

The Inheritance of Valuable Economic Traits Abroad and In Our Republic in The Conditions of Moderately Saline Soil and Climate of Karakalpakstan And the Infection of F3 Hybrid Families of Cotton with Wilt

Zholymbetova R.M.

PhD student, Karakalpak Institute of Agriculture and Agrotechnologies, Uzbekistan

Received: 25 Jan 2026 | Received Revised Version: 15 Feb 2026 | Accepted: 28 Feb 2026 | Published: 15 Mar 2026

Volume 08 Issue 03 2026 | Crossref DOI: 10.37547/tajabe/Volume08Issue03-02

Abstract

In the world, modern methods of genetics and breeding science are effectively used to create new cotton varieties and increase their sown areas. According to the United Nations, more than 1.5 billion people in the world face serious difficulties due to food shortages due to soil degradation in agricultural lands. The area of irrigated land in the republic is 4.3 million hectares, of which 44.7 percent are of varying salinity, including 31.0 percent are slightly saline, 11.9 percent are moderately saline, and 1.9 percent are highly saline. Therefore, the samples studied in this article are aimed at creating varieties that yield high and quality yields in saline soils by crossing collection samples brought from cotton origin centers with local varieties in moderately saline soil-climatic conditions of Karakalpakstan and creating initial material for selection based on the analysis of economically valuable traits of their offspring.

Keywords: Cotton collection, varieties and lines, Fusarium wilt disease, Verticillium dahliae Kleb, fiber quality, ecologically and geographically distant variety, early-maturing, productive, high fiber yield and fiber quality.

© 2026 Zholymbetova R.M.. This work is licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0). The authors retain copyright and allow others to share, adapt, or redistribute the work with proper attribution.

Cite This Article: Zholymbetova R.M. (2026). The Inheritance of Valuable Economic Traits Abroad and In Our Republic in The Conditions of Moderately Saline Soil and Climate of Karakalpakstan And the Infection of F3 Hybrid Families of Cotton with Wilt. The American Journal of Agriculture and Biomedical Engineering, 8(03), 6–9. <https://doi.org/10.37547/tajabe/Volume08Issue03-02>

1. Introduction

In more than 80 cotton-growing countries of the world, cotton is sown annually on an area of about 33 million hectares. In particular, the leading countries in cotton production are China (6.4 million tons), India (6.1 million tons), the USA (3.2 million tons), Africa (2.5-3 million tons), Australia (1.2 million tons), Pakistan (981 thousand tons) and Uzbekistan (940 thousand tons). Using cotton samples from these countries, the creation of new cotton varieties and starting materials suitable for

the soil and climatic conditions of the new region, resistant to soil salinity, early-maturing, resistant to diseases and pests, high-yielding, with high fiber quality that meets the requirements of world standards, is one of the urgent tasks.

In cotton breeding, early-ripening, high-yielding, wilt-resistant lines and varieties that meet modern requirements, possessing fiber quality that meets international standards, are of great importance.

In our republic, in saline soil and climatic conditions,

such scientists as R.A.Azimov, S.S.Sadikov, T.Kudayberdiev, Kh.Munasov, A.B.Amanturdiyev, O.E.Kuchkarov, B.N.Norov, V.Bocharova, E.B.Abdurakhmanov, Zh.I.Saidov, Kh.E.Abdurakhmanov, V.A.Avtonomov, S.S.Alikhodzhaeva, S.A.Rakhmonkulov, S.A.Usmanov, Kh.Kh.Jalolov conducted genetic and breeding research based on various types of hybridization using foreign and local cotton varieties and samples, and this work continues to this day.

But, using new varieties and lines created directly in our republic, based on the hybridization of foreign varieties and samples with local varieties, studies on combining early-maturing, productive, disease-resistant, and fiber type IV traits in one genotype have been conducted very little. Therefore, in our country, the creation of new, early-ripening, high-yielding varieties and raw materials resistant to moderately saline soil conditions is an important task.

Currently, the increasing level of soil salinity on Earth remains one of the main environmental problems. According to statistics, today one-third of all irrigated land in the world is increasingly saline to varying degrees [2; 715-719].

Saline soils are more common in regions with hot and dry climates, where chloride, sulfate, and carbonate salts of sodium, calcium, and magnesium are found. Salt soils can be chloride-sulfate, sulfate-chloride, chloride, sulfate, or carbonate based on the ratio of anions. In such soils, the main cations are sodium and calcium, and magnesium carbonates and magnesium chlorides are also found. Of these salts, sodium carbonate (Na_2CO_3) and sodium bicarbonate (NaHCO_3) have the most harmful effects on plants [3; Pp. 23-24].

