

Viability and Fungal Infection in Treated and Untreated Seeds of Cucumber (*Cucumis sativus*) and Garden Pea (*Pisum sativum*)

¹Prathibha. K. Y, ²Rizwana, ³Naushin Sabha, ⁴Aathiya Vanekar, ⁵Marhoob Banu

¹Professor, ^{2,3,4,5} Research Scholar
Department of Botany
Maharani Cluster University
Palace Road, Bengaluru, Karnataka, India
Corresponding author: Marhoob Banu

Abstract- Seed viability and fungal infections are critical factors influencing the successful germination and growth of plants. The present study investigates the viability and occurrence of fungal infections in untreated and treated seeds of garden pea (*Pisum sativum*) and cucumber (*Cucumis sativus*). The study aimed to assess the impact of seed treatment on seed viability and the prevalence of fungal pathogens in the seeds. The seeds were subjected to germination tests, and fungal isolation and identification techniques were employed to determine the fungal infection rates. The results of seed viability and the incidence of fungal infections were recorded, providing valuable insights for seed treatment strategies and crop management practices.

Keywords: Seed viability, Fungal infections, *Pisum Sativum*, *Cucumis sativus*, crop management practices

INTRODUCTION

Cucumber is a member of cucurbitaceae.¹ Cucumber is a highly nutritious fruit that contains a significant amount of water. Consumption of cucumber can potentially contribute to reducing blood sugar levels, preventing constipation, and aiding in weight loss. In order to fully harness the health advantages offered by cucumber, it is advisable to consume the peel as well.²

The pea (*Pisum sativum*), commonly known as the garden pea, is an herbaceous annual plant belonging to the Fabaceae family.³ It is cultivated extensively across the globe for its edible seeds. Peas are available in fresh, canned, and frozen forms, while dried peas are frequently utilized in soups. Certain pea varieties, such as sugar peas and snow peas, bear edible pods that can be consumed either raw or cooked, resembling green beans. These types of peas are particularly popular in East Asian cuisines. Growing pea plants is relatively straightforward, and their seeds offer a valuable source of protein and dietary fiber.⁴

Seed quality, including viability and freedom from fungal infections, is crucial for successful plant establishment and crop production. Untreated seeds may carry pathogens, reducing germination rates and compromising plant health. Seed treatments, such as chemical and biological treatments, are commonly used to enhance seed quality and protect seeds from fungal infections. The present research study aims to assess the fungal infection rates and seed viability in treated and untreated seeds garden pea and cucumber seeds.

METHODOLOGY

2.1 Seed Collection and Treatment:

Untreated seeds and treated seeds with fungicides were collected from IIHR, Bengaluru, Karnataka, India.

2.2 Viability Test:

A germination test was conducted using a standard blotting method. A specific number of untreated and treated seeds were sown in triplicates on moistened filter paper in Petri dishes. The dishes were placed in a controlled environment with optimal temperature and lighting conditions. Water was added daily to maintain moisture content till seven days. The germination percentage was calculated on seventh day.

2.3 Fungal Isolation and Identification:

Fungal isolation was performed on both untreated and treated seeds to determine the presence and prevalence of fungal infections. The seeds were surface-sterilized, arranged in triplicates on moistened filter paper in Petri dishes and incubated under suitable conditions for fungal growth. Fungal colonies were isolated and identified using standard morphological techniques.

RESULTS

All the treated cucumber seeds were germinated while in untreated cucumber seeds 1 did not germinate. Similarly, no fungal infection was seen in treated cucumber seeds while untreated cucumber seeds were infected with *Aspergillus niger*, *Fusarium* and *Rhizopus*.

In treated garden pea seeds, 4 did not germinate while in untreated garden pea seeds, all the seeds germinated. Treated seeds were free from fungal infection while untreated seeds were affected by fungi. Fungal isolation and identification revealed the presence of various fungal pathogens in untreated seeds. However, the incidence of fungal infections was less in treated seeds. Common fungal pathogens such as *Fusarium*, *Chaetomium globosum*, *Rhizopus* and *Aspergillus* were identified in the untreated seeds.

