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Report of *Phyllactinia* spp. on *Dalbergia sissoo* and *Morus alba* from Chhattisgarh

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In this study, two powdery mildew causing fungi, *Phyllactinia dalbergiae* and *Phyllactinia guttata*, infecting *Dalbergia sissoo* and *Morus alba,* respectively, are documented from Chhattisgarh, India. Detailed macro and micro morphological descriptions, including conidiophores, conidia, and cleistothecia, are provided. The study highlights their complete life cycle, illustrating both asexual and sexual stages, and contributes to the mycological knowledge of forest and agroforestry pathogens in the region.

Keywords : Agroforestry, Chhattisgarh, conidiophores, micro-morphological

INTRODUCTION

Powdery mildew is a widespread and economically significant fungal disease affecting a wide range of plants, including numerous forest and agroforestry tree species. It can be easily identified by a white to greyish powdery growth on the surface of leaves, stems and sometimes flowers and fruits. This disease is caused by obligate fungi belonging to the order Erysiphales under the phylum Ascomycota. Several genera are known to cause powdery mildew in trees, including *Phyllactinia*, *Erysiphe*, *Microsphaera*, *Uncinula*, *Sphaerotheca*, *Leveillula*, and *Oidium* (the anamorphic form of many species). Globally, approximately 900 species of powdery mildew-causing organisms have been reported (Braun and Cook, 2012). In India, the diversity of powdery mildew fungi was initially estimated to include approximately 120–150 species, based on early taxonomic surveys and regional floristic accounts (Hosagoudar, 2003). However, subsequent intensive explorations, systematic documentation, and taxonomic revisions have significantly expanded this number.

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A comprehensive checklist compiled by Hosagoudar and Agarwal (2009) reported over 250 species of powdery mildew fungi across various agroclimatic zones of India. In Chhattisgarh, detailed documentation for the number of species is still unexplored.

In Chhattisgarh, *Dalbergia sissoo* (Shisham) and *Morus alba* (Mulberry) are valued tree species with ecological and economic importance. Shisham thrives along rivers, forest areas, and roadsides and is prized for its durable timber, while Mulberry is cultivated primarily for silkworm rearing in sericulture. Both contribute to agroforestry systems and support rural livelihoods in the region.

In this research, an attempt was made to document the macroscopic and microscopic characters and the life cycle of the infected trees of Mulberry and Shisham.

MATERIALS AND METHODS

Dead and infected leaves of *Morus alba* and *Dalbergia sissoo* showing powdery mildew symptoms were collected from the College of Agriculture premises, Raipur, Chhattisgarh.

Samples were excised, placed in labelled zip-lock bags, and transported to the laboratory. After air-drying overnight, they were stored in clean paper envelopes for preservation. A Foldscope was used for preliminary field observations of fungal structures. In the lab, symptomatic tissues were examined under a Stereo Zoom microscope (Nikon, SZM 745T, Japan) to identify conidiophores, conidia, and cleistothecia (if present). Freehand sections were prepared with a sterilised razor blade, and fungal structures were mounted in lactophenol, aqueous Congo red, and lactophenol cotton blue. Microscopic observations and measurements were conducted using a Labovision Sense i4000 Research Microscope with a digital imaging system. Calibration was performed using an Erma stage micrometre (0.01 mm). Calibrated images were used to produce camera lucida–style drawings using the Sketchbook app (version 6.1) on an Apple iPad (9th generation) with Apple Pencil (1st generation).The identification of *Phyllactinia dalbergiae and Phyllactinia guttata*, infecting Dalbergia sissoo and Morus alba, respectively, were made based on standard primary taxonomic keys " Taxonomic Manual of the Erysiphales (Powdery mildews)" by Braun and Cook (2012) which is a global standard as far as morphological and microscopic keys are concerned for this group.

