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Epidemic effect *Phyllactinia dalbergiae* piroz. on *Dalbergia sissoo* roxb.

Seema Sahu[1], Kalpa Oza[2*]
[1] Lecturer, Department of Botany, Sant Ghasidas Govt. PG College, Raipur, Chhattisgarh, India
[2] Assistant Professor, Department of Botany, Sardar Patel M.Sc. College, Akhaj, Mehsana, Gujarat, India

Abstract
In the early phases of plant life, *Phyllactinia dalbergiae* produces powdery mildew on *Dalbergia sissoo* Roxb. (shisham). The pathogen enters the host through the stomatal opening, spreads, and establishes itself there. The first indication of a symptom is the formation of a white, powdery mass on the leaf surface, which eventually spreads throughout the entire stem before the plant dies. With upright conidiophores bearing a single terminal conidium and brown-black cleistothecia (fruiting bodies), the infected area displayed extensive mycelial development. In a cavity slide with nutritive medium through germ tube formation, the spore's vitality was found to be 100% within two to four days. In order to examine the development of disease, healthy plants were infected with a 15-day-old culture of the pathogen during pathogenicity studies. Through stomata, the disease spreads, severely harming the tree plantation. The pathogen enters the host through the stomatal opening, after which it spreads and becomes established in the host. First, a white, powdery mass forms on the leaf surface; later, it spreads throughout the entire stalk; and finally, the plant dies.

Keywords: Mycelial, Pathogenicity, Powdery mildew, Shisham

Introduction

Dalbergia sissoo Roxb. Shisham is an essential legume tree belonging to family *Fabaceae*, subfamily *Papilionaceae* it's widely grown all over the world and in India It is grown as the ornamental roadside tree and for medicinal purposes.

Phyllactinia dalbergiae is responsible pathogen for powdery mildew, which causes symptoms to appear in early stages of plants before they die. For the first time in the nation, *Phyllactinia dalbergiae* reported powdery mildew in *Dalbergia sissoo*. dalbergiae (Jackson, 1987) [4] and later by Patil and Mahamulkar (1998) [8]. Wankhade and Peshney (1991) [10] studied conidial survival and cross-infectivity of certain powdery mildew fungi, viz., Unicinula, Phyllactinia, Sphaerotheca and Erisyphe from cultivated and wild plant. They prepare a suspension of 5% glucose with traces of citric acid in a cavity slide and as result they found spore germination in 12 hr. With upright conidiophores bearing a single terminal conidium and brown-black cleistothecia (fruiting bodies), the infected area displayed extensive mycelial development. In a cavity slide with nutritive medium through germ tube formation, the spore's vitality was found to be 100% within two to four days. In order to examine the development of disease, healthy plants were infected with a 15-day-old culture of the pathogen during pathogenicity studies (Fig. 1), (Dubey *et al.*, 2018) [2]. The presence of intercellular mycelium in the leaf's epidermal and sub-epidermal (dorsal and ventral surface) cells was demonstrated by cleared whole-mount preparation and hand-cut sections. Cells were lysed and disintegrated by dense mycelial ramification. Tree plantations are suffering significant losses as a result of the pathogen's transmission through stomata. *Phyllactinia dalbergiae* investigated the biochemical alterations in *Dalbergia sissoo* leaves. *Phyllactinia dalbergiae* infections were discovered in nurseries' trees and seedlings during the field study. Thus, *Phyllactinia dalbergiae's* morphology, pathogenicity, and disease progression were investigated in this study in both *in vitro* and *in vivo* conditions (Hiremath and Hiremath 1993) [3].