Pigeon pea was also subjected to viability test and fungal pathogen screening. Pigeon pea was very sensitive to moisture and showed higher contamination with fungal pathogens and insects.⁸



Fig 1: Contaminated pigeon pea

Table 1: Percentage of germination and infection in treated cucumber seeds

SL no.	No. Of seeds in petriplate	No. Of seeds germinated	No. Of seeds infected	No. Of seeds not infected	Percentage of germination	Percentage of infection
1.	25	25	0	25	100%	0%
2.	25	25	0	25	100%	0%
3.	25	25	0	25	100%	0%
4.	25	25	0	25	100%	0%

Table 2: Percentage of germination and infection in untreated cucumber seeds

SL no.	No. of seeds in petriplate	No. Of seeds germinated	No. Of seeds infected	No. Of seeds not infected	Percentage of germination	Percentage of infection
1.	25	25	0	25	100%	0%
2.	25	25	1	24	100%	4%
3.	25	25	0	24	100%	0%
4.	25	25	0	24	100%	0%

Table 3: Percentage of germination and infection in treated garden pea seeds

SL no.	No. Of seeds in petriplate	No. Of seeds germinated	No. Of seeds infected	No. Of seeds not infected	Percentage of germination	Percentage of infection
1.	10	4	0	10	40%	0%
2.	10	10	0	10	100%	0%
3.	10	10	0	10	100%	0%
4.	10	10	0	10	100%	0%

Table 4: Percentage of germination and infection in untreated garden pea seeds

SL no.	No. Of seeds in petriplate	No. Of seeds germinated	No. Of seeds infected	No. Of seeds not infected	Percentage of germination	Percentage of infection
1.	10	10	3	7	100%	30%
2.	10	10	2	8	100%	20%
3.	10	10	0	10	100%	0%
4.	10	10	0	10	100%	0%

