies, 4 and 33 combinations turned out to be such hybrids.

Key words: genetic male sterility, pollen fertility, pollen sterility, variety, hybrid combination, backcross, box size, verticilliosis wilt, micronaire, fiber length, growing season, cotton.

Cotton is a universal culture; its products are used in many industries. But mainly these plants are cultivated for the sake of fiber, which is a valuable raw material for the textile industry. To meet the growing demand of the textile industry for high-quality cotton fiber, it is necessary to create and introduce into production more mature, productive, high-quality fibers that are resistant to diseases and pests, adapted for mechanized processing and harvesting new varieties of cotton. The success of plant breeding largely depends on the targeted selection of parental pairs for hybridization.

The length of the growing season, the yield of fiber, the length of the fiber, the mass of raw cotton in one box, micronaire and susceptibility to wilt are the most important economically valuable traits.

Research Methodology

The studies were carried out at the research institute for selection, seed production and agricultural technology of cotton growing, located in the north-east of Tashkent with coordinates 41º22 ’north latitude and 60º54’ east longitude. Studies were conducted in the laboratory of genetics of cotton immunity. The experiments were laid against a heavily infected natural wilt background, where for many years a monoculture of cotton was cultivated.

For research, hybrid combinations involving domestic cotton varieties C-6524, C-2609, Omad, An-512, An Bayavut-2, 108-F, Bukhara-6 and Indian variety samples with a sign of nuclear male sterility S were involved in backcrossing -5001, S-5003, S-5007, S-5095, S-5097. The laying of nurseries of hybrid F_2 combinations (where backcrossing was performed) was carried out against a heavily infected natural wilt background, in triplicate, four rows, twenty-hole plots according to the mother-hybrid-father principle (sowing scheme 90 x 20 x 1). Backcrossing was carried out on 50 flowers for each hybrid combination.

Research results

As can be seen from the table, the influence of the genotypes of our varieties was very significant. The backcrossing results were analyzed according to the length of the growing season, the yield of fiber, the length of the fiber, the mass of raw cotton in one box, micronaire and the susceptibility to wilt. Of the 35 combinations studied, the 34th combination involving the Omad variety, which is one of the most mature varieties of local selection, turned out to be the most precocious. And the latest combination turned out to be the 4th combination, where the An-Bayaut-2 variety (146 days) was used as a tester. In other hybrid combinations, the length of the growing season ranged from 135 to 145 days. Due to the relative late maturity of a number of local varieties, such as Bukhara-6 and others, backcross hybrids did not show sufficient precocity.

In general, given the late maturity of Indian specimens, we can say that the first backcross hybrids inherited the early maturity of local varieties. The fiber yield in Indian and local forms did not differ much from each other, therefore, the indices of this trait ranged from 32 to 35%. Thus, backcrossing did not significantly affect the fiber yield, but combinations nos. 2, 7, 24, and 28 showed a rather high fiber yield of 34–35%. As you know, all cotton-growing countries create varieties with fiber quality that meet the requirements of the world standard. Both Indian and local forms with type V fiber quality had fiber lengths of 32 to 34 millimeters. Therefore, the results of the first backcrossing are difficult to judge by the improvement of this feature. At the same time, the fiber length indices for Bukhara-6 and C-6524 were in some cases at the level of F_1 hybrids. Combinations nos. 7, 14, 21, 23 and others had a fiber length of 34 mm and above.

The size of the boxes is one of the main elements of plant productivity. This indicator in Indian samples was significantly lower than indices of local varieties. The first backcross hybrids had the size of the boxes higher than that of Indian samples approaching the indices of domestic varieties. The most large-boxed plants were hybrid combinations under No. 7, 8, 15, 21, 22 and 29, in which this indicator was higher than 6 g.

Micronaire, as well as fiber length, is one of the main parameters of fiber quality. As you know, micronaire over 5 is unacceptable for the textile industry. In our studies, 4 and 33 combinations turned out to be such hybrids, and the micronaire of Indian samples and local varieties corresponded to world standards.

Uzbekistan is one of the foci of the emergence and spread of new races of verticillium fungus, and since studies were carried out against a heavily infected wilt background, all Indian samples were susceptible to this disease. This is due to the fact that all existing verticillium fungal pathotypes common in Uzbekistan are apparently absent in India. If the wilt susceptibility was evaluated on a 5-point scale, then the wilt susceptibility of the first 4 backcross hybrids was no higher than 4 points.

Conclusion

Of the 35 combinations studied, the 34th combination involving the Omad variety, which is one of the most mature varieties of local selection, turned out to be the most precocious. And the latest combination turned out to be the 4th combination, where the An-Bayaut-2 variety (146 days) was used as a tester. The fiber yield in Indian and local forms did not differ much from each other, therefore, the indices of this trait ranged from 32 to 35%. Thus, backcrossing did not significantly affect the fiber yield.

