

Original Research Article

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## Seedling Die-back of *Dalbergia latifolia* in Central India caused by *Colletotrichum capsici* - A New Record

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### ABSTRACT

#### Keywords

*Dalbergia latifolia*,  
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A new seedling die-back disease of *Dalbergia latifolia* was observed at Jabalpur in Central India. The causal organism was identified as *Colletotrichum capsici*. In nursery the disease ranges from 16.7 to 33.3% with an average of 25.2%. To control the disease fungicide, 0.2% Ridomil Gold was applied at fortnightly interval as soil drench. The watering schedule was also monitored to avoid extra moisture in and around root zone of seedlings.

### Introduction

*Dalbergia latifolia* Roxb. (syn. *Dalbergia emarginata* Roxb.) commonly known as blackwood, rosewood, Indian palisandre and Java palisandre is an economically important timber species native to low-elevation tropical monsoon forests of eastern India. Indian rosewood is reported to be scattered in the dry deciduous forest throughout the Indian peninsula. It grows in the sub-Himalayan tract from Oudh eastwards to Sikkim, Bihar, Orissa, and throughout Central and Southern India. Optimum growing conditions for this species are reported to be in the Bombay region (Troup and Joshi, 1983; Orwa *et al.*, 2009). It is also used in apiculture because its honey is dark amber and strong flavored.

The wood is fragrant, very hard and difficult to work because of its high density. The heartwood is rated as very durable and is generally highly resistant to attack by termites and decay fungi (Orwa *et al.*, 2009; NFTA, 1994). The sapwood, however, is liable to powder-post beetle attack. It is used to make premium-grade furniture, paneling, veneers and interior and exterior joinery. Secondary uses of the wood include knife handles, musical instruments, agricultural implements calico-printing blocks, mathematical instruments and boat keels and screws. Medicines made from the bark tannins are used against diarrhoea, worms, indigestion, leprosy and as appetizer (Kirtikar and Basu, 2005; Mohammad

Khalid and Siddiqui, 2011; Rao Konda *et al.*, 2013). It is planted as a shade tree in coffee plantations and on roadsides; being a nitrogen fixing tree and slow leaf litter decomposition it is used as mulch in crop production and also intercropped with annual crops or fruit tree (Khalid *et al.*, 2011; Nadkarni, 1954).

For large scale plantation, seedlings of *Dalbergia latifolia* are raised in nurseries. The seedlings are raised in nursery beds as well as in polyethylene containers suffered from many disease (Sehgal, 1983) causing mortality and affecting the health and vigorous of plants (Harsh *et al.*, 1992). Recently some wilt diseases of forest tree species caused by *Fusarium solani* are reported from this Institute for example, *Litsea glutinosa* (Verma and Verma, 2015); *Pterocarpus marsupium* (Verma and Verma, 2015a); and *Madhuca indica* (Verma *et al.*, 2015).

In *Dalbergia latifolia* many diseases were recorded for example, leaf spot by *Cercospora dalbergiae-latifoliae* Chiddarwar from Pune, MS (Chiddarwar, 1959); *Phyllachora dalbergiae* Niessl from Coimbatore, TN (Hosagoudar, 1985a); *Uromyces achorus* Std. from Idukki, Kerala (Hosagoudar, 1985b). *Colletotrichum capsici* was recorded on 42 different vegetables, ornamental, flower plants and some forest tree species viz. *Butea monosperma*, *Grewia oppositifolia*, *Jatropha gossypifolia*, *Mangifera indica*, *Manihot vtilissima*, *Prosopis juliflora*, *Rauwolfia serpentine*, *Sesbania grandiflora* and *Tabernaemontana divaricata* tree (Bilgrami *et al.*, 1981). The die back disease causes significant damage to young plantations (1-5years) (Verma *et al.*, 1997) in Central India. An account of diseases of leguminous trees and their management has been reported (Verma *et al.*, 2011) without

any mention of die back disease *Dalbergia latifolia* by *Colletotrichum capsici*.

The present study reports a new record of seedling die back disease of *Dalbergia latifolia* caused by *Colletotrichum capsici* (Syd.) E.J. Butler and Bisby, in nursery of Central India.

## Materials and Methods

### Study Area and Sample Collection

The samples were collected from nursery of Genetics and Plant Propagation Division, Tropical Forest Research Institute (TFRI), Jabalpur, India is situated between 23°5'37" to 23°6'10"N latitude and 79°59'49" to 79°59'42"E longitude, average elevation is 411 meter from sea level. The area falls under basaltic landscape and the soil texture is more than 55% clay content. The soil of Jabalpur is black cotton soil. The temperature of Jabalpur varies from 9°C to 43°C and the average annual rainfall over the area is 1358mm (Totey and Gupta, 1993). *Dalbergia latifolia* seeds were collected from TFRI campus and seedlings were raised in polyethylene bags. These seedlings were kept in groups under agro-shade house and irrigated with sprinkler misting system. Numbers of disease in seedlings in each row were counted and recorded.

