

# Fungal Diseases of Trees in Forest Nurseries of Indore, India

Hemant Pathak\*, Saurabh Maru, Satya HN and Silawat SC

Forest Research and Extension Circle, Indore, Madhya Pradesh, India

## Abstract

The forest nurseries, maintained by Forest Research and Extension Circle, Indore Department of Madhya Pradesh in Indore and Dewas Dist. have many tree species. During a routine survey of nurseries, 8 tree species were found infected by fungal pathogens. The infected species showed Leaf Spot disease during the winter and rainy season. The survey was conducted at 8 nurseries in the region and the incidence of fungal disease commonly found, were recorded. The fungal pathogens were identified and studied in relation to respective environment.

**Keywords :** Nursery disease; Fungal pathogens; Tree species

## Introduction

The forest serves as a source for timber, fuel, fodder and minor forest produce to human along with conserving soil & water, moderating climate, offering food & shelter for wildlife and adding to the aesthetic value & recreational needs of man. There is a close relationship of plants and the environment. In the natural forest, productivity is generally low due to inherent slow growth of the species and mixed composition where all species may not be valuable. One of the interesting areas of the forest department is to know the causes and mechanism of a disease outbreak. Particularly in plantation, where, due to drastic changes in ecosystems, catastrophic losses may occur in the event of an outbreak of a disease. The forest nurseries have been observed with such conditions and serves as sample to understand the ecological metamorphosis. In the forest nurseries, different type of diseases such as Damping off, Root rot, Stem rot, leaf curl, Wilt, Canker, Rust, Decay etc. can be found. In the present study, we are observed specific and wide spread pathological problems of forest nurseries of Indore Dist. due to fungal pathogens in trees.

## Materials and Methods

### Sampling sites

The forest nurseries of Indore district were selected to observe fungus infected plant species. The head quarter of Research and Extension Circle of forest is situated at Malwa Demo Nursery in Khandwa Road, Indore. The Malwa demo (near Soyabean Research Center), Devi Ahilya (near Residency club), Varahmihir (near Govt. Malhar Asharam H.S. School), Kishanpura (near National Highway 59), Omkar (near Indore- Ichapur Road), Dr. Bhimrao Ambedkar (near Balaji Ka Mandir Badgonda), Paras (near Punjapura Village) and Chandrakesar (near Chandrakesar Dam) nurseries were selected for sample collection and about 20-30 different types of plant species were observed for fungal pathogens. Location of nurseries shown on the map (by Google Maps Search) of Indore and Dewas Dist. as Red marked. The Selected nurseries were observed in month of September 2013 to February 2014 (Figure 1).

### Collection and Identification

The infected plant parts of these species were collected in transparent airtight polythene bags from nurseries and identified for causal organism or disease type by observing them in Compound microscope and Dissecting microscope. The fungal species were identified based on their habit, diseases symptoms and spores identification. Plants species as *Madhuca latifolia* (Roxb.) Chev., *Pongamia pinnata* (L.) Pierre,

*Tectona grandis* L.f., *Terminalia arjuana* W. & A., *Terminalia elliptica* Willd., *Ficus racemosa* L., *Ficus benghalensis*, *Azadirachta indica* A. Juss. and *Delbergia latifolia* Roxb. found infected with fungus.

## Result and Discussion

In the present study, the nurseries were observed after the rainy season. During this season, the conditions were favorable for fungal growth. After observing different nurseries, following plant species were commonly found infected.

### *Madhuca latifolia*

The *Madhuca latifolia* (Roxb.) Chev. commonly known as Mahua is an economically and medicinally important plant growing throughout the subtropical region of the Indo-Pakistan subcontinent. Large numbers of Mahua trees were found in the Madhya Pradesh [1]. In the current study, parasitic fungi *Scopella echinulata* rust was observed on host *Madhuca latifolia* (Roxb.) Chev. lower leaf surface. Rust has dark brown telutospores on lower surface of leaf. Telutospores were observed are spiny and irregular round in shape [2]. The rust formed dark chocolate color pustules on lower surface of the leaf (Figure 2).

