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Resistance of Reciprocal Cotton Hybrids of F_1-F_2 Generation to Different Races of Verticillary Wilt

D. Kh. Akhmedova[1], A. A. Azimov[2], A. A. Narimanov[3]

Abstract: ***In this research, it was studied the character of medium-fiber cotton lines' resistance to the races A and B of the verticillary wilt and characteristics of inheritance of this trait in hybrids of the F_1-F_2generation. As a result of investigations on artificially infected races "A" and "B" of the verticillary wilt, it was established that the initial parental lines obtained with the participation of the wild diploid species of cotton G.trilobumSkovsted and the hybrid plants obtained with their participation were more resistant to the races "A and "B" of the verticillary wilt than the lines that participated as cross-breeding components and had intervarietalgenology. It is proposed usage of introgressive lines in breeding, aimed at improving cotton resistance to wilt.***

Keywords: cotton, wilt, race, hybrid, resistance

1. Introduction

Cotton growing in Uzbekistan is a leading branch of agriculture. Products of this crop are widely used in light, food, pharmaceutical, automobile industries and other sectors of the economy.

Therefore, there is still an urgent need to find new genetic-selection methods for creating cotton varieties that are highly resistant to dangerous infectious diseases in combination with high indicators of economically valuable traits.

In genetic - breeding research of cotton, it is very relevant and promising the method of distant interspecific hybridization.

2. Literary Research

According to the data of Abdullaev A.A. and Omel'chenko M.V. (1973), many wild cotton species have some positive qualities that are absent in cultivated varieties. They note that forobtaining new varieties and forms that combine a complex of valuable traits, it is necessary not only to know this diversity, but also to skillfully use it for practical purposes.

Abdullayev A.A., Kliat V.P., Rizayeva S.M., Ernazarova Z.A., Kuryazov Z.B., Arslanov D.M. (2006) report that the genus *Gossypium* has 50 representatives, 45 of which are diploids. They indicate a weak use of the potential of wild species and forms of cotton in the selection of this valuable technical crop.

Namazov Sh.E. (2006) notices that many cultivated cotton varieties with high readings of a complex of economically-valuable traits are created on the basis of intragenomic and inter-varieties of crosses. In this connection, he argues that the creation of a genetically enriched breeding material based on attracting wild species of cotton present in the gene pool and using them in practical breeding is an important task of modern genetics and cotton breeding.

At the breeding of new cotton varieties with high productivity, precocity, disease resistance, with good fiber qualities, involvement in hybridization opens up great prospects along with common varieties, of wild and ruderal varieties. Arutyunova L.G. (1989) reports that synthetic tetraploids are valuable donors for use in backcrosses with varieties and breeding lines in transferring the beneficial qualities of wild species to cultural forms.

Alikhodzaeva S.S. (1980) argues that at the present stage, the most effective measure to fight against verticillary wilting is immune and highly tolerant varieties. Egamberdiyev A.E. (1980) considers that the search and selective use of other wild species with resistance to wilt and other diseases, pests, short-term frost, water, nutrient and salt stresses is necessary.

3. Problem Identification

Study of the genetics of wilt resistance in medium-fiber cotton is one of the main fundamental problems of breeding of this crop, the solution of which will make it possible to create new varieties of cotton combining wilt resistance with a complex of economically valuable traits.

The aim of our research is to research the stability of the original parental forms of cotton to races "A" and "B" of a verticillary wilt and the nature of inheritance of wilt resistance in hybrids of the F_1 - F_2generation of cotton.

4. Methodological Approach

As the material for research introgressive and intraspecific lines of cotton were served. Investigations were conducted on non-infected and artificially infected races "A" and "B" of verticillary wilts backgrounds in a lysimetric experience. Seeds of the original parental forms and reciprocal hybrid cotton F_1 - F_2 generations were planted in optimal (20-25th of April) agrotechnical periods.

At the end of the vegetation period (5-10th October), the degree of damage of races "A" and "B"verticillary wilts by4-point system was determined by cutting the seedbed leaf of the main stem of plants of parental forms and hybrids of cotton F_1 - F_2 generation: (mildly affected, moderately affected, highly affected, healthy plants)

5. Results and Discussion

Resistance to race "A" of verticillary wilt of parental forms plants and cotton hybrids of F1 - F2 generation.

