

RESEARCH ARTICLE

MICROSCOPIC STUDY OF POWDERY AND DOWNY MILDEW FUNGI ON WILD PLANTS FROM THE TEHSIL AREA OF DHULE, MAHARASHTRA

Dinesh Sahebrao Patil*¹, Sambhaji Yashavantrao Patil² and Vasudeo Ramesh Patil³

¹BSSPMs Arts, Commerce and Science College, Songir, Dhule, M.S., India

²SSVPSs Late. Dr. P.R. Ghogrey Science College, Dhule, M.S., India

³Rani Laxmibai Mahavidyalaya, Parola, Jalgaon, M.S., India

*Corresponding author E-mail: dinesh94214@gmail.com

DOI: <https://doi.org/10.5281/zenodo.19415061>

Abstract:

The study examined fungal infections in cultivated and wild plants in the Dhule tehsil of Northern Maharashtra, India, using random sampling. Observations were made on fungal infections of crop and wild plant species occurring in the Dhule tehsil of Northern Maharashtra, India. Plant samples were collected by random sampling from different habitats and microscopic observations made with the help of camera lucida for detailed illustrations. Fungal structures such as coarse and delicate creeping or upright hyphae, sporangia, conidiophores and mycelium were characterized. Illustrations of powdery and downy mildew fungi and their relationships with the leaves of the host plant are also presented. The relationship between fungal elements and host cells was highlighted in the findings.

Keywords: Dhule Tehsil, Phytopathogenic Fungi, Wild Plants, Microscopic Analysis.

Introduction:

Dhule Tehsil, also known as a Taluka, is a crucial administrative unit situated in Dhule District, Maharashtra, India, specifically in the northwest region of the state [1]. This tehsil serves as the central hub for the Khandesh province and is characterized by a rich assortment of historical and cultural artifacts. Dhule Tehsil encompasses both rural villages and Dhule city, the latter functioning as the administrative center for the tehsil and the district at large. The diverse composition of urban areas, towns, and rural landscapes within Dhule Tehsil illustrates the various lifestyles and traditions of its inhabitants, making it a vital area for exploring the broader cultural dynamics present in Maharashtra [2-4]. Dhule Tehsil, located in northwestern Maharashtra, showcases a diverse range of native plant species due to its varied topography, which includes rugged terrains, sloping hills, and unique atmospheric conditions. The landscape features a mix of deserts, open forests, and thick scrub, fostering rich biodiversity. The soil types

and climatic factors contribute to the thriving plant life, making Dhule a significant region for ecological balance [5]. Additionally, the interplay of natural elements, particularly near springs, supports this biodiversity while maintaining ecological balance in the area, highlighting the importance of plant species in the region's environment [6]. The survey details the effects of phytopathogenic fungi, such as powdery mildew and downy mildew, on local wild plants, linking symptoms and environmental conditions to specific diseases [7]. Conservation of infected wild plant samples in the Dhule region was conducted using the FAA method, ensuring effective slide preparation and examination of the impacts of phytopathogenic fungi such as powdery mildew and downy mildew [8]. This process is critical to understanding plant health and disease management. Phytopathogenic fungi were identified and their structural features examined in selected plant samples using microscopy.

Material and Methods:

The study focused on the Dhule tehsil in Northern Maharashtra, India, utilizing random sampling to gather specimens of powdery mildew and downy mildew from wild infected plants near villages. Various villages and adjacent cultivated areas were selected for a comprehensive analysis. The collected plant specimens were placed in sterile polythene bags and preserved in FAA solution. For slide preparation, botanical glass slides and other tools were employed, along with lactophenol cotton blue stain for visualization. To capture detailed images of phytopathogenic fungal structures, the researcher utilized a compound microscope equipped with camera lucida and digital microscopy, achieving high magnifications between 50X and 2000X.

