Study of Fungal Infections in Ridge Gourd and Watermelon Seeds: Prevalence, Identification, and Management

[1]Prathibha. K. Y., [2]Sinchana. S., [3]Sunaina. N., [4]Marhoob Banu

[1]Professor, [2,3,4] Research Scholar
Department of Botany
Maharani Cluster University
Palace Road, Bengaluru, Karnataka, India
***Corresponding author: Marhoob Banu**

***Abstract*- Fungal infections pose a significant threat to agricultural crops, including ridge gourd (*Luffa acutangula*) and watermelon (*Citrullus lanatus*) affecting seed quality, germination, and overall crop productivity. The current study aims to investigate fungal infections in ridge gourd and watermelon seeds, focusing on the prevalence, identification of common fungal pathogens, and strategies for their management. The study involves laboratory analysis and experimentation to determine the severity and diversity of fungal infections in ridge gourd and watermelon seeds. Treated and untreated seeds of ridge gourd and water melon were collected. All the four types of seeds were inoculated on wet blotting paper in the petriplates according to standard blotting method. Water was added once a day to maintain moisture content. After 7 days fungi growing on seeds were isolated, identified and percentage of infection and germination was calculated. The findings contribute to a better understanding of fungal diseases in ridge gourd and watermelon and provide insights into effective disease management practices for sustainable ridge gourd and watermelon cultivation.**

***Keywords*: *Citrullus lanatus*, Fungal diseases, Germination, Infection, *Luffa acutangula*, Seed quality**

INTRODUCTION

Ridge gourd seeds are of great importance due to their numerous health benefits. These tiny seeds are a rich source of dietary fiber, protein, vitamins, and minerals. They aid in digestion, regulate blood sugar levels, and promote weight loss. Ridge gourd seeds also possess antioxidant properties, which boost the immune system and protect against oxidative stress. Moreover, these seeds have been traditionally used in Ayurvedic medicine for their potential anti-inflammatory and anti-cancer properties. With their versatile nature, ridge gourd seeds can be incorporated into various dishes, providing a crunchy texture and a nutty flavor. Including ridge gourd seeds in our diet can contribute to overall well-being and vitality.[1] Fungal diseases can affect ridge gourd seeds, leading to reduced yield and quality. Some common fungal diseases that can affect ridge gourd seeds include damping-off,[2] anthracnose,[3] fusarium wilt[4] and powdery mildew.[5] To prevent and manage these fungal diseases in ridge gourd seeds, practices like seed treatment with fungicides, crop rotation, proper sanitation, and use of resistant varieties can be employed. It is important to consult local agricultural extension services or experts for specific recommendations based on the region and prevailing conditions.

Currently, the management strategies for fungal infections in ridge gourd seeds typically involve the use of chemical fungicides. Fungicides are applied as seed treatments or foliar sprays to control fungal pathogens. These fungicides help in reducing the incidence and severity of fungal infections, thereby protecting the seeds and ensuring better yield. However, the use of chemical fungicides has several disadvantages. Continuous and indiscriminate use can lead to the development of fungicide resistance in fungal populations, rendering the treatments ineffective. Additionally, there may be concerns regarding potential environmental pollution, negative impacts on non-target organisms, and potential risks to human health. Therefore, it is crucial to adopt integrated pest management (IPM) approaches that combine multiple strategies, such as cultural practices, biological control agents, and resistant cultivars, to minimize the reliance on chemical fungicides and promote sustainable disease management.[6]

Watermelon seeds hold significant importance due to their rich nutritional composition and potential health benefits. Despite their small size, they are packed with essential nutrients like protein, healthy fats, fiber, vitamins, and minerals. These seeds are particularly abundant in magnesium, which promotes heart health and regulates blood pressure. They also contain iron, zinc, and folate, supporting immune function and preventing anemia. Additionally, watermelon seeds are a good source of antioxidants that combat free radicals and reduce the risk of chronic diseases. Roasting and consuming them can be a nutritious snack or ingredient in various recipes.[7] Fungal diseases can pose a significant threat to watermelon seeds, impacting germination, seedling vigor, and overall crop yield. Several fungal pathogens have been associated with watermelon seedborne diseases, including *Fusarium* spp., *Pythium* spp., *Rhizoctonia solani*, and *Colletotrichum* spp. These pathogens can cause seed rot, damping-off, and seedling blight, leading to poor stand establishment and reduced crop productivity. Implementing proper seed treatment techniques, such as hot water treatment or fungicide application, can help mitigate the risk of seedborne fungal diseases. Additionally, maintaining field hygiene, crop rotation, and using certified disease-free seeds are crucial preventive measures.[8,9]

