

# INFLUENCE OF SUSPENSION WITH STRAINS OF *FUSARIUM OXYSPORUM F.SP. VASINFECTUM* AND *AZOTOBACTER CHROOCOCCUM* ON THE GERMINATION OF COTTON VARIETIES (*GOSSYPIUM HIRSUTUM L.*)

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**Abstract.** In this article, the pathogenic fungus *Fusarium oxysporum f.sp. vasinfectum* and *Azotobacter chroococcum* strains of cotton (*Gossypium hirsutum L.*) seeds of "Gulbahor-2", "Afsona", "UzFA-709", "Sadaf", "Bukhoro-102" varieties permeability and germination were compared. It was determined that the cotton seed germination rate and seed germination power were 25-30% higher in the variants using the *Azotobacter chroococcum* strain.

**Keywords:** *Fusarium oxysporum f.sp. vasinfectum (FOV)*, *Azotobacter chroococcum*, cotton (*Gossypium hirsutum L.*) varieties.

## Introduction

Cotton (*Gossypium hirsutum L.*) is an important crop grown in more than 80 countries around the world. Without effective control measures, its productivity can be reduced by up to 70% due to major pests. *Fusarium wilt* is one of the most economically destructive diseases of cotton globally, with *Fusarium oxysporum f.sp. vasinfectum* being the primary pathogen. This disease can significantly reduce cotton yields in regions such as Africa, Asia, the United States, South America, and Oceania. The parasite phase of the pathogen in the plant or its saprophytic phase in the soil likely emerges from plant residues after harvest. The spread of this pathogen in cotton seeds ranges from 0.6% to 47%. To prevent such situations, it is crucial to reduce the amount of pathogenic infection in plant materials, including seeds, seedlings, and others. Recently, using bacterial strains from the genus *Azotobacter* to enhance the physiological properties of plants has shown promising results.

The aim of this research was to study the effect of suspensions of *Fusarium oxysporum f.sp. vasinfectum* and *Azotobacter chroococcum* strains on the germination of various cotton varieties.

## Materials and Methods

**Bacterial and Fungal Strains.** This study used suspensions of *Azotobacter chroococcum* and *Fusarium oxysporum f.sp. vasinfectum* strains maintained in the Biotechnology and Nanotechnology laboratory collection. These strains were cultured in traditional liquid Ashby and Chapek nutrient media. To intensively produce EPS and metabolites, the strains were incubated in nutrient media for 5 days at 28-30°C with a rotation speed of 150-180 rpm.

Experiments to study the effect of strains on seed germination were conducted in a laboratory setting using Petri dishes and pots. Seeds of cotton (*Gossypium hirsutum L.*) varieties "Gulbahor-2", "Afsona", "UzFA-709", "Sadaf", and "Bukhoro-102" were inoculated in three variants:

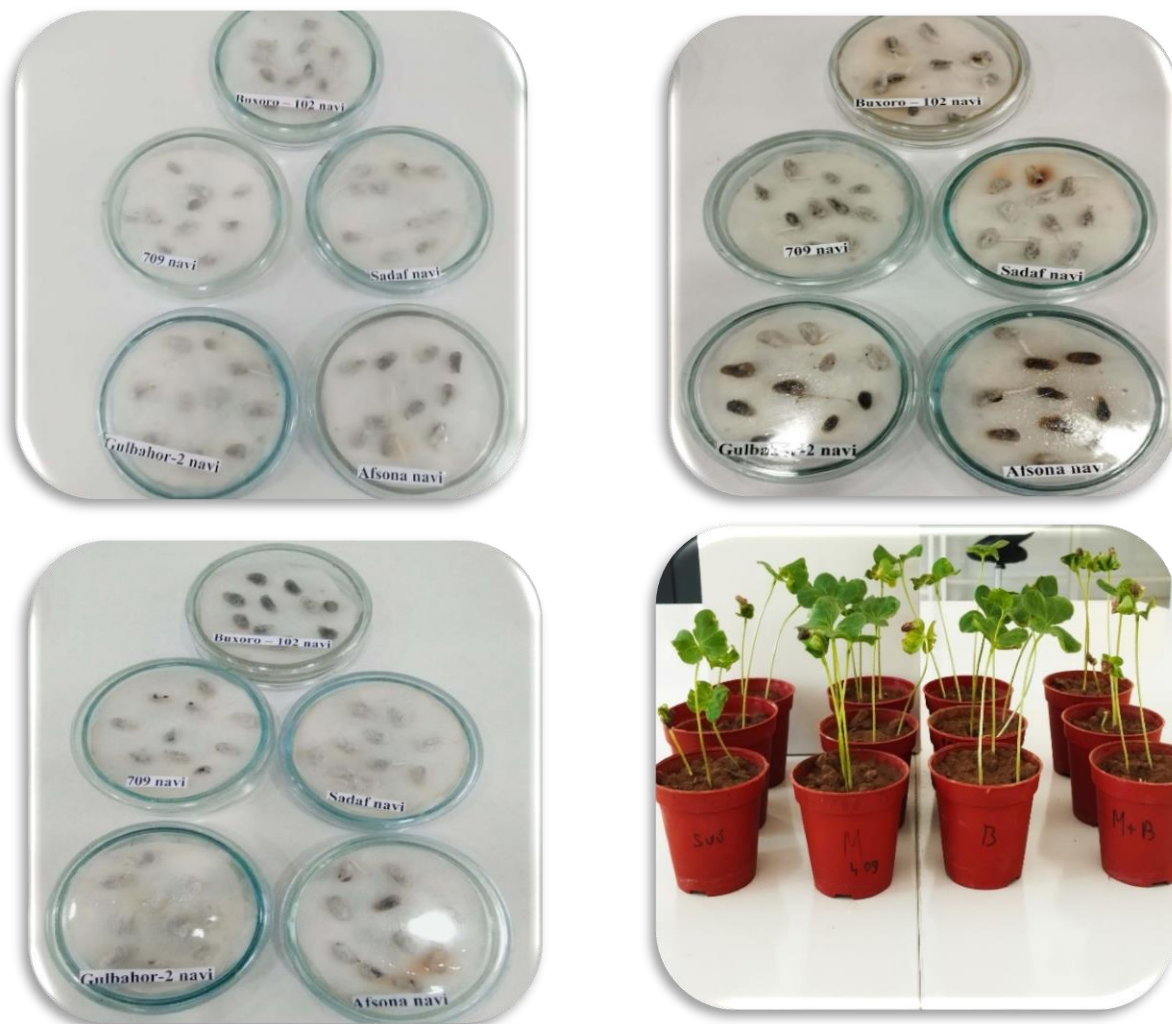
1. Seeds + water (Control)