Random Selection Method for Sampling and Microscopic Analysis Wild Plant Samples

The study focused on the Dhule tehsil in Northern Maharashtra, India, utilizing random sampling to gather specimens from wild infected. Microscopic examination revealed various fungal structures, including hyphae, spores, and mycelium. The hyphae observed were either thread-like and septate or aseptate, depending on the species, with spores exhibiting diverse shapes from round to complex forms. Observable spore masses and conidiophores indicated active infections in some samples. The presence of these fungal structures was noted both on the surface of the plant tissues (ectophytic) and within the plant tissues (endophytic), highlighting the extent of fungal colonization in the examined specimens.



Figure 1: Wild plant samples and microscopic slides of Dhule tehsil

Camera Lucida Observation Report:

The researcher employed the camera lucida, an optical instrument, to meticulously study the distinct fungal forms found in various plant samples. This technique allowed for detailed documentation of the unique morphology and intricate spatial structures of fungi, including specific hyphal arrangements and spore formations. These features are essential for understanding the complex ecological interactions between fungi and their host plants, providing valuable insights into their relationships and roles within ecosystems.

Result and Discussion:

The pictures highlight the plant's natural environment to aid in its identification. A fragment of the infected plant was carefully removed to create a microscope slide for the purpose of detecting phytopathogenic fungi. This approach allows for a more detailed examination of the plant's condition, facilitating the understanding of the infection's nature and potential impact.

Powdery Mildew on wild plant (DH-W1):

Type of phytopathogenic fungi	:	Powdery Mildew
Host plant	:	Rough cocklebur (Landgi)
Plant species (scientific name)	:	<i>Xanthium strumarium</i>
Family	:	Asteraceae (Aster)
Infected part of the plant	:	Leaf
Month of collection	:	February
Area of collection	:	Dhule (Fagne-Ajang)

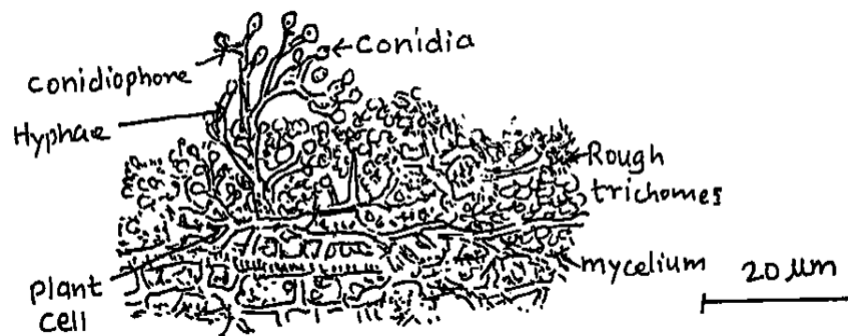


Figure 2: Powdery Mildew on Rough cocklebur leaf (DH-W1)

A camera lucida drawing of the microstructure of powdery mildew fungus on a rough cocklebur leaf (DH-W1). The figure shows the hyphae of the fungi growing on the surface of the host foliage and forming the mycelia. From the hyphae arise the conidiophores bearing chains of conidia (the asexual spores of the fungus responsible for the spread of disease). Also shown are plant cells of the host tissue and the rough trichomes covering the surface of the leaf. These structures are fungal hyphae growing through the epidermal surface of the leaf to obtain nutrients from the host plant.

