

International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
 ISSN Online: 2617-4707
 IJABR 2024; 8(10): 123-125
www.biochemjournal.com
 Received: 15-08-2024
 Accepted: 19-09-2024

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Host range of *Phytophthora palmivora* in Arecaceae family crops

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DOI: <https://doi.org/10.33545/26174693.2024.v8.i10b.2457>

Abstract

Phytophthora palmivora is a well-known pathogen and it has been reported on different host plants such as coconut, black pepper, rubber, cocoa, durian, papaya, apple, areca nut and different ornamental palms. The ability of *P. palmivora* to infect various plant parts in a wide range of hosts is a major threat to the future global spread and epidemic. The disease caused by *P. palmivora* is recognized by the initial symptoms on the central shoot, followed by the browning or blackening of the heart leaf, indicates a significant problem. The present study, host range of *Phytophthora palmivora* was carried out on nine different plants of Arecaceae family. For this study, pathogen was isolated from naturally infected coconut bud displaying typical symptoms of bud rot disease and the pathogenicity was tested on two seedlings of each type of host plant, one was kept for control and other for testing host range of pathogen. Study revealed certain symptoms on host plants like brown spots on young leaves, rotting and foul smell of bud, and finally leaves were totally dried and drooped down. These symptoms were similar to that of *Phytophthora palmivora*.

Keywords: *Phytophthora palmivora*, host range, Arecaceae family

Introduction

Phytophthora palmivora is a pathogen responsible for causing significant diseases in a variety of plants, particularly tropical crops and trees, including palms, coconuts, and cacao. It thrives in moist environments and causes rot-related diseases that can lead to severe losses. *Phytophthora palmivora* produces certain types of symptoms in different host plants like leaf discoloration especially spear leaves which turn from pale green to brown as they desiccate. The tan-colored necrotic rots with brown margins on the leaf stems are characteristic of stem rots caused by *P. palmivora*. The pathogen often enters through wounds or natural openings, spreading to the stem and base. Bud rot, this is particularly devastating for palms, as the infection kills the growing tip of the plant, leading to complete death.

Phytophthora palmivora is an oomycete that raises global concern, due to its broad host range and the economic losses it causes in the field in cultivated crops (De Oliveira *et al.*, 2024) [1]. It is a pan-tropical distributed pathogen that can infect plants at all growth stages. Extensive studies have linked *P. palmivora* to severe diseases in several crops, such as black pepper, rubber, cocoa, and durian, causing global economic losses (Misman *et al.*, 2022) [3]. So that, the study of host range of *P. palmivora* is essential for safeguarding both the economic and environmental sustainability of different host plants.

Materials and Methods

The experiment on the present study was carried out in the Department of Plant Pathology, College of Agriculture, Dr. Balasaheb Sawant Konkarn Krishi Vidyapeeth, Dapoli, District Ratnagiri (M.S) during year 2023-24. The host range of *Phytophthora palmivora* was studied on different plants of Arecaceae family. For this study, nine different plants from Arecaceae family such as *Areca catechu* (Areca nut), *Caryota* (Fish tail palm), *Livistona chinensis* (Chinese fan palm), *Wodyetia bifurcata* (Foxtail palm), *Adonidia merrillii* (Green manila palm), *Howea forsteriana* (Kentia palm), *Rhapis excelsa* (Lady palm), *Licuala grandis* (Ruffled fan palm), *Dypsis lutescens* (Areca palm) etc. were selected.

For the experiment two seedlings of each type were selected, one was kept for control and other for testing the host range of pathogen. When experiment was carried out, stem of test seedlings were sterilized by rinsing with 70% ethanol solution. Sterilized stem then wounded with the help of a sterile needle. Before inoculation, pathogen was cultured on PDA medium at 25°C for 7 days. Then, in mycelial discs of size 0.5 mm diameter were cut with a sterilized cork borer and were transferred to wounded stem. Wound was closed by placing sterile absorbent cotton on it and wrapped by polythene bag to maintain high humidity. Seedlings were regularly observed for the appearance of diseased symptoms. Symptoms were appeared on test seedlings after 3-4 days of inoculation and photographs were taken for further study.