The first backcross hybrids had the size of the boxes higher than that of Indian samples approaching the indices of domestic varieties. The most large-boxed plants were hybrid combinations under No. 7, 8, 15, 21, 22 and 29, in which this indicator was higher than 6 g. The index of micronaire after the first backcrossing in F2 in Indian samples and local varieties was consistent with international standards. All Indian specimens were susceptible to verticillium wilt. This is due to the fact that all existing verticillium fungal pathotypes common in Uzbekistan are apparently absent in India.

Table:

Results of the first backcrossing on indicators of economically valuable attributes

№	Hybrid combinations F_2B_1	Vegetable length days	Output fiber, %	Fiber length, mm	The size of the boxes, g.	Micronaire	Affect wilt. point
1	2	3	4	5	6	7	8
1.	F_2(S-5001xC-2609) x C-2609	142	34.6	33.4	5.5	4.3	4.3

2.	F_2 (S-5001xC-6524) x C-6524	145	35.2	32.8	5.0	4.5	4.6
3.	F_2 (S-5001x AN-512) x AN-512	139	33.9	32.4	5.3	4.9	3.9
4.	F_2 (S-5001xAN-Bayavut-2) x AN-Bayavut-2	146	34.8	30.9	5.1	5.0	4.0
5.	F_2 (S-5001x108F) x 108F	137	35.0	32.0	5.7	4.6	4.0
6.	F_2 (S-5001xOmad) x Omad	135	34.9	33.0	5.5	4.5	4.2
7.	F_2 (S-5001xBukhara-6) x Bukhara-6	144	35.5	33.4	6.0	4.2	3.8
8.	F_2 (S-5003xC-2609)x C-2609	141	32.4	32.6	6.1	4.3	3.9
9.	F_2 (S-5003x C-6524) x C-6524	144	32.8	32.0	4.7	4.7	4.2
10.	F_2 (S-5003x AN-512) x AN-512	140	33.1	31.8	5.2	4.6	4.4
11.	F_2 (S-5003x AN-Bayavut-2) x AN-Bayavut-2	143	32.0	31.6	5.0	4.9	4.4
12.	F_2 (S-5003x108F) x 108F	140	33.5	32.0	4.9	4.8	4.6
13.	F_2 (S-5003xOmad) x Omad	136	33.3	33.1	5.3	4.4	4.0
14.	F_2 (S-5003x Bukhara-6) x Bukhara-6	142	34.0	33.4	5.8	4.3	3.8
15.	F_2 (S-5007x C-2609) x C-2609	137	33.8	33.0	6.1	4.2	3.6
16.	F_2 (S-5007x C-6524) x C-6524	140	32.5	32.9	5.4	4.5	4.0
17.	F_2 (S-5007x AN-512) x AN-512	142	34.0	31.7	5.0	4.8	3.8
18.	F_2 (S-5007x AN-Bayavut-2) x AN-Bayavut-2	140	33.8	31.0	5.0	4.7	3.8
19.	F_2 (S-5007x108F) x 108F	139	32.4	32.9	5.2	4.9	4.2

20.	F_2 (S-5007xOmad) x Omad	133	33.5	33.5	5.7	4.4	3.7
21.	F_2 (S-5007x Bukhara-6) x Bukhara-6	145	33.5	34.0	6.0	4.3.	4.4
22.	F_2 (S-5095x C-2609) x C-2609	137	34.0	33.1	6.0	4.3	3.6
23.	F_2 (S-5095x C-6524) x C-6524)	140	34.6	33.6	4.8	4.6	4.0
24.	F_2 (S-5095x AN-512) x AN-512	142	35.1	32.7	5.0	4.6	4.2
25.	F_2 (S-5095xAN-Bayavut-2) x AN-Bayavut-2	143	34.3	31.8	5.0	4.9	4.5
26.	F_2 (S-5095x108F) x 108F	140	33.9	32.0	5.2	4.9	4.5
27.	F_2 (S-5095xOmad) x Omad	135	34.7	33.7	5.9	4.4	4.1
28.	F_2 (S-5095x Bukhara-6) x Bukhara-6	144	34.4	33.8	5.9	4.4	4.0
29.	F_2 (S-5097x C-2609) x C-2609	136	30.8	34.0	6.1	4.1	3.7
30.	F_2 (S-5097x C-6524) x C-6524	138	31.5	33.8	5.5	4.4	3.9
31.	F_2 (S-5097x AN-512) x AN-512	138	32.4	31.6	5.2	4.7	4.0
32.	F_2(S-5097x AN-Bayavut-2)x AN-Bayavut-2	140	33.3	32.0	4.9	4.7	3.5
33.	F_2 (S-5097x108F) x 108F	139	32.8	32.3	5.0	5.0	3.8
34.	F_2 (S-5097xOmad) x Omad	133	32.6	32.9	5.8	4.7	3.9
35.	F_2(S-5097x Bukhara-6)x Bukhara-6	142	31.8	33.5	5.9	4.5	3.5
	LSD_{05} 2.7	0.78	0.69	0.38	0.25	0.16	

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