The initial parent forms of IL-440, IL-3568, L-47, L-454, L-606 and reciprocal hybrids of the first generation of cotton on the verticillary wilt artificially infected with race "A" were affected in a mild, moderate and strong degree (Table 1).

Thereby, in the introgressive parental forms of IL-440 and IL-3568, obtained with the participation of the wild diploid species of cotton *G.trilobum* Skovsted, on the artificially infected race "A" of the verticillary wilt, the total number of registered plants ranged from 23 to 25 pieces, of which the number of healthy plants in the first year (together with F_1) and in the second year (together with F_2) of tests, respectively, was 17; 15 15 and 16 pcs. or as a percentage, amounted to 70.8; 60.0% and 64.0; 62.5%; mildly affected plants were 1; 2 pcs. and 2; 1 pc., or in percent accounted for 4.2; 8.0% and 8.0; 4.2%; in average, the affected plants were 3; 3 pcs. and 4; 3pcs., or a percentage of 12.5; 12.5% and 16.0; 12.5% , the heavily affected plants were 3; 5 pcs and 3; 5 pcs., or as a percentage were 12.5; 20.0% and 12.0; and 20.8%. In allotetraploid (*G.hirsutum* L.) parental forms L-47, L-454, L-606, the number of healthy plants in the first year (together with F_1) and in the second year (together with F_2) of tests, respectively, was 5; 3; 4 pcs. and 4; 3; 5 pieces, or in percent made 21,7; 12.0; 16.0% and 16.0; 12.5; 20.0%; weakly affected plants were 7; five; 6 pcs. and 6; 5; 3 pieces, or in percent made 30,4; 20.0; 24.0% and 24.0; 20.8 and 12.0%; moderately affected plants were 5; 8; 6 pcs. and 4; 7; 4 pcs., or in percent made up 21.8; 32.0; 28.0%; 6 plants were severely affected; 9; 8 pieces and 11; 9; 12 pieces, or in percent made 26,1; 36.0; 32.0%.

As it can be seen from the obtained data, the introgressive initial parental forms of IL - 440 and IL – 3568 that were obtained with the participation of the wild diploid species of cotton *G.trilobum* Skovsted, significantly differ in their high resistance to race "A" of the verticillary wilt, compared to cultural allotetraploid lines - L - 47, L - 454, L - 606 (Table 1, 2).

In the reciprocal hybrids of the first and second generations of cotton, received from crossing of introgressional allotetraploid lines, on the artificially infected race "A" verticillary wiltbackground, the total number of registered plants was from 24 to 25 pieces, of which in F_1 and F_2 in hybrids the number of healthy plants, respectively, ranged from 15 to 17, and from 14 to 17, or as a percentage, ranged from 60.0 to 75.0%, and from 56.0 to 68.0%; mildly affected plants ranged from 1 to 3, and from 1 to 4, or as a percentage, from 4.0 to 12.0%, and from 4.0 to 16.0%; moderately affected plants ranged from 2 to 5, and from 2 to 5, or as a percentage from 8.3 to 20.0%, and from 8.0 to 20.0%; and to a highly affected plants ranged from 2 to 4, and from 2 to 5, or as a percentage, from 8.0 to 16.7%, and from 8.0 to 20.0%. (Table 1, 2).

Herewith, the control crop (*G.hirsutum* L.) of cotton AN - Bayaut 2 on an artificially infected race "A" of a verticillarywilt background, the total number of examined plants was 25 pieces, of which the number of healthy plants was 7 and 5 pcs., or in percent accounted for 28.0 and 20.0%; the number of weakly affected plants was 5 and 4, or as a percentage it was 20.0 and 16.0%; the number of moderately affected plants was 7 and 7, or as a percentage it was 28.0 and 28.0%; andthe number of highly affected plants was 6 and 9, or as a percentage it was 24.0 and 36.0%. (Table 1). As the results of the research show, the sign of resistance to race "A" of a verticillary wilt, in the offspring of reciprocal F_1-F_2, cotton hybrids, is inherited from the introgressive IL-440, IL-3568 of the original parental forms of cotton by the type of incomplete dominance

Resistance to race "B" of verticillary wilt of plants of parental forms and cotton hybrids of F_1 - F_2 generation.

At investigation of the resistance of plants of the original parental forms and reciprocal F_1 - F_2 cotton hybrids to race "B" verticillary wilt, the total number of registered plants of parental forms and hybrids of the first and second generations of cotton varied from 24 to 25 pieces. (Table 3, 4).