Current management strategies for fungal infections in watermelon seeds typically involve a combination of cultural practices, seed treatments, and fungicide applications. Culturally, measures such as crop rotation, proper sanitation, and removal of infected plant debris are recommended to minimize disease incidence. Seed treatments, including hot water treatment, chemical seed treatments, and biological agents, are employed to control fungal pathogens on the seed surface. Additionally, foliar fungicides are often applied

to protect plants from foliar fungal infections. However, these management strategies have certain disadvantages. The use of chemical fungicides may lead to environmental pollution, development of resistance in fungal populations, and potential health risks to humans and beneficial organisms. Moreover, seed treatments may not provide complete protection against all fungal pathogens, and the effectiveness of cultural practices can vary depending on the specific pathogen and environmental conditions. Therefore, an integrated approach that combines various management strategies is crucial for effective control of fungal infections in watermelon seeds.[10, 11, 12]

METHODOLOGY

- Sample collection

Untreated and treated seeds of ridge gourd and watermelon were collected from IIHR, Bengaluru

- Study of fungal infection and viability of ridge gourd and watermelon seeds

Treated and untreated seeds of ridge gourd and watermelon were surface sterilised with 0.2% sodium hypochlorite and washed with distilled water. Glass petriplates were sterilised using 70% alcohol and 2 layers of blotting paper was added on both the sides of petriplate to maintain moisture content. Treated and untreated seeds of both the types were arranged on the blotting paper of different petriplates. Distilled water was added once a day for 7 days to maintain moisture content. After 7 days germination and infection of both the types of seeds were observed and recorded. Experiments were done in quintuple and the results obtained in this study is the average of it.

- Identification of fungi

Fungal colony growing on infected seeds was mounted by lactophenol cotton blue method.[13] Fungi was identified with the help direct microscopy technique[14] by observing the sporulation characteristics of fungi.

- Calculation of percentage of infection and germination

Infection was studied by observing the fungal colony around the seeds and number of seeds infected were counted and percentage of infection was calculated using the formula:

% Infection = No. of seeds infected ÷ Total no. of seeds × 100

Similarly, no. of seeds germinated was counted manually and % of germination was calculated using formula:

% Germination = No. of seeds germinated ÷ Total no. of seeds × 100

RESULTS

Untreated and treated seeds of ridge gourd and watermelon were observed for infection and germination after 7 days and data was recorded. Direct microscopy of fungal colony on ridge gourd seeds and watermelon seeds revealed that the pathogenic fungi is *Fusarium*. *Cladosporium* was also isolated from ridge gourd seeds.The data of Infection and Germination is as follows:

Table 1: Percentage of germination of treated ridge gourd seeds

Sl.no	No of seeds in petri plate	No of seeds germinated	% of germination
1	16	05	31.25%
2	16	10	62.5%
3	16	10	62.5%
4	16	08	50%

Table 2: Percentage of germination of untreated ridge gourd seeds

Sl.no	No of seeds in petri plate	No of seeds germinated	% of germination
01	16	15	93.75%
02	16	00	0%
03	16	15	93.75%
04	16	15	93.75%
05	16	13	81.25%

Table 3: Percentage of infection in treated ridge gourd seeds

Sl.no	No of seeds in petri plate	No of seeds infected	% of infection
1	16	06	37.5%
2	16	07	43.75%
3	16	06	37.5%
4	16	06	37.5%

Table 4: Percentage of infection in untreated ridge gourd seeds

Sl.no	No of seeds in petri plate	No of seeds infected	% of infection
1	16	02	12.5%
2	16	16	100%
3	16	16	100%

4	16	09	56.25%
5	16	11	68.75%

Table 5: Percentage of germination of treated watermelon seeds

Sl.no	No of seeds in petri plate	No of seeds germinated	% of seeds germinated
1	16	16	100%
2	16	16	100%
3	16	16	100%
4	16	16	100%
5	16	16	100%