RESULTS AND DISCUSSION

Leaves of *Dalbergia sissoo* (Shisham) infected with *Phyllactinia dalbergiae* exhibited characteristic symptoms of powdery mildew disease, primarily on the abaxial (lower) surface(Fig. 1. a-b). A white, cottony mycelial growth was observed, accompanied by a dense emergence of conidiophores. In several instances, profuse sporulation led to visible discolouration of the lower leaf surface, which turned greyish-white to pale yellow. As the infection advanced, black to dark brown spherical cleistothecia developed, each containing asci and ascospores, with a few radially arranged, bulbous-based appendages arising from the equatorial region. The cleistothecia measured 225–248 µm in diameter, while appendages ranged from 171–197 µm in length (Fig. 1. c, e &f). Severely infected leaves displayed premature senescence and loss of physiological activity, contributing to a decline in overall plant health.Microscopic examination of *Phyllactinia dalbergia* revealed that the conidiophores were long, slender, hyaline structures, each terminating with a single conidium. The conidia were unicellular, hyaline, and varied in shape from naviculate (boat-shaped) to pyriform or obovate, measuring approximately 100–115 × 15–45 µm (Fig. 1. d). These conidia represent the asexual reproductive stage of the pathogen and were found to germinate rapidly under favourable temperature and humidity conditions.

In the case of Mulberry (*Morusalba*) leaves infected with *Phyllactinia guttata,* displayed typical powdery mildew symptoms, beginning as small white powdery patches on the abaxial (lower) surface (Fig. 2. a). As the disease progressed, these patches expanded to cover the entire leaf surface, ultimately leading to chlorosis, leaf curling, and, in severe cases, premature defoliation. Microscopic observations revealed the presence of septate, hyaline mycelium colonising the leaf surface, from which upright, unbranched, club-shaped conidiophores emerged perpendicularly (2 b). The conidiophores produced conidia singly at their tips. The conidia were hyaline, single-celled, and ranged in size from 57–95 µm in length and 15–20 µm in width (Fig. 2. c & d).

Microscopic and structural observations of *Phyllactinia* spp. revealed a well-defined life cycle involving both asexual and sexual stages. The fungus behaved as an ectoparasite, with superficial mycelium developing on the host leaf surface. It penetrated the leaf tissue through stomatal openings by producing haustoria to extract nutrients from epidermal cells. Asexual reproduction occurred via hyaline, unbranched, club-shaped conidiophores that arose perpendicularly from the mycelial mat. These conidiophores bore single, hyaline, unicellular conidia. The conidia were easily detached and disseminated by air currents, contributing to the rapid secondary spread of the disease during favourable conditions (Fig. 3. a-e).

Under adverse environmental conditions or in the later stages of disease development, *Phyllactinia*