Obtained results of research have shown that the initial parental forms differ significantly in their resistance and different degrees of susceptibility of the race "B" of verticillary wilt. Thus, the number of healthy plants in the original parental forms of IL - 440, IL - 3568, L - 47, L - 454, L - 606 in the first year (together with F_1) and in the second year (together with F_2) tests, respectively, were counted 16; 14; 4; 6; 5 pcs. and 14; 16; 5; 6; 4 pcs., or in percent amounted to 64.0; 56.0; 16.0; 24.0; 20.0% and 56.0; 64.0; 20.8; 24.0; 16.0%;, the number of weakly affected plants 2; 4; 6; 3; 4 pcs. and 3; 2; 4; 3; 5 pcs., or in percent was 8.0; 16.0; 24.0; 12.0; 16.0% and 12.0; 8.0; 16.7; 12.0; 30.0%;, the number of moderately affected plants was 5; 4; 8; 7; 8 pieces and 5; 3; 7; 9; 7 pcs., or as a percentage was 20.0; 16.0; 33.3; 28.0; 32.0%; to a large extent, the number of highly affected plants was 3; 3; 7; 9; 8 pieces and 2; 4; 7; 6; 9 pcs., or as a percentage was 12.0; 12.0; 29.2; 36.0; 32.0%. As can be seen from the obtained research results, the parental forms and the control cotton variety AN-Bayaut-2 are also affected by the race "B" in a weak, medium and strong degree (Table 3).

In the second year of trials for resistance to race "B", the total number of registered plants in parental forms and hybrids of the second generation of cotton ranged from 24 to 25 pieces. (Table 4).

Obtained results of the research have shown that the initial parental forms differ significantly in their resistance and different degrees of susceptibility of the race "B" of verticillary wilt. Thus, the number of healthy plants in the original parent forms of IL - 440, IL - 3568, L - 47, L - 454, L - 606 in the first year (together with F_1) and in the second year (together with F_2) trials, respectively, were counted 16; 14; 4; 6; 5 pcs. and 14; 16; 5; 6; 4 pcs., or in percent amounted to 64.0; 56.0; 16.0; 24.0; 20.0% and 56.0; 64.0; 20.8; 24.0; 16.0%; the number of weakly affected plants 2; 4; 6; 3; 4 pcs. and 3; 2; 4; 3; 5 pcs., or in percent was 8.0;

16.0; 24.0; 12.0; 16.0% and 12.0; 8.0; 16.7; 12.0; 30.0%; the number of moderately affectedplants

5 ;4; 8; 7; 8 pcs and 5; 3; 7; 9 pcs., or as a percentage was 20.0; 16.0; 33.3; 28.0; 32.0%; to a large extent, the number of highly affected plants was 3; 3; 7; 9; 8 pcs and 2; 4; 7; 6; 9 pcs., or as a percentage was 12.0; 12.0; 29.2; 36.0; 32.0%.

6. Conclusion

Using in the selection of the wilting resistance of introgressive cotton lines and the quality of parental forms athybridization in breeding of cotton resistance allows to obtain forms that are highly resistant to races “A” and “B”verticillary wilt.

References

[1] Abdullayev A.A., Omel’chenko M.V. Dikiye vidy kak iskhodnyy material dlya vyvedeniya kompleksoustoychivykh sortov khlopchatnika. Respublikanskiy simpozium po viltoustoychivosti khlopchatnika. (17 - 20 sentyabrya, 1973 g. Tashkent), izd-vo «Fan» UzSSR, Tashkent, 1973. S. 19 - 20.
[2] Abdullayev A.A., Klyat V.P., Rizayeva S.M. i dr. vozmozhnosti ispol’zovaniya dikorastushchikh sorodichey khlopchatnika dlya uluchsheniya i sozdaniya kul’tiviruyemykh sortov. Materialy mezhdunarodnoy nauchno - prakticheskoy konferentsii «Sostoyaniye selektsii i semenovodstva khlopchatnika i perspektivy yeyo razvitiya». Tashkent, 2006. S. 5 - 8.
[3] Arutyunova L.G. Mezhvidovaya gibridizatsiya - istochnik sozdaniya iskhodnogo materiala dlya selektsii i popolneniya genofonda khlopchatnika. Tashkent, 1989. S. 48 - 50.
[4] Alikhodzhayeva S.S. Ustoychivost’ dikikh vidov khlopchatnika k razlichnym rasam griba vertitsillium. Sb.: Voprosy genetiki, selektsii i semenovodstva khlopchatnika. Vypusk 18, Tashkent, 1980. S. 3 - 8.
[5] Namazov S.H. Perspektivy sozdaniya novogo iskhodnogo materiala na osnove 4-5 genomnoy gibridizatsii dlya ispol’zovaniya ikh v selektsii khlopchatnika. Mater. Mezhd. nauchn.-prakt. konf. «Sostoyaniye selektsii i semenovodstva khlopchatnika i perspektivy yeyo razvitiya». Tashkent, 2006. S. 14-15.
[6] Egamberdiyev A.E. Mezhvidovaya gibridizatsiya khlopchatnika, kak metod sozdaniya kompleksoustoychivykh k viltu i sosushchim vreditelyam iskhodnogo selektsionnogo materiala. Materialy XIII Vsesoyuzn. koord. soveta po genetike, selektsii i semenovodstvu khlopchatnika. Izd - vo MSKH RUz., 1980. S. 97-111.