### *Pongamia pinnata*

It is medicinally important plant, particularly in Ayurvedic medicine in bronchitis, whooping cough, rheumatic joints and diabetes. Leaves used as a medicated bath for relieving rheumatic pain and for cleaning ulcer in gonorrhoea. The pongam seed oil has a bitter taste and considered as non edible oil. It is used as fuel for cooking and lamps, lubricant, tanning leather making soap and as illuminating oil. The seed oil contains karanjin, an active ingredient with important biological attributes [3]. A parasitic fungus *Fusicladium pongamiae* observed on host *Pongamia pinnata* (L.) Pierre, lower leaf surface. It causes black patches on lower surface of leaves and sometime leaf

\*Corresponding author: Hemant Pathak, Forest Research and Extension Circle, Indore, Madhya Pradesh, India, Tel: 0731-2461292; E-mail: [shemantpathak777@gmail.com](mailto:shemantpathak777@gmail.com)

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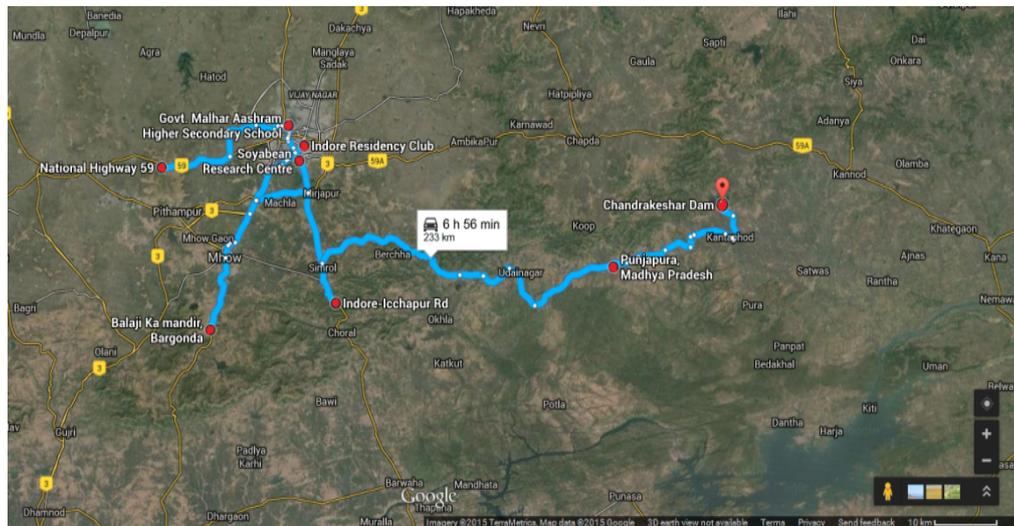


Figure 1: Location of Nurseries.



Figure 2: Rust disease caused by *Scopella echinulata* (10 × 10) on *Madhuca latifolia*.

curled (Figure 3). Fungal spores were found on lower leaf surface are long, one and two cell capsule shaped.

### *Tectona grandis*

*Tectona grandis* L.f. is a large deciduous tree with a rounded crown and, under favorable conditions, a tall, clean cylindrical bole of more than 25 m. Leaves are broad, elliptical or obovate and usually 30 to 60 cm long. Over most of its range, teak occurs in moist and dry deciduous forests. Teak (*Tectona grandis* L.f.) is one of the world's premier hardwood timbers, rightly famous for its mellow color, fine grain and durability [4].

*Olivea tectonae*, the teak leaf rust, found throughout all the observed nurseries. It is also occurs, the range of distribution of the host in India. The disease commonly found in forest nurseries. Leaves were commonly attacked, usually from October to February. Uredial and telial sori orange, yellow and observed on the lower surface of the leaf [5]. The upper surface of the leaves showed gray appearance due to the formation of flecks (Figure 4) Infection due to teak leaf rust causes premature defoliation in forest nurseries. Early defoliation resulted retardation in plant growth.