Table 6: Percentage of germination of untreated watermelon seeds

Sl.no	No of seeds in petri plate	No of seeds germinated	% of seeds germinated
1	16	16	100%
2	16	16	100%
3	16	16	100%
4	16	16	100%
5	16	16	100%

Table 7: Percentage of infection in treated watermelon seeds

Sl.no	No of seeds in petri plate	No of seeds infected	% of infection
1	16	02	12.5%
2	16	02	12.5%
3	16	02	12.5%
4	16	01	6.25%
5	16	00	0%

Table 8: Percentage of infection in untreated watermelon seeds

Sl.no	No of seeds in petri plate	No of seeds infected	% of infection
1	16	00	0%
2	16	02	12.5%
3	16	03	18.75%
4	16	01	6.25%
5	16	02	12.5%

Fig 1: Treated ridge gourd seed

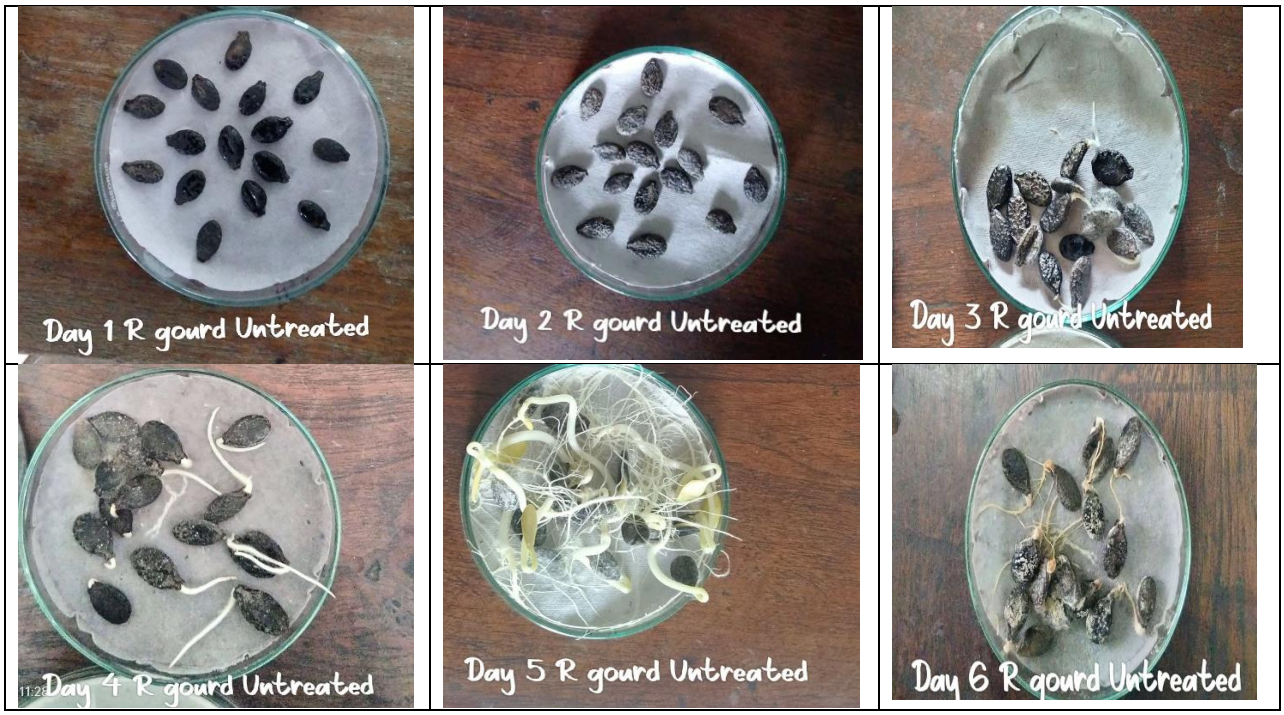

Fig 2: Untreated ridge gourd seed

Fig 3: Treated watermelon seeds

Fig 4: Untreated watermelon seeds

(a) *Cladosporium* (b) *Fusarium*

Fig 5: Cladosporium and Fusarium isolated from ridge gourd seeds

DISCUSSION

Several approaches have been explored for the management of fungal diseases in ridge gourd and watermelon seeds. These include cultural practices, such as crop rotation and proper sanitation, as well as the use of chemical fungicides and biocontrol agents. Additionally, the development and utilization of resistant cultivars hold promise for long-term and sustainable management of fungal infections.[15] However, it is crucial to consider the limitations and challenges associated with current management strategies. The continuous use of chemical fungicides may lead to the development of resistance, while the reliance on specific resistant cultivars can potentially narrow the genetic diversity of crops. Therefore, a holistic approach that integrates multiple management practices, including IPM strategies, should be encouraged.[2, 16, 17]

Further research is needed to explore alternative and sustainable methods for controlling fungal infections in ridge gourd and watermelon seeds. This could include the investigation of biological control agents, the study of plant-microbe interactions, and the utilization of advanced molecular techniques to identify and characterize fungal pathogens.

CONCLUSION

In conclusion, the study of fungal infections in ridge gourd seeds and watermelon seeds provides valuable insights into the prevalence, identification, and management of fungal diseases in these crops. The research conducted sheds light on the specific fungal pathogens that affect the seeds, including *Fusarium* species. It highlights the importance of implementing effective disease management strategies to minimize the impact of these infections on seed quality and yield.