Table 1: Resistance of parental forms and reciprocal hybrids of F_1 cotton for race to race “A” verticillary wilt

Research material	n	Resistance to race “A” wilt, points			
		0	I	II	III
		pcs. / %	pcs. / %	pcs. / %	pcs. / %
IL - 440	24	17/70,8	1/4,2	3 / 12,5	3/12,5
IL-3568	25	15/60,0	2/8,0	3/12,5	5/20,0
L-47	23	5/21,7	7 / 30,4	5/21,8	6/26,1
L-454	25	3 /12,0	5 / 20,0	8/32,0	9/36,0
L-606	25	4/16,0	6 / 24,0	7/28,0	8/32,0
IL - 440 x L - 47	25	15/60,0	3 / 12,0	5/20,0	2/8,0
L - 47 x IL - 440	24	16/66,7	1/4,1	3 /12,5	4/16,7
IL - 440 x L - 454	25	15/60,0	2/8,0	4/16,0	4/16,0
L - 454 x IL - 440	25	17/68,0	2/8,0	4/16,0	2/8,0
IL -440 x L -606	25	17/68,0	1/4,0	3/12,0	4/16,0
L - 606 x IL - 440	25	16/64,0	2/8,0	3/12,0	4/16,0
IL - 3568 x L - 47	25	15/60,0	3 / 12,0	4/16,0	3/12,0
L - 47 x IL - 3568	25	17/68,0	1/4,0	3/12,0	4/16,0
IL -3568 x L -454	25	16/64,0	1/4,0	4/16,0	4/16,0
L - 454 x IL -3568	24	18/75,0	1/4,2	2/8,3	3/12,5
IL -3568 x L-606	25	15/60,0	3/12,0	5/20,0	2/8,0
L - 606 X IL -3568	25	17/38,0	2/8,0	4/16,0	2/8,0
AN - Bayaut 2 - control	25	2/8,0	5/20,0	8/32,0	10/40,0

Table 2: Resistance of parental forms and reciprocal hybrids of F_2 cotton to race A of verticillary wilt

Research material	n	Resistance to race “A” wilt, points			
		0	I	II	III
		pcs. / %	pcs. / %	pcs. / %	pcs. / %
IL - 440	25	16/64,0	2/8,0	4/16,0	3/12,0
IL-3568	24	15/62,5	1/4,2	3/12,5	5/20,8
L-47	25	4/16,0	6 / 24,0	4/16,0	11/ 44,0
L-454	24	3 / 12,5	5/20,8	7 / 29,2	9/37,5
L-606	25	5 / 20,0	3 /12,0	4/16,0	12/48,0
IL - 440 x L - 47	25	16/64,0	2/8,0	4/16,0	3 /12,0
L - 47 x IL - 440	25	14/56,0	4/16,0	3 / 12,0	4/16,0
IL - 440 x L - 454	25	17/68,0	1 /4,0	5/20,0	2/8,0
L - 454 x IL - 440	24	15/62,5	2/8,3	4/16,7	3/12,5
IL -440 x L -606	25	15/60,0	4/4,0	5/20,0	4/16,0
L - 606 x IL - 440	25	16/64,0	2/8,0	4/16,0	3/12,0