Downy Mildew on wild Plant (DH-W2):

Type of phytopathogenic fungi	: Downy Mildew
Host plant	: Tar wine (Ghetuli)
Plant species (scientific name)	: <i>Boerhaavia diffusa</i> L.
Family	: Nyctaginaceae
Infected part of the plant	: Leaf
Month of collection	: February
Area of collection	: Dhule (Sarvad-Devbhane)

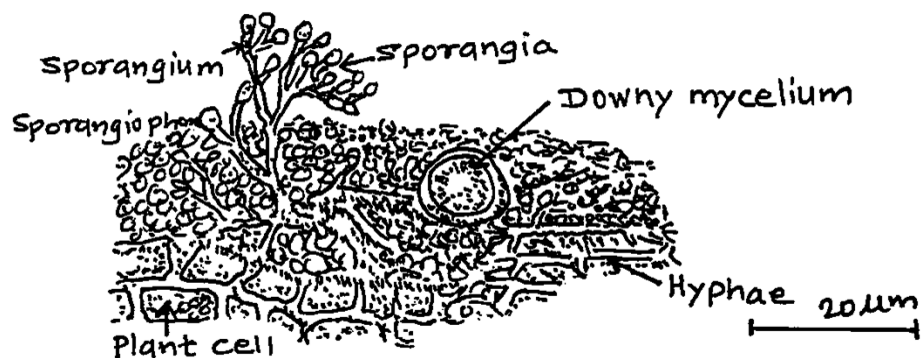


Figure 3: Downy Mildew on Tarvine leaf (DH-W2)

Microscopical structure of downy mildew fungus on wild tar wine leaf (DH-W2). The figure illustrates the structures of downy mildew fungus viewed by microscopy by camera lucida drawing. The hyphae and downy mycelia spread on and between host plant cells. A sporangiophore emerges from the mycelium, bearing dozens of sporangia at the end. The sporangia produced by the sporangia release spores which are responsible for the fungus' reproduction and spread. In the infected leaf tissue, the relationships between the fungal structures and host plant cells are also revealed.

Conclusion:

Left panel: Details of powdery mildew on rough cocklebur (*Xylophieae*, *Asteraceae*) showing the dense mycelium consisting of fine hyphae and erect conidiophores bearing single or chains of conidia for asexual reproduction. The plant surface bears various trichomes including the prominent, longitudinally-rough trichomes that are not affected by the fungal pathogen. The fungus can colonize the entire leaf surface causing the powdery appearance.

Right panel: Typical downy mildew showing sporangiophores with terminal sporangia and downy mycelium and hyphae that cover the surface of the leaf. The structures form part of the plant colonizer and cause the disease symptoms on the leaf surface.

References:

1. Deshmukh, S. K., *et al.* (2016). Biodiversity of fungi from Maharashtra, India. *Indian Journal of Microbiology*, 56(1), 1–12.

2. Shinde, S. D., & Patil, S. S. (2013). Socio-economic structure of rural Maharashtra. *Indian Journal of Social Research*, 54(2), 209–218.
3. Kulkarni, A. R. (2012). Agricultural development and regional economy of Khandesh region in Maharashtra. *Indian Journal of Regional Studies*, 44(1), 41–50.
4. Patil, M. S., & Pawar, N. B. (2013). Agricultural and environmental characteristics of Northern Maharashtra. *Journal of Environmental Biology*, 34(6), 1205–1210.
5. Ajithkumar, K., *et al.* (2025). Fungal phytopathogens and the importance of early detection through conventional methods. In *Molecular approaches for the detection of fungal phytopathogens* (pp. 1–27). CRC Press.
6. Sharma, P. D. (2014). *Plant ecology and environment* (12th ed.). Rastogi Publications.
7. Madhushan, A., Weerasingha, D. B., Ilyukhin, E., Taylor, P. W., Ratnayake, A. S., Liu, J. K., & Maharachchikumbura, S. S. (2025). From natural hosts to agricultural threats: The evolutionary journey of phytopathogenic fungi. *Journal of Fungi*, 11(1), 25.
8. Rangaswami, G., & Mahadevan, A. (2005). *Diseases of crop plants in India* (4th ed.). Prentice-Hall of India.
9. Directorate of Economics and Statistics. (2020). *District statistical handbook: Dhule district*. Government of Maharashtra.
10. Government of Maharashtra. (2020). *District statistical handbook: Dhule district*. Directorate of Economics and Statistics.