### *Terminalia arjuna*

*Terminalia arjuna* occurs commonly throughout India along rivers, streams, ravines and dry water courses. *Terminalia arjuna* is a deciduous large sized fluted tree to 30 m tall and 2-2.5 m diameter in width. It is one of the most versatile medicinal plants. In forest nurseries height of *Terminalia arjuna* is about 6-7 ft. the wood is used for building, agricultural implements, carts and boats. The bark is used for tanning.

The fungal *Sphaceloma terminaliae* were found parasitic on host *Terminalia arjuna*. This showed rust like symptoms on host plant. It causes small spots on leaves. Fruiting body of rust presented on lower surface of leaves (Figure 5). Rust produce white creamy color pustules on lower surface of leaves. Telutospores of rust were found round shaped, whitish and one celled.

### *Delbergia latifolia*

*D. latifolia* is native to the Indian Subcontinent and Southern Iran and best known internationally as deciduous premier timber species. Its wood is used in the construction industry and fuel.

Powdery mildews, one of the common plant pathogen forming colonies on the leaves and tender portions of many of the economically important plants. They are distributed in the tropical, subtropical and temperate regions of the world. *Ovulariopsis sissoo* causes powdery mildew on lower leaf surface of *D. latifolia* (Figure 6). The fungus produces persistent, dense mycelium on the lower surface of *D. latifolia* leaves. Spores were found are club shaped one celled and transparent. Infected leaves may become distorted, turn yellow with small to large patches of green, and fall prematurely. The disease on *D. latifolia* also observed [6].

### *Azadirachta indica*

*Azadirachta indica* (neem) is an herbal plant widely distributed in our subcontinent during all seasons. For thousands of years the beneficial properties of *A.indica* A. Juss have been recognized in the Indian traditional medicine. Each part of the neem tree has some medicinal property. Neem leaves, bark extracts and neem oil are commonly used for therapeutic purpose [7]. During a disease observation in nurseries powdery mildew found on upper leaf surface of *A. indica* plants. *Acrosporium (Oidium)* sp. found parasitic on this plant and causes powdery mildew on upper leaf surface (Figure 7). Spores were found are whitish capsule shaped and one celled. These powdery mildews mostly observed in the month of October- February. Fungal species on *A. indica* in khandesh of Maharashtra also observed [8].

### *Ficus benghalensis*

*F. benghalensis* is widely cultivated in the tropics. It is cultivated

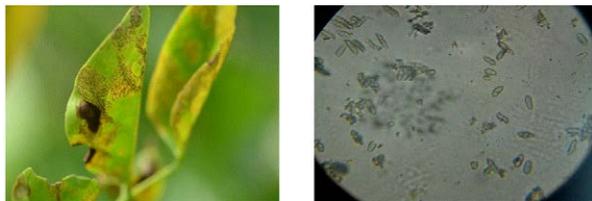


Figure 3: Rust disease caused by *Fusicladium pongamiae* (10 × 10) on *Pongamia pinnata*.

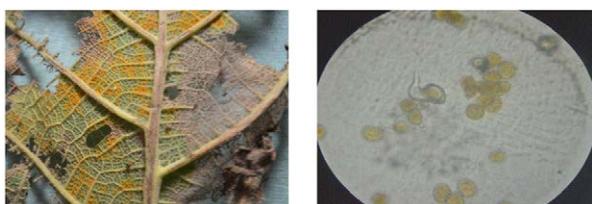


Figure 4: Rust disease caused by *Olivea tectonae* (10 × 10) on *Tectona grandis*.



Figure 5: Rust disease caused by *Sphaceloma terminaliae* (10 × 10) on *Terminalia arjuna*.

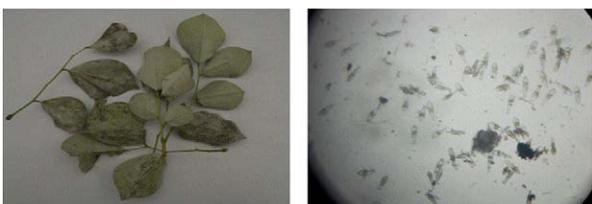


Figure 6: Powdery mildew caused by *Ovulariopsis sissoo* (10 × 10) on *Delbergia latifolia*.