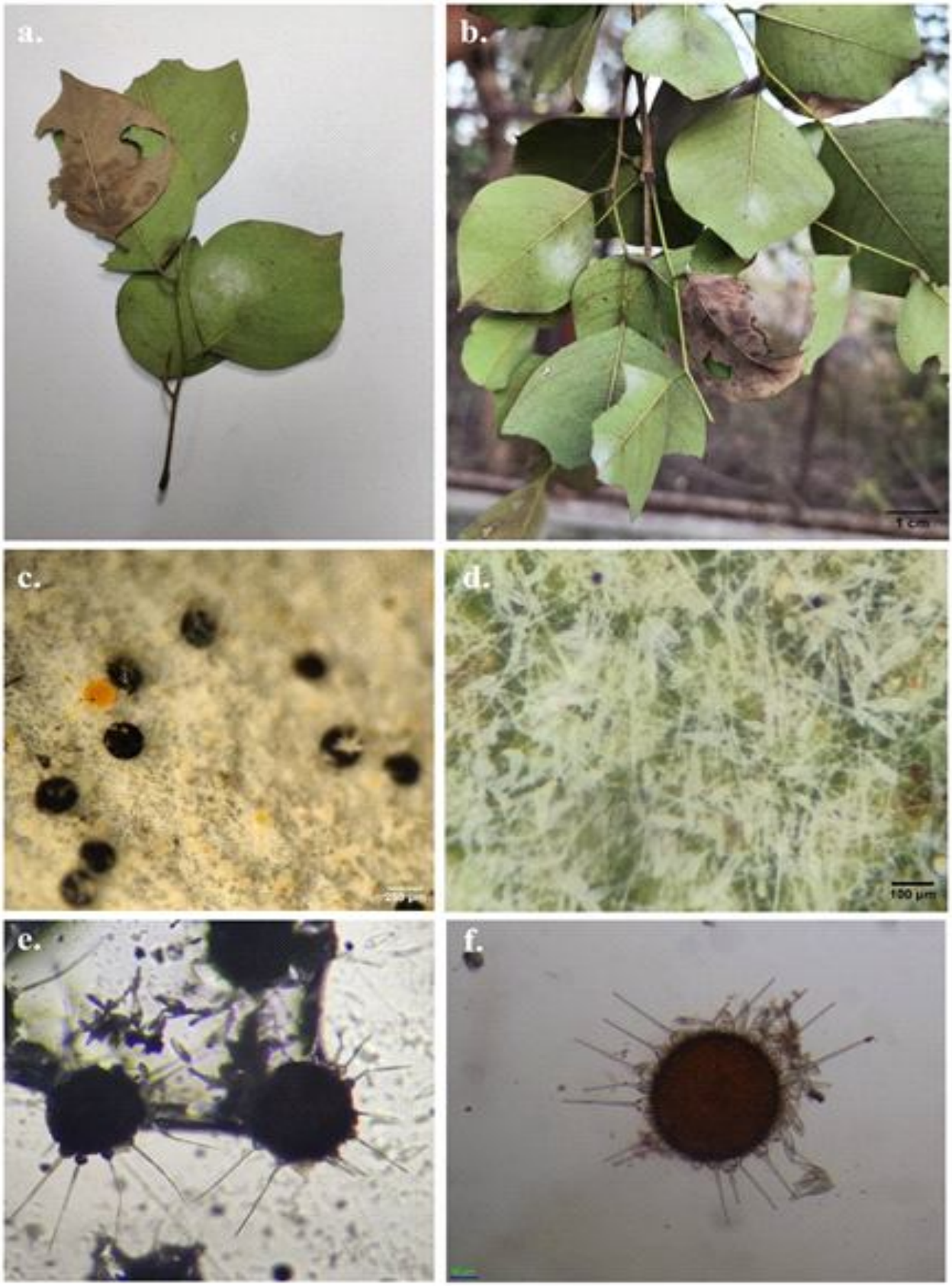

Fig. 1 : *Phyllactinia dalbergia.* **a-b.** Infected leaves of Shisham; **c.** Cleistothecium under stereomicroscope; **d.** Mycelial and conidia; **e.** On-site foldscope image; **f.** Cleistothecium at 40X zoom.