Negative factors, such as the reduction of suitable land in agriculture and global climate change, increase the demand of clusters and farms for salt-tolerant cotton varieties, as well as other varieties of agricultural crops. To eliminate these factors, the creation of salt-tolerant, fast-ripening, productive breeding material with fiber quality that meets the requirements of the international market is of great importance. In this regard, scientists of the laboratory "Selection of Water Deficiency and Salt-Resistant Cotton Varieties" of the Research Institute of Irrigation and Agricultural Mechanization of the Republic of Uzbekistan recommended the use of the SP-7702 medium-fiber cotton variety, which is resistant to stress factors, early-maturing, has the best indicators of

fiber yield and fiber quality, micronaire, fiber length, specific breaking load, and fiber uniformity, and has a high boll opening rate, as a starting material in research on genetics and breeding [6; Pp. 5-6].

Research by foreign scientists on cotton wilt diseases. Scientists from Clemson University, Cotton Incorporated in the USA, and CSIRO (Commonwealth Scientific and Industrial Research Organisation) in Australia are collaborating on the creation of cotton varieties resistant to Fusarium wilt. These studies are aimed at faster detection of Fusarium wilt and faster cultivation of resistant varieties. [3; 41-43p.].

Verticillium wilt mainly affects medium-fiber cotton varieties. Its causative agent is the soil fungus *Verticillium dahliae* Kleb. Verticillium wilt is one of the most common and dangerous diseases of cotton, known in all cotton-growing countries of the world. The disease is widespread not only in our republic, but also in the countries of Central Asia, where cotton of the species *G. hirsutum* L. is cultivated, as well as in the USA, China, and Iran. In addition, wilt is widespread in North and South America, Africa, Australia, Europe, and Asia. According to their many years of experience, as a result of distant hybridization, new lines were created that showed superiority in complex traits over Australian samples [7; Pp. 21-22].

Verticillium wilt disease is present in all cotton-growing regions of the world and is one of the most common and dangerous diseases of cotton. The disease is widespread not only in our republic, but also in the countries of Central Asia, the USA, China, and Iran, where cotton varieties of the species *G.hirsutum*.L. are cultivated. In addition, wilt is widespread in North and South America, Africa, Australia, Europe, and Asia, as evidenced by the works of a number of authors. *Verticillium dahliae* Kleb. fungi have been a major problem for a hundred years. As a result of cotton damage by biotic and abiotic factors, up to 30-50% of the yield is lost, which leads to a deterioration in the quality of cotton fiber.

2. Methods of Conducting the Experiment

The scientific research was conducted in the field and laboratory conditions of the Karakalpak Research Institute of Agriculture[1]. The Institute is located 4 km northeast of the city of Chimbay, 430-440 north latitude, in the territory of the Chimbay district of the Republic of Karakalpakstan. The purpose of the research is to create early-ripening, productive raw materials with type IV

fiber based on the hybridization of collected varieties and samples from China, Africa, Australia, India, Pakistan, and the USA with local varieties, available in the cotton collection under moderately saline soil and climatic conditions of Karakalpakstan, and to recommend them for practical selection. Hybrids of the F₃ generation, planted according to the samples, parental forms, and the variety C-4727 were planted as a standard. All field observations were carried out according to the methods of conducting field experiments. In particular, in the field experiment, phenological observations of morphobiological traits and field and laboratory analyses of economically valuable traits were carried out. The results obtained on the basis of the experiments were statistically processed according to the method of B.A. Dospikhov [5]. In this case, the obtained indicators for each characteristic were mathematically analyzed.

3. Results and Discussion

The influence of various biotic and abiotic factors leads

to a decrease in yield and a decrease in the quality of the harvest. Resistance to wilt, one of the main diseases of cotton, is also an important economically valuable trait. In recent years, breeding scientists have conducted numerous studies aimed at solving this problem and have created initial forms and varieties resistant to wilt disease. However, the emergence of new races of wilt requires continuous research on this problem. Therefore, increasing the resistance of cotton varieties to wilt using initial materials of different heredity is an important task. In the experiments, by comparing ecologically and geographically distant cotton varieties, samples, local varieties, and the F₃ hybrid families obtained with their participation with the standard variety C-4727, it was established that in the conditions of moderately saline soils of Karakalpakstan, wilt is commonly and severely. In the experimental field, observations were conducted on a total of 300 plants from 3 locations, 100 plants each, with a general and moderate degree of infection with this disease (see Table 1).