Results and Discussion

Host range of *Phytophthora palmivora* in Arecaceae family crops

The aim of this objective was to study the host range of *Phytophthora palmivora* on different plants of Arecaceae family. For this study, nine different plants from Arecaceae family such as *Areca catechu* (Areca nut), *Dypsis lutescens* (Areca palm), *Livistona chinensis* (Chinese fan palm), *Caryota* sp. (Fish tail palm), *Wodyetia bifurcata* (Foxtail palm), *Adonidia merrillii* (Green manila palm), *Howea forsteriana* (Kentia palm), *Licuala grandis* (Ruffeled fan palm), *Rhapis excelsa* (Lady palm), etc. were selected and artificially inoculated with the culture of *Phytophthora palmivora*.

The study revealed that, similar symptoms of *P. palmivora* were observed on experimental seedlings after inoculation. The earlier symptom observed was brown spots on young leaves after 3-4 days in *Areca catechu* (Areca nut), *Dypsis lutescens* (Areca palm), *Caryota* sp. (Fish tail palm) *Wodyetia bifurcata* (Foxtail palm), *Howea forsteriana* (Kentia palm), *Adonidia merrillii* (Green manila palm) whereas in fan palms viz., *Livistona chinensis* (Chinese fan palm), *Licuala grandis* (Ruffeled fan palm), *Rhapis excelsa* (Lady palm) produced brown spots after 6-7 days due to thick bud. It was also observed rotting and foul smell of bud and seems that affected leaves were totally dried and dropped down, (Plate I a-i).

The findings of the present study are also in close conformity with those of Elliott *et al.*, (2024) [2] who studied diseases caused by *Phytophthora palmivora* and other species of *Phytophthora* on different types of ornamental palms like *Chamaedorea seifrizii*, *Trithrinax acanthocoma*, *Washingtonia* sp (maxican fan palm). They also studied leaf spots and severe blights of parlor palm (*Chamaedorea elegans*) and golden palm (*Dypsis lutescens*) were caused by *P. palmivora* and *Phytophthora arecae* was confirmed as a root rotting pathogen of *Chamaedorea seifrizii* x *erumpens*.

The similar results were also reported by De Oliveira *et al.*, (2024) [1] and Wang *et al.*, (2020) [5] who studied root and stem rot disease in *Acrocomia aculeata* (macaw palm) and global migrations of the tropical pathogen *P. palmivora* on different hosts like coconut and other palms, respectively. Pandian *et al.*, (2021) [4] reported that *Phytophthora palmivora* has expanded its host range to infect *Areca triandra*, which was previously considered resistant to fruit rot caused by *Phytophthora meadii*.



a) *Areca catechu* (Areca nut)



b) *Dypsis lutescens* (Areca palm)



c) *Caryota* spp. (Fish tail palm)



d) *Wodyetia bifurcata* (Foxtail palm)



e) *Howea forsteriana* (Kentia palm)



f) *Adonidia merrillii* (Green manila palm)



g) *Livistona chinensis* (Chinese fan palm)



h) *Licuala grandis* (Ruffled fan palm)



i) *Rhapsis excels* (Lady palm)

Plate I (a-i): Host range of *P. palmivora* in Arecaceae family crops.

Conclusion

In this review, the host range of *P. palmivora* in multiple crops of Arecaceae family viz., *Areca catechu* (Areca nut), *Dypsis lutescens* (Areca palm), *Caryota* sp. (Fish tail palm) *Wodyetia bifurcata* (Foxtail palm), *Howea forsteriana* (Kentia palm), *Adonidia merrillii* (Green manila palm), *Livistona chinensis* (Chinese fan palm), *Licuala grandis* (Ruffled fan palm), *Rhapsis excelsa* (Lady palm) was studied and showed similar symptoms that of *P. palmivora*.

Acknowledgement

Authors are thankful to the Department of Plant Pathology, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, (M.S.), India for providing necessary facilities.

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