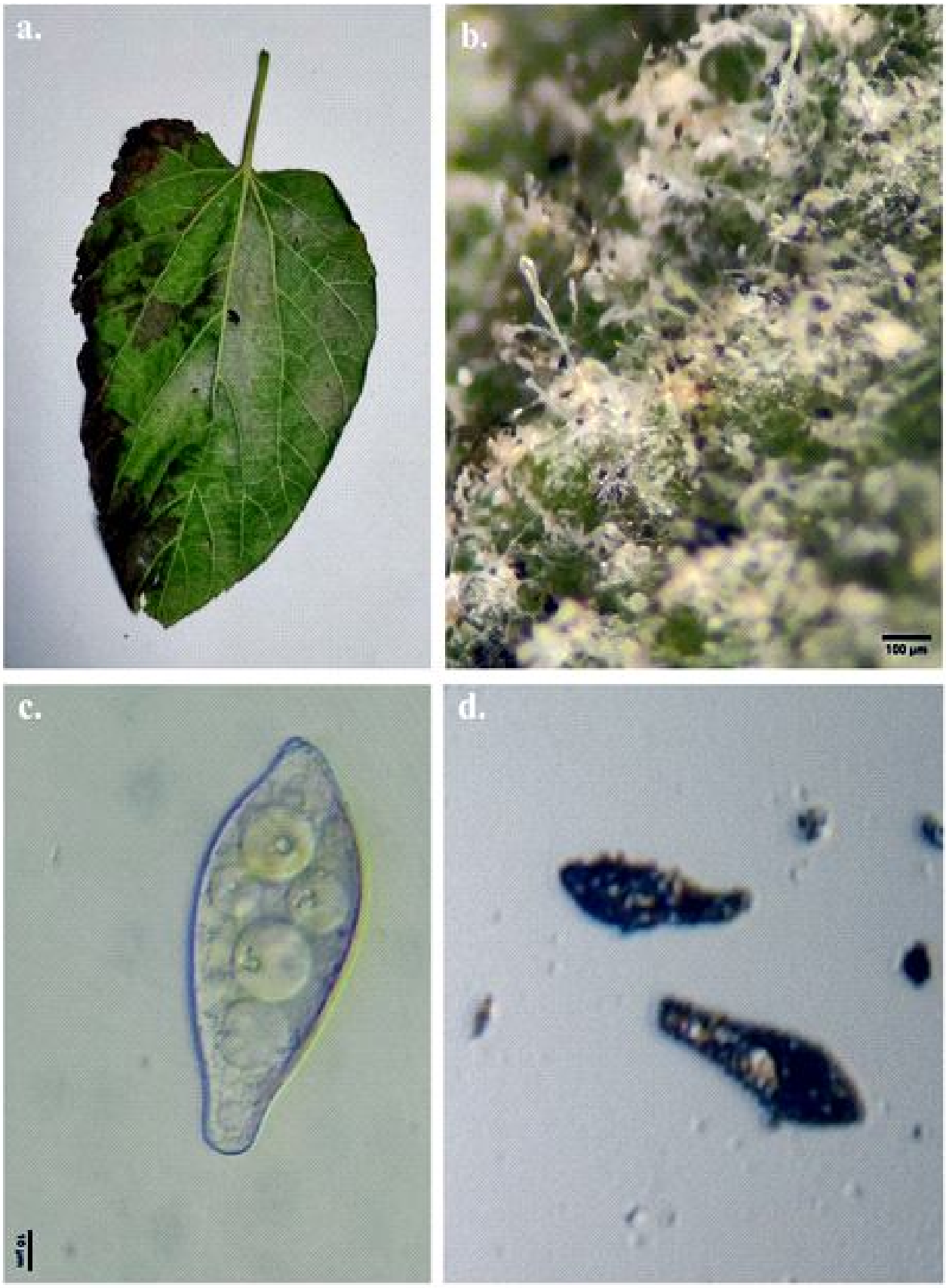

Fig. 2: *Phyllactinia guttata*.**a.** Infected leaves of Mulberry; **b.** Conidiophores and conidia under stereomicroscope; **c.** Conidia at 40X zoom; **d.** Conidia under foldscope