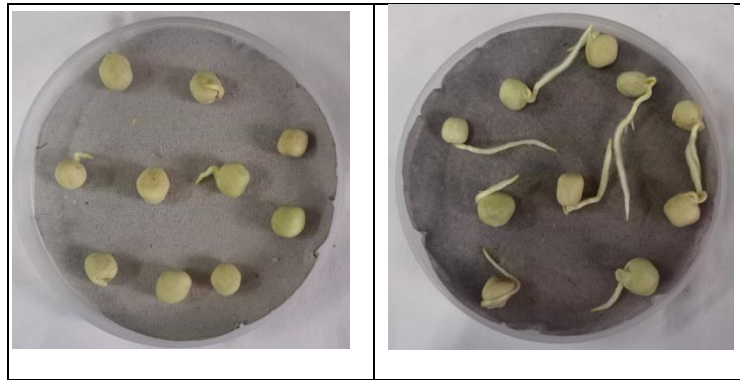


Fig 2: Treated cucumber seeds



Fig 3: Untreated garden pea seeds

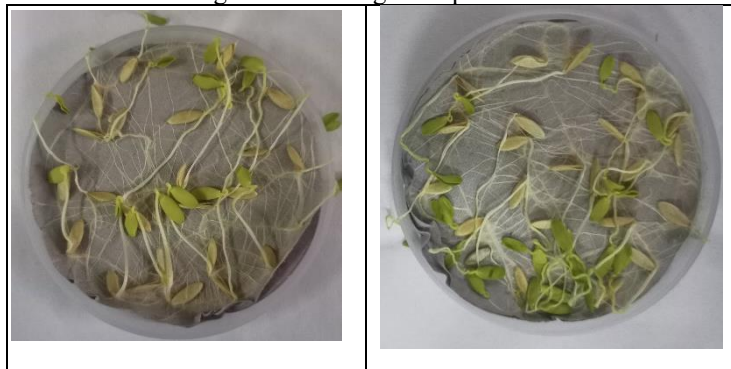


Fig 4: Treated cucumber seeds

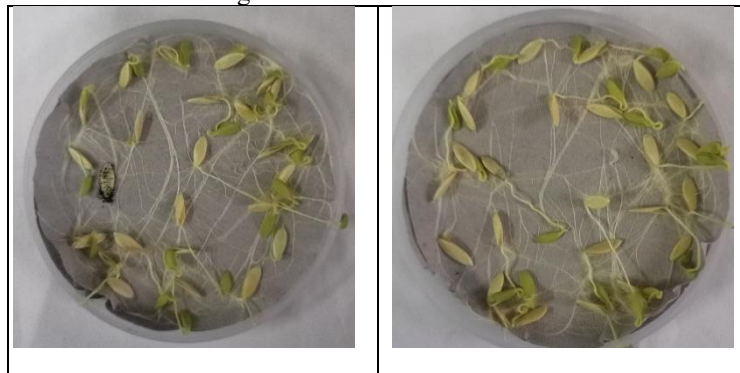


Fig 5: Untreated cucumber seeds

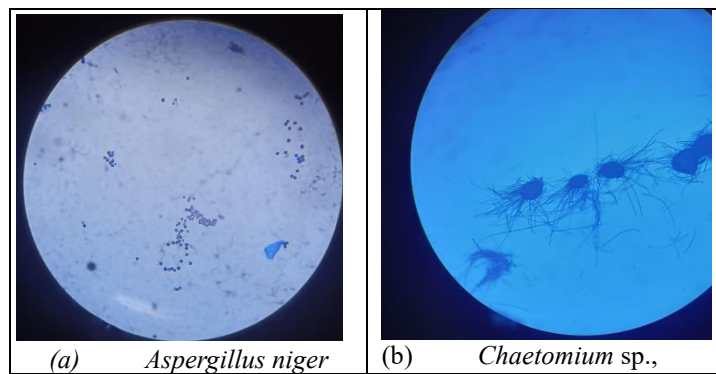


Fig 6: *Aspergillus niger* and *Chaetomium* isolated from garden pea seeds

DISCUSSION

The presence of fungal pathogens in untreated seeds emphasizes the potential risks associated with using untreated seeds for sowing. Fungal infections can lead to poor germination, seedling mortality, and reduced crop yields. Seed treatment serves as a preventive measure to protect the seeds and promote healthy plant growth.

Ismail I A et al., evaluated the effectiveness of various seed treatments in controlling seedborne pathogens and enhancing germination in cucumber. The results revealed that seed treatments, such as hot water treatment and fungicide application, significantly reduced fungal infection in cucumber seeds. Additionally, treated seeds showed improved germination rates and seedling growth compared to untreated seeds.^{5,9} Joshi. S. J et al., investigated the efficacy of seed treatment with biocontrol agents against seedborne fungal pathogens of cucumber. The results demonstrated that treated cucumber seeds exhibited reduced fungal infection and enhanced seed germination compared to untreated seeds. The use of biocontrol agents can effectively manage fungal pathogens in cucumber seeds.⁶ Manjunath P et al., studied the impact of seed treatments on seedborne fungal pathogens and seed quality in garden pea. The study found that treated garden pea seeds had significantly reduced fungal infection compared to untreated seeds. Furthermore, the treated seeds exhibited improved germination, seedling vigor, and overall seed quality.⁷ The findings from Verma A. P et al., indicated that seed treatments, including fungicides and biocontrol agents, effectively suppressed fungal pathogens in pea seeds. Moreover, treated seeds exhibited enhanced seed health and improved seedling establishment compared to untreated seeds.¹⁰

CONCLUSION

The viability and fungal infection in treated and untreated seeds of cucumber and garden pea have been extensively studied. The use of chemical fungicides for the seed treatment causes the environmental pollution as well as the serious hazards to human health. Seed treatments, such as the application of biocontrol agents and hot water treatment are recommended for reducing fungal infections and enhancing seed viability, germination, and overall seedling performance. These findings highlight the importance of seed treatments in managing seedborne fungal pathogens and ensuring healthy seedlings for improved crop productivity.

REFERENCES:

1. <https://en.wikipedia.org/wiki/Cucumber>
2. 7 Health Benefits of Eating Cucumber, By Rachael Ajmera, MS, RD on February 28, 2023, <https://www.healthline.com/nutrition/7-health-benefits-of-cucumber>
3. <https://en.wikipedia.org/wiki/Pea>
4. <https://www.britannica.com/plant/pea>
5. Ismail, I. A., El-Mohamedy, R. S. R., & Abdel-Megeed, A., "Evaluation of seed treatments for control of seedborne pathogens and enhancement of germination in cucumber (*Cucumis sativus* L.)", Archives of Phytopathology and Plant Protection, 2017
6. Joshi, S. J., Bhargava, A., Pandey, R. R., & Pandya, P. R., "Seed treatment with biocontrol agents for managing seedborne fungal pathogens of cucumber", Archives of Phytopathology and Plant Protection, 2021
7. Manjunath, P., & Pujari, B. T., "Effect of seed treatments on seedborne fungal pathogens and seed quality of garden pea (*Pisum sativum* L.)", Journal of Plant Protection and Environment, 2018
8. Gupta, Prince & Kaur, Manpreet & Roy, Bishal & Joshi, Sarthak & Singh, Prabhas. (2022). Pigeon pea Diseases and their Recent Approaches for Sustainable Management in India: Current Status and Future Prospective.
9. Yan XN, Sikora RA, Zheng JW. Potential use of cucumber (*Cucumis sativus* L.) endophytic fungi as seed treatment agents against root-knot nematode *Meloidogyne incognita*. J Zhejiang Univ Sci B. 2011 Mar;12(3):219-25. Doi: 10.1631/jzus.B1000165. PMID: 21370507; PMCID: PMC3048937.
10. N, Badri ZA, Bhat NA, Bhat FA, Sultan P, Bhat TA, Rather MA, Sakina A. Effect of the combination of biological, chemical control and agronomic technique in integrated management pea root rot and its productivity. Sci Rep. 2022 Jul 5;12(1):11348. Doi: 10.1038/s41598-022-15580-1. PMID: 35790796; PMCID: PMC9256638.