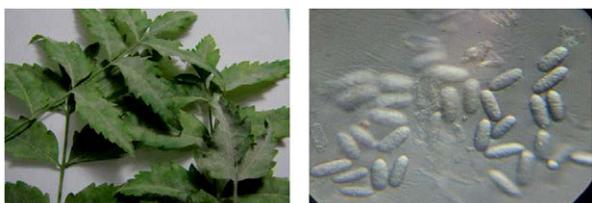


Figure 7: Powdery mildew caused by *Acrosporium (Oidium)* (10 × 10) on *Azadirachta indica*.

in India and has not had its associated wasp introduced and therefore has not yet spread from initial plantings. *F. benghalensis* is the world's largest tree in terms of its spread with some old trees covering over an acre of ground. The roots of *ficus benghalensis* are given in obstinate vomiting and an infusion of its bark is considered as a tonic and astringent and is also used in diarrhea, dysentery and diabetes [9].

The *ficus benghalensis* plant species found infected in nurseries. Fungal species *Septoria arcuata* found parasitic on ficus plants [10]. The leaves of infected plants have dark black spot on lower surface of leaves (Figure 8). Spores were found are yellowish long rod shaped one celled. In growing stage the cells divide and forming 2-3 celled club shaped structure. After some time of infection the infected area of leaves become dead and discarded from leaves.

#### *Ficus racemosa*

*Ficus racemosa* Linn. (Moraceae) is an evergreen, moderate to large sized spreading, lactiferous, deciduous tree, without much prominent aerial roots found throughout the greater part of India in most localities and is often cultivated in villages for its edible fruit. Different parts of *F. racemosa* are traditionally used as fodder, edible and ceremonial. All parts of this plant (leaves, fruits, bark, latex, and sap of the root) are medicinally important in the traditional system of medicine in India [11].

The fungal *Cerotelium fici* were found parasitic on host *Ficus racemosa*. It causes small dark brown spots on the lower surface of leaves (Figure 9). Fruiting body presented on lower surface of leaves. The spores have single celled, rounded and spiny outer layer. The disease also observed in Patna, India [12].

#### Suggestion to prevent and control of the pathogenic outbreak

**Fungicide based approach:** Rust or fungal is very hard to treat. Fungicides such as Mancozeb or Triforine may help but may never eradicate the disease. Some organic preventative solutions are available and Sulfur powder is known to stop the growth of rust and any other fungal species. In the studies going on at our center showed significant pesticide activity against rust by a Neem oil based bio-pesticide.

**Non fungicide based approach:** High standards of hygiene and good soil drainage and careful watering may minimize problems. Any appearance of rust or fungal must be immediately dealt with by removing and burning all affected leaves.

#### Conclusion

The plant pathogen causes significant losses in forests. Fungal pathogens are one of the most common resistant types of pathogens. Thus, a study on fungal pathogens and finding solutions to eradicate



Figure 8: Shot holes caused by *Septoria arcuata* (10 × 10) on *F. benghalensis*.

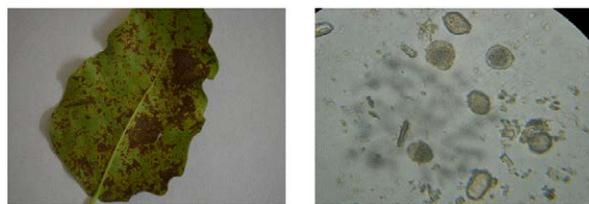


Figure 9: Rust disease caused by *Cerotelium fici* (10 × 10) on *Ficus religiosa*.

as well as prevent their infection is of utmost importance. In the current study, we concluded various types of fungal disease present in forest nurseries of Indore dist. Rust and Powdery Mildew diseases commonly found in all nurseries and some fungal pathogens *Septoria arcuata*, *Fusicladium pongamiae*, *Cerotelium fici*, showed leaf spots on infected plant species. The current survey may help forester or nursery coordinators to understand about occurrence timing, specific infecting organism, and host plant of fungal pathogens. The knowledge of the given pathogen can be useful in reducing the fungal diseases and infection in forest nursery.

#### Acknowledgement

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