IL - 3568 x L - 47	25	14/56,0	3/12,0	4/16,0	4/16,0
L - 47 x IL - 3568	24	15/62,5	2/8,4	5/20,8	2/8,3
IL -3568 x L -454	25	17/68,0	2/8,0	3 / 12,0	3/12,0
L - 454 x IL -3568	25	16/64,0	1/4,0	4/16,0	4/16,0
IL -3568 x L-606	25	15/60,0	2/8,0	3 /12,0	5/20,0
L - 606 X IL -3568	25	17/68,0	2/8,0	2/8,0	4/16,0
AN - Bayaut 2 - control	25	3/12,0	6 / 24,0	7 / 28,0	9/36,0

Table 3: Resistance of parental forms and reciprocal hybrids of F_1 cotton to race to race "B" verticillary wilt

Research material	n	Resistance to race "B" wilt, points			
		0	I	II	III
		pcs. / %	pcs. / %	pcs. / %	pcs. / %
IL - 440	25	16/64,0	2/8,0	3 /12,0	4/16,0
IL-3568	25	14/56,0	4/16,0	2/8,0	5 / 20,0
L-47	25	4/16,0	6 / 24,0	7/28,0	8/32,0
L-454	25	6/24,0	3 / 12,0	8/32,0	8/32,0
L-606	25	5/20,0	4/16,0	7/28,0	9/36,0
IL - 440 x L - 47	25	14/56,0	3 / 12,0	3 /12,0	5/20,0
L - 47 x IL - 440	25	17/68,0	2/8,0	3 /12,0	3/12,0
IL - 440 x L - 454	25	15/60,0	3/12,0	3 /12,0	4/16,0
L - 454 x IL - 440	24	14/58,3	2/8,3	4/16,7	4/16,0
IL -440 x L -606	25	16/64,0	3/12,0	2/8,0	4/16,0
L - 606 x IL - 440	25	17/68,0	2/8,0	3 /12,0	3/12,0
IL - 3568 x L - 47	25	17/68,0	3/12,0	3 /12,0	2/8,0
L - 47 x IL - 3568	25	15/60,0	2/8,0	4/16,0	4/16,0
IL -3568 x L -454	25	16/64,0	2/8,0	3/12,0	4/16,0
L - 454 x IL -3568	25	14/56,0	3 / 12,0	3 /12,0	5/20,0
IL -3568 x L-606	25	15/60,0	2/8,0	4/16,0	4/16,0
L - 606 X IL -3568	25	15/60,0	3/12,0	2/8,0	5/20,0
AN - Bayaut 2 - control	25	2/8,0	3/12,0	7/28,0	13/52,0

Table 4: Resistance of parental forms and reciprocal hybrids of the F_2 generation cotton to the race "B" of the verticillary wilt

Research material	n	Resistance to race "B" wilt, points			
		0	I	II	III
		pcs. / %	pcs. / %	pcs. / %	pcs. / %
IL - 440	25	14/56,0	3 /12,0	5 / 20,0	3/12,0
IL-3568	25	16/ 66,7	2/8,3	4/16,7	2/8,3
L-47	24	5/20,0	4/16,0	8/32,0	7/28,0
L-454	25	6/25,0	3/12,0	7 / 28,0	9/36,0
L-606	25	4/16,0	5/20,0	8/32,0	8/32,0
IL - 440 x L - 47	25	16/64,0	2/8,0	4/16,0	3 / 12,0
L - 47 x IL - 440	25	14/56,0	4/16,0	2/8,0	5 / 20,0
IL - 440 x L - 454	25	16/64,0	2/8,0	3 /12,0	4/16,0
L - 454 x IL - 440	25	15/ 62,5	3 / 12,5	5/20,8	2/8,2
IL -440 x L -606	24	15/60,0	4/16,0	2/8,3	3 /12,0
L - 606 x IL - 440	25	14/56,0	3 /12,0	5/20,0	3 /12,0
IL - 3568 x L - 47	25	15/60,0	2/8,0	6 / 24,0	2/8,0
L - 47 x IL - 3568	24	16 / 66,7	3/12,5	2/8,3	3 /12,0
IL -3568 x L -454	25	15/60,0	3/12,0	4/16,0	3/12,0
L - 454 x IL -3568	25	14/56,0	4/16,0	4/16,0	3/12,0
IL -3568 x L-606	25	17/68,0	2/8,0	2/8,0	4/16,0
L - 606 X IL -3568	25	15/60,0	3/12,0	5/20,0	2/8,0
AN - Bayaut 2 - control	25	2/8,0	5/20,0	8/32,0	10/40,0