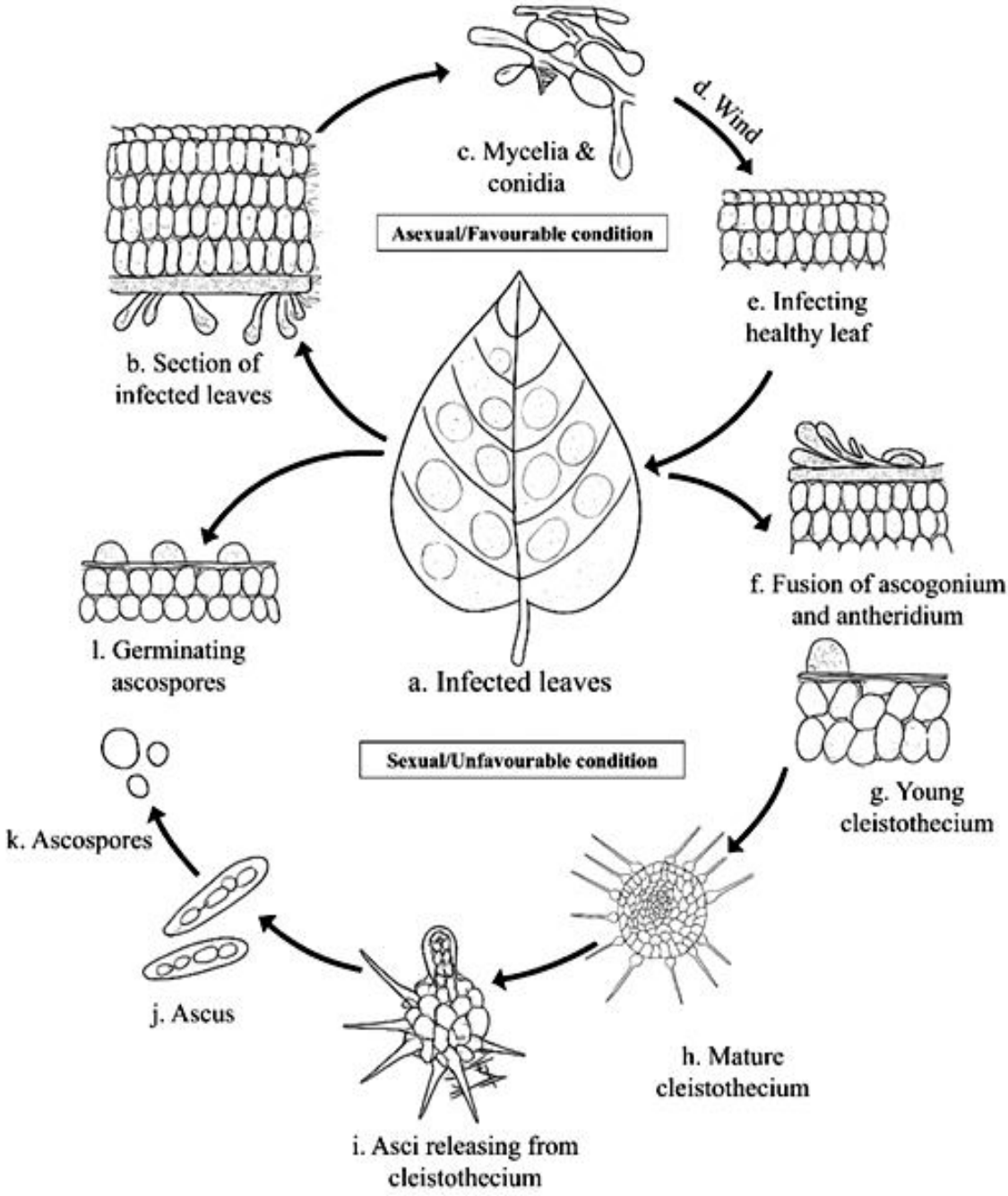

Fig. 3: *Phyllactinia* spp.**a-e** Asexual/Favourable condition; **f-l.** Sexual mode/Unfavourable condition

spp. Initiated sexual reproduction by forming cleistothecia. These closed fruiting bodies were initially yellow, later becoming black, and were covered with numerous colourless, needle-like appendages. Each cleistothecium is enclosed with asci, and each ascus typically contains ascospores. Upon maturation and exposure to favorable environmental cues, the cleistothecia ruptured, releasing asci and ascospores. These ascospores germinated to produce fresh hyphae that reestablished the infection cycle, beginning with the development of new conidiophores. This dual reproductive strategy allows *Phyllactinia* spp. to effectively colonize host plants during active growth periods and persist through unfavorable seasons via cleistothecial dormancy (Fig. 3. f-l)

In the present investigation, the occurrence of *Phyllactinia dalbergiae* on *Dalbergia sissoo* and

Phyllactinia guttata on *Morus alba* was confirmed based on detailed field symptoms and microscopic observations. The powdery mildew symptoms of *P. dalbergiae* observed on *D. sissoo* align with previous reports by Gupta *et al*. (2017), Dubey *et al.* (2018), and Sahu & Oza (2025), and have been further corroborated by the current findings. Infected leaves exhibited white, cottony mycelial growth primarily on the abaxial surface, occasionally leading to pale-yellow discolouration and early defoliation. The morphological and micrometric characters such as long, hyaline conidiophores terminating in single conidia (100–115 × 15–45/ µm) and cleistothecia measuring 225–248/ µm with myceloid appendages (171–197/ µm) closely resemble the features reported by earlier authors, including the naviculate to pyriform shape of conidia and the spear-like appendages described by Dubey *et al.* (2018) and Sahu & Oza (2025). Histological signs of intercellular colonisation and degradation of host tissues further validate the identification of the pathogen as *Phyllactinia dalbergiae*.

Similarly, the powdery mildew infection of mulberry caused by *Phyllactinia guttata* is in close agreement with descriptions provided by Bessey (1950), Teotia and Sen (1994), and Sharma *et al.* (2011). Infected leaves showed initial signs of small, white powdery patches on the lower surface that progressively expanded, leading to yellowing, coalescence of lesions, and early leaf drop. Sharma *et al.* (2011) had noted chlorotic zones on the upper leaf surface directly opposite the powdery growth and a tendency for infected areas to darken over time, all of which were observed in the current study. Microscopic analysis revealed upright, unbranched, hyaline, club-shaped conidiophores bearing single hyaline conidia ranging from 57–95 × 15–20/ µm. These observations are in line with the findings of Sharma *et al.* (2011), who recorded conidia averaging 71.17 × 29.58/ µm. Bessey (1950) also documented that conidia of *Phyllactinia* species are produced singly and shed prior to the formation of new ones, a characteristic confirmed in the present material by the absence of conidial chains.

Both species observed—*P. dalbergiae* and *P. guttata*—exhibited consistent morphological traits with previous literature and provided further confirmation of their distribution in Chhattisgarh. These observations contribute to the growing documentation of powdery mildew pathogens in central India and reinforce the importance of microscopic validation for accurate species identification.

DECLARATION

Conflict of interest. Authors declare no conflict of interest.

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