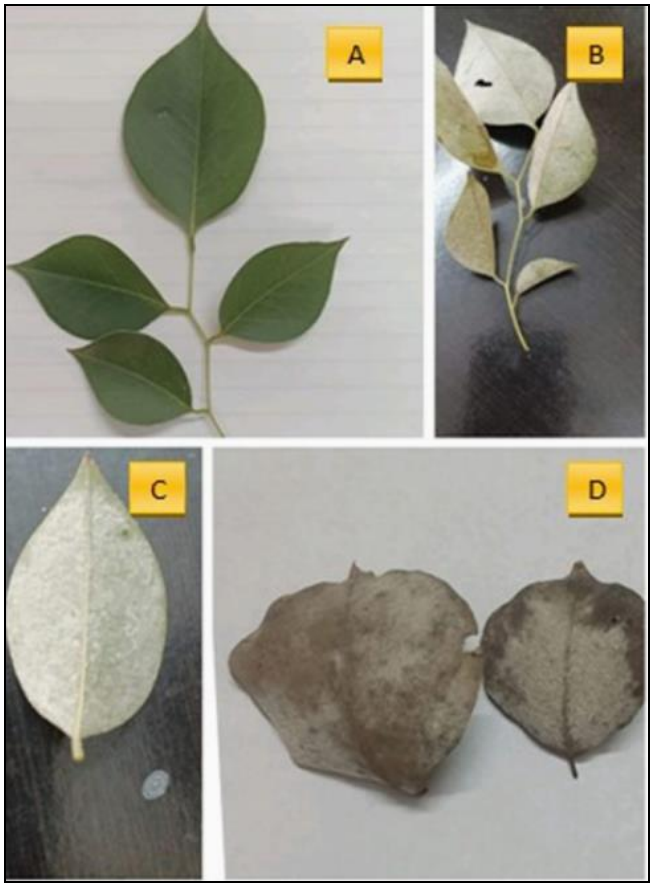

Fig 1: A. Fresh leaf of *Dalbergia sissoo* Roxb., B-C. Infected leaf by *Phyllactinia dalbergiae*, D. Old and infected leaf of *Dalbergia sissoo* Roxb.

Material and methods

The field survey was conducted for the collection of leaf samples from 10 different locations of Chhattisgarh. The excessive leaves loss was detected due to the incidence of powdery mildew disease caused by *Phyllactinia dalbergiae*.

Samples of infected leaves were collected and fixed in FAA for further studies (Dubey *et al.,* 2018) [2]. Morphology, pathogenicity, and disease progression were thoroughly examined in both *in vitro* and *in vivo* settings. The pathogen was identified and isolated for morphological research by incubating the surface-sterilized leaves (3% sodium hypochlorite for 5 minutes) on moistened blotters at 26 o 2 oC for 7 days under 12/12 hr cycles of light and darkness. The pathogen's growth pattern, development, and mycelium, conidia (Fig. 2) and cleistothecia structure were all observed. For seven and thirty days, respectively, *Phyllactinia dalbergiae* were placed on Richard's medium (broth) and Potato Dextrose Agar (PDA) media (Oza *el.al.,* 2021) [5, 6]. Conidia germination was examined using a nutrient solution in a hollow slide. Healthy seedlings (5 seeds/pot) that were 3–4 months old were artificially injected with a spore suspension (15 days old culture on PDA) of the pathogen in order to assess its pathogenicity. On the second, fourth, and eighth days following inoculation, observations were made on the plant's symptomatology, disease progress, and survivorship. To reisolate the fungus, infected plants were cultured using the blotter method. This was followed by hand-cut sections and a cleaned whole mount preparation. Histopathological investigations were conducted to ascertain the pathogen's establishment in the host tissue in order to examine the disease development in naturally infected seedlings and plants. The diseased seedlings underwent hand cutting, microtome sectioning, epidermal peeling, and cleared whole mount preparation.

Result and Discursion

Phyllactinia dalbergiae was identified as the predominant pathogen impacting the plantation's *Dalbergia sissoo* seedlings and plants during the field survey. First time reported by Jackson (1987) [4], *Phyllactinia dalbergiae* was caused powdery mildew in D. sissoo. As a result, diseased seedlings were gathered from fields and nurseries. Under a stereo binocular microscope, morphological observations of infected plant portions revealed mycelial development with densely developing erect conidiophores, each with a terminal solitary conidium. Later on, cleistothecia (fruiting bodies) were seen on the leaf surface. These were spherical, dark brown to black bodies with a few appendages that contained ascus and ascospores. The pathogen grew pure in the infected plant portion during incubation, and after 8 and 15 days, respectively, it produced a white mycelial mat when transferred to PDA and Richard's medium (Oza *et. al.,* 2020, 2021) [5, 6]. In cultures that were 18–20 days old, cleistothecia formed in both media. Hyaline, coenocytic, sparingly branching, hypophyllous, with a conspicuous nucleus and thick cytoplasm, was the characteristic mycelium. The hyphae were uninucleate and septate upon maturity. Conidia (Fig. 2) grow on conidiophores alone (Dubey *et al*., 2018) [2]. Conidiophores produce a single terminal conidium and are long, erect, hyaline, unbranched, and spirally coiled at the base. Foot cells, middle intercalary cells, and terminal generative conidiogenous cells make up a conidiophore. Conidia are hyaline, vacuolated, one-celled, and have thin walls. Related observations were found by Banerjee *et al*. (1995) [1], that the *Phyllactinia dalbergiae* conidia that cause *D. sissoo* powdery mildew germinate on a cellulose acetate sheet rather than in water. When cleistothecia are forming, they first have a white, pinhead-like shape. As they mature, they turn reddish-orange and then black. A thick hyphal wall covering mature cleistothecia, which are spherical or globose and 180–280 ôm in diameter, is made up of 6–15 short, apical, stiff, simple, spear-like appendages with a bulbous base, a pointed tip, and mucilage-secreting m X 14–22 appendages for attaching the leaf surface (Smith, 1999) [9]. In the current investigation *P. dalbergiae* was identified as the predominant pathogen on *D. sissoo* seedlings and plants during the field survey. In order to investigate symptomatology, pathogen isolation, fungal characterisation in the host and culture medium, their histology, and disease development, infected plant material was gathered.

Fig 2: Microscopic view of *Phyllactinia dalbergiae* spores.

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