REFERENCES:

1. https://www.netmeds.com/health-library/post/5-excellent-health-benefits-of-adding-ridge-gourd-to-your-daily-d
2. Sharma, A., et al. (2019). Fungal diseases of vegetable crops and their management. Vegetable Crops Research Bulletin, 80, 1-26.
3. Gupta et al., 2019](https://doi.org/10.1007/s13313-018-0610-5)
4. Chavan et al., 2020](https://doi.org/10.1007/s13313-020-00767-2)
5. Khot et al., 2017](https://doi.org/10.1007/s13313-017-0521-1)
6. Selvakumar et al., 2018](https://doi.org/10.1016/j.fcr.2018.01.021)
7. Kundu, A., Mitra, M., & Bhattacharya, S. (2019). Health benefits of watermelon seeds. Food Science and Human Wellness, 8(3), 235-240.
8. Babu, B.K., et al. (2017). Seedborne fungal pathogens of watermelon and their management. Plant Disease, 101(12), 2028-2038.
9. Hopkins, D.L., et al. (2016). Identification and management of seedborne fungal pathogens associated with watermelon seeds. University of Florida IFAS Extension, PP322.
10. Holmes, G. J., & Ojiambo, P. S. (2017). Seed treatment with biocontrol agents for managing soilborne fungal, bacterial, and viral pathogens. In Seed Treatment: Progress and Prospects (pp. 323-358). Springer.
11. Kloepper, J. W., & Ryu, C. M. (2006). Bacterial endophytes as elicitors of induced systemic resistance. In PGPR: Biocontrol and Biofertilization (pp. 33-52). Springer.

12. Mancini, V., Romanazzi, G., & Campobenedetto, C. (2018). The potential of biological control agents against fungal diseases of fruits and vegetables. Pest Management Science, 74(10), 2146-2155
13. Leck A. Preparation of lactophenol cotton blue slide mounts. Community Eye Health. 1999;12(30):24. PMID: 17491984; PMCID: PMC1706009.
14. Chandler D. Direct microscopy in the dermatology clinic: enhancing the management of skin infections and infestations. Clin Exp Dermatol. 2022 Jun;47(6):1023-1029. Doi: 10.1111/ced.15118. Epub 2022 Apr 3. PMID: 35119697; PMCID: PMC9322315.
15. Kishore, G. K., & Pande, S. (2015). Fungal diseases of watermelon: challenges and opportunities for sustainable management. Frontiers in Plant Science, 6, 1026. Doi: 10.3389/fpls.2015.01026
16. Chavan, A. S., et al. (2020). Characterization of Fusarium oxysporum f. Sp. Lagenariae causing wilt of ridge gourd. Journal of Phytopathology, 168(5), 257-267. Doi: 10.1111/jph.12905
17. Thakur, R., et al. (2020). Seedborne fungal diseases of cucurbits and their management strategies: A review. Journal of Applied Horticulture, 22(3), 286-296.