Table 1

Infection of F₃ hybrid cotton families with *Vyverticilium dahlia* Kleb under moderately saline soil conditions of Karakalpakstan

| Parental forms and F ₃ hybrid families | Number of plants | General damage | Severe damage |
|---|------------------|----------------|---------------|
| | Grain | Percent | Percent |
| (China) 06058 | 300 | 5,0 | 3,0 |
| (Africa) 06201 | 300 | 7,0 | 4,0 |
| (Australia) 06830 | 300 | 4,0 | 2,0 |
| (Australia) 09801 | 300 | 5,0 | 2,0 |
| (Pakistan) 07291 | 300 | 8,0 | 5,0 |
| (USA) 011571 | 300 | 4,0 | 2,0 |
| KK-3535 | 300 | 3,0 | 1,0 |
| Chimbay-5018 | 300 | 4,0 | 1,0 |
| Sultan | 300 | 6,0 | 3,0 |
| F ₃ (China. 06058 x KK-3535) | 300 | 3,0 | 1,0 |
| F ₃ (Africa. 06201 x Chimboy-5018) | 300 | 5,0 | 3,0 |
| F ₃ (Australia. 06830 x Chimboy-5018) | 300 | 4,0 | 1,0 |
| F ₃ (Australia. 09801 x KK-3535) | 300 | 2,0 | - |
| F ₃ (Pakistan. 07291 x KK-3535) | 300 | 5,0 | 3,0 |
| F ₃ (USA. 011571 x Sulton) | 300 | 3,0 | 1,0 |

| | | | |
|-------------------|-----|------|-----|
| <i>St. C-4727</i> | 300 | 11,0 | 6,0 |
|-------------------|-----|------|-----|

It was established that the general degree of wilt infection in foreign varieties and samples ranged from 4.0 percent to 06830 Australia and 011571 USA, up to 8.0 percent, 07291 Pakistan, and the severe degree of wilt infection was up to 5.0 percent, while in local varieties the general degree of wilt infection ranged from 3.0 percent in the KK-3535 variety, up to 6.0 percent in the Sultan variety, and up to 3.0 percent in the severe degree. In the conditions of moderately saline soils of Karakalpakstan, it was noted that the foreign variety 06830 Australia and sample samples 011571 USA from the parental forms, and the local variety KK-3535 from the local varieties were somewhat more resistant to wilt disease compared to other parental forms.

In the conditions of moderately saline soils of Karakalpakstan, the total susceptibility to wilt in F3 hybrids obtained with the participation of foreign varieties, samples, and local varieties increased from 2.0% in F3 (Australia. 09801 x KK-3535), up to 5.0% in F3 (Africa. 06201 x Chimbay-5018) and F3 (Pakistan. 07291 x KK-3535), and severe damage was observed up to 3.0%. In the standard variety C-4727, damage to the general degree was 11.0%, and to the strong degree - 6.0%.

4. Conclusion

1. As a result of selective breeding of several years of main economically valuable traits in F3 hybrids, F3 (China. 06058 x KK-3535), F3 (Australia. 06830 x Chimbay-5018), F3 (Australia. 09801 x KK-3535) and F3 (USA. 011571 x Sultan) were more resistant to wilt than the parent forms and other hybrids, as well as the standard variety.

2. As a result of selection, it was established that wilt infection in most hybrids was 3-4 times higher than in the standard variety. As a result of the research, new wilt-resistant, early-maturing, productive families with high fiber yield and type IV fiber quality were identified.

References

1. Zholymbetova R.M., Aytjanov U.Y., Aytjanov B.U. Variational analysis of fiber quality indicators in G3 hybrid families under moderately saline soil and climatic conditions of Karakalpakstan. "Science and innovation" International scientific journal. Volume 4, Issue 5, May. 2025. Issn: 2181-

3337/ Scientists.uz. B. 9-13.

<https://doi.org/10.5281/zenodo.15478752>.

- Ahmad S., N.I. Khan, M.Z. Iqbal, A. Hussain and M. Hassan. 2002. Salt tolerance of cotton (*Gossypium hirsutum* L.). Asian Journal of Plant Sciences 1: P.715-719.
- Razanov N.A. Development and current state of secondary soil salinization in the Pakhtaaraal state farm. An. USSR. 1948. P. 23-24.
- Zhang. Z. Different genotypes and diseases of Fusarium wilt of cotton. Crop Science Volume 48, Number 3. 2008. P.41-43.
- Dospekhov B.A. Methodology of Field Experiment. Moscow, Agropromizdat. 1985. 351 p.
- Qo'chqarov O. Fiber quality indicators of the studied cotton lines and F3 hybrids under saline soil conditions. Agro ilm. journal. Special number. Tashkent. 2019. P.5-6.
- Ibragimov P. Sh., Yergashev B., Yergesheva S. Selection of cotton resistant to wilt based on distant hybridization. Agro ilm journal. Tashkent 2019. P.21-22.