2. Seeds + *A. chroococcum* (Experiment-1)
3. Seeds + *Fusarium oxysporum* f.sp. *vasinfectum* (Experiment-2)
4. Seeds + *F. oxysporum* f.sp. *vasinfectum* + *A. chroococcum* (Experiment-3)

Seeds in the control variant were soaked in distilled water, while seeds in Experiment-1, Experiment-2, and Experiment-3 were soaked in a 1:10 ratio of culture liquid for 3 days at room temperature.

### Results

The germination of inoculated cotton seeds was observed until two true leaves appeared. On the fifth day, seeds inoculated with *Fusarium oxysporum* f.sp. *vasinfectum* (Experiment-2) and the control variant germinated more slowly compared to seeds inoculated with *A. chroococcum* (Experiment-1). Significant differences were observed in the number of germinated seeds and the length of the seedlings, especially in "UzFA-709", "Sadaf", and "Bukhoro-102" varieties.



**Figure 1: Germination process of cotton varieties:**

**a) Seeds + water (Control)**

**b) Seeds + *A. chroococcum* (Experiment-1)**

**c) Seeds + *Fusarium oxysporum* f.sp. *vasinfectum* (Experiment-2)**

From the figure, it is clear that seeds inoculated with *A. chroococcum* (Experiment-1) germinated more actively compared to others. Seeds inoculated with *Fusarium oxysporum* f.sp. *vasinfectum* (Experiment-2) germinated very slowly compared to the control.

*Table 1*

*Germination of cotton (*Gossypium hirsutum* L.) varieties inoculated with *Fusarium oxysporum* f.sp. *vasinfectum* and *A. chroococcum* strains.*

| № | Variety Name | Number of Germinated Seeds % |              |              | Length of Germinated Seedling cm |              |              | Seed Germination Power |              |              |
|---|--------------|------------------------------|--------------|--------------|----------------------------------|--------------|--------------|------------------------|--------------|--------------|
|   |              | Control                      | Experiment-1 | Experiment-2 | Control                          | Experiment-1 | Experiment-2 | Control                | Experiment-1 | Experiment-2 |
| 1 | Gulbahor-2   | 70                           | 80           | 40           | 1,2±0,0<br>9                     | 2,1±0,5<br>3 | 1,1±0,1<br>2 | 84                     | 168          | 44           |
| 2 | Afsona       | 80                           | 90           | 40           | 0,7±0,0<br>8                     | 1,8±0,2<br>1 | 0,6±0,0<br>6 | 56                     | 162          | 24           |
| 3 | O'zFA-709    | 60                           | 80           | 60           | 1,2±0,1<br>1                     | 2,0±0,6<br>4 | 1,0±0,0<br>8 | 72                     | 160          | 60           |
| 4 | Sadaf        | 90                           | 100          | 60           | 0,2±0,0<br>3                     | 1,0±0,0<br>9 | 0,8±0,7<br>6 | 72                     | 100          | 48           |
| 5 | Buxoro-102   | 100                          | 90           | 30           | 0,3±0,0<br>5                     | 1,9±0,8<br>1 | 0,1±0,1      | 30                     | 171          | 3            |

**Note:** Seed germination power was calculated as the number of germinated seeds (%) multiplied by the average length of the germinated seedling.

The germination of seeds was higher in "Gulbahor-2", "Afsona", and "Buxoro-102" varieties. Experiments showed that the germination of cotton seeds inoculated with the pathogenic fungus *F. oxysporum* f.sp. *vasinfectum* and *A. chroococcum* strain was 25-30% higher when using the *A. chroococcum* strain. This strain not only positively affected the growth and development of certain cotton varieties but also played an important role in partially mitigating the negative effects of *F. oxysporum* f.sp. *vasinfectum*.

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