

# Fungal Species Isolated From Tomato Seeds Under The Conditions Of The Republic Of Karakalpakstan And Their Significance In Disease Epidemiology

Dauletmuratova Gulzada Satbay kizi

PhD student, Institute of Agriculture and Agrotechnologies of Karakalpakstan, Uzbekistan

Nuraliev Khamra Khaydaralievich

Professor, Tashkent State Agrarian University, PhD in Biology, Uzbekistan

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**Abstract:** This study investigates the species composition and infection rates of phytopathogenic fungi associated with tomato seeds under the agro-climatic conditions of the Republic of Karakalpakstan. Six fungal species were isolated and identified, with *Fusarium oxysporum* f. sp. *lycopersici* exhibiting the highest infection rate. These findings provide a scientific basis for field evaluation of fungicides and support the development of seed health management strategies to improve tomato production.

**Keywords:** Tomato, seedborne pathogens, fungus, infection rate, seed health.

**Introduction:** Seedborne diseases play a critical role in the epidemiology of plant pathogens, as seeds frequently act as primary reservoirs of infection. Historical research, including early phytopathological studies dating back to the 1750 s, demonstrated the importance of treating infected seeds with chemical agents to reduce fungal contamination (Rapilly Frantz, 2001) [4].

Subsequent research by N. Naumov., A. Semenov., M. Khokhryakov., M. Ablazova., D. Zuparova., S. Khasanov and others further confirmed the seedborne transmission of *Fusarium* wilt, *Verticillium* wilt, *Alternaria* leaf spot, *Cladosporium* leaf mold, and many other economically important diseases [5–10].

Recognizing the importance of seedborne inoculum, this study aimed to isolate and identify fungal pathogens associated with tomato seeds and determine their infection rates under the conditions of Karakalpakstan.

## METHODS

The study was conducted at the Laboratory of Plant Protection and Quarantine, Karakalpakstan Institute of Agriculture and Agrotechnologies; the laboratories of

the F.N. Rusanov Botanical Garden of the Academy of Sciences of Uzbekistan; and tomato-growing farms specializing in commercial production.

To identify fungal species, morphological analyses were performed using an N-300M (MD101) trinocular microscope. Seedborne fungal species were determined using standard phytopathological identification keys and accepted diagnostic protocols [1–3].

### 1 Moist chamber test

Seed health assessment was carried out using the moist chamber method (Naumov, 1937). Four replications were prepared, each consisting of 10 sterile Petri dishes. Ten surface-sterilized tomato seeds were placed in each dish and incubated at 25–27 °C. Moisture was monitored every three days.

After ten days, mycelial growth emerging from seeds was transferred to nutrient media in Petri dishes. Pure fungal cultures were subsequently inoculated into slants and incubated for seven days for final identification.

## RESULTS

**Table 1**  
**Incidence of Seedborne Fungal Pathogens in Tomato Seeds, expressed as a percentage**  
**(2023–2024)**

No	Fungal species isolated from tomato seeds	Infection rate of tomato seeds by fungal species, %
1	<i>Alternaria solani</i>	8,4
2	<i>Botrytis cinerea</i>	7,2
3	<i>F. oxysporum</i> f.sp. <i>lycopersici</i>	18,4
4	<i>Fusarium solani</i>	12,1
5	<i>Fusarium sp.</i>	4,8
6	<i>Penicillium stoloniferum</i>	4,6
Total:		6 ta

#### 1 Infection rates

The highest infection rate was observed in *F. oxysporum* f. sp. *lycopersici* (18.4%), followed by *F. solani* (12.1%) and *A. solani* (8.4%). The incidence of *B. cinerea* reached 7.2%, while *P. stoloniferum* showed the lowest infection level at 4.6%.

These data indicate that tomato seeds serve as a significant reservoir of fungal inoculum.

#### DISCUSSION

The dominance of *Fusarium* species among isolated fungi suggests a high risk of *Fusarium* wilt outbreaks in tomato fields in Karakalpakstan. Seedborne *Fusarium* species are known to reduce seed germination, weaken seedlings, and cause pre- and post-emergence damping-off.

The presence of *Alternaria solani* and *Botrytis cinerea* also poses a threat, particularly under high humidity conditions, contributing to early blight and gray mold development.

Low-level contamination by *Penicillium stoloniferum* indicates minimal risk but still highlights the importance of monitoring storage fungi in seed lots.

#### CONCLUSION

The results demonstrate that tomato seeds in the Republic of Karakalpakstan are contaminated with six fungal species, with the highest infection rates recorded for *Fusarium oxysporum* f. sp. *lycopersici* (18.4%), *Fusarium solani* (12.1%), and *Alternaria solani* (8.4%).

Seedborne pathogens significantly reduce seed germination, cause seed decay in soil, decrease field emergence, and ultimately reduce crop yield.

Therefore, prior to sowing, tomato seeds should be treated with thermal methods or microbiological/chemical seed treatment agents to suppress seedborne infections and improve seed health and field performance.

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