### Identification of Pathogen

Diagnosis and identification of causal organism were done in laboratory. The pathogen was cultured in petri-dish using sterilized potato dextrose agar (PDA) medium inoculated with surface sterilized diseased bits of tender roots. After 5 days of incubation at 28 ± 2°C, whitish wooly growth of fungal colony appeared in petri dish. For microscopic study, slides were

prepared in lactophenol and cotton blue staining reagent and studied under different magnification using advance research microscope [Leica (Germany) model DMRB 1994] and photographs were taken. The infected sample is deposited in the forest pathology herbarium under Acc. No 3840 and culture is deposit in TFRI, Jabalpur under Acc. No. TFC 60. The pathogen was identified after cultural and microscopic study by consulting literature (Burnett, 1976; Jamaluddin *et al.*, 2004; Verma *et al.*, 2008; Nagmani *et al.*, 2009).

### Disease Incidence

Numbers of infected seedlings from each row of nursery were counted. Percentage disease incidence was determined as follows:

$$\text{Disease Incidence \%} = \frac{\text{Number of seedlings infected} \times 100}{\text{Total number of seedlings}}$$

### Results and Discussion

#### Pathogen

*Colletotrichum capsici* (Syd.) E.J. Butler and Bisby = *Vermicularia capsici* Syd. = *Steirochaete capsici* (Syd.) Sacc., Fungi of India: 152 (1931) (Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Glomerellales, Glomerellaceae)

The causal organism of *Dalbergia latifolia* seedling's die back was identified as follows:

Colonies with dense whitish to dark grey aerial mycelium; reverse dark brown, fruiting bodies acervuli, developing from the stromatic mass of hyphae, conidiophores closely packed, simple, short, hyaline; phialides in palisade layer; conidia aseptate,

fusoid, somewhat curved or sickle shaped or cylindrical, smooth, 1-celled hyaline, aggregated in cream, orange or red or brownish slimy masses, appearing as glistening mass, conidial masses pale buff to salmon; sclerotia absent; setal abundant, long, rigid, bristle like, septate, dark below, lighter above; conidia falcate, fusiform, apices acute, 16-21 x 2.8-3.5  $\mu\text{m}$ .

#### Pathogenicity test

The pathogenicity was proved as per Koch's postulates by inoculating the healthy seedlings with fungal spore suspension. The spore suspension of pathogen was prepared ( $4 \times 10^3$  cfu/ml) from 15d-old culture and 30 ml of spore suspension was inoculated in healthy plants (18 seedlings) having 5.5-8.5 cm height. The same pathogen was re-isolated from inoculated affected seedlings in pure form and identified as *C. capsici*.

#### Occurrence of Disease

The disease appeared after the early rainfall in late July and continued up to September. The infected plants started dying from top to downward. Plant became partially to completely dry. The occurrence of the disease was calculated after counting the numbers of die back disease affected seedlings. Total 30 seedlings were observed in each row and number of affected seedling was counted. Disease ranges from 16.7 to 33.3% with an average of 25.2% (Table 1). The pathogens produced large number of viable conidia in nursery, thereby, causing severe damage to the seedlings.

#### Management of Disease

To manage the disease fungicide, 0.2% Ridomil Gold, (Make, Syngenta, containing metalaxyl – M, 4%, mancozeb, 64%, sodium lignosulfonate, 2% and dibutyl naphthalene sulfonic acid sodium salt, 2%) was applied

at fortnightly interval as soil drench. The watering schedule was also monitored to avoid extra moisture in and around root zone of seedlings. The above treatments and management practice control the disease up to 93.69%.

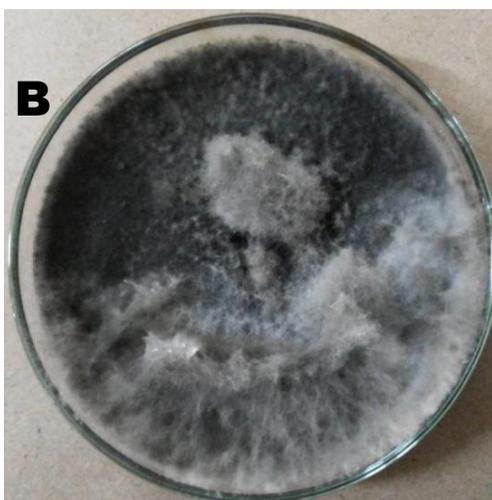
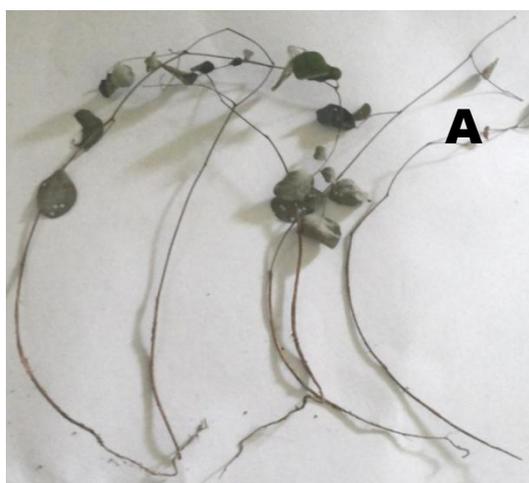
Sapling die-back in young plantation was also reported in *Acacia nilotica*, *Albizia lebbek* and *Pongamia pinnata* with mortality percentage 25.5%, 20.8% and 11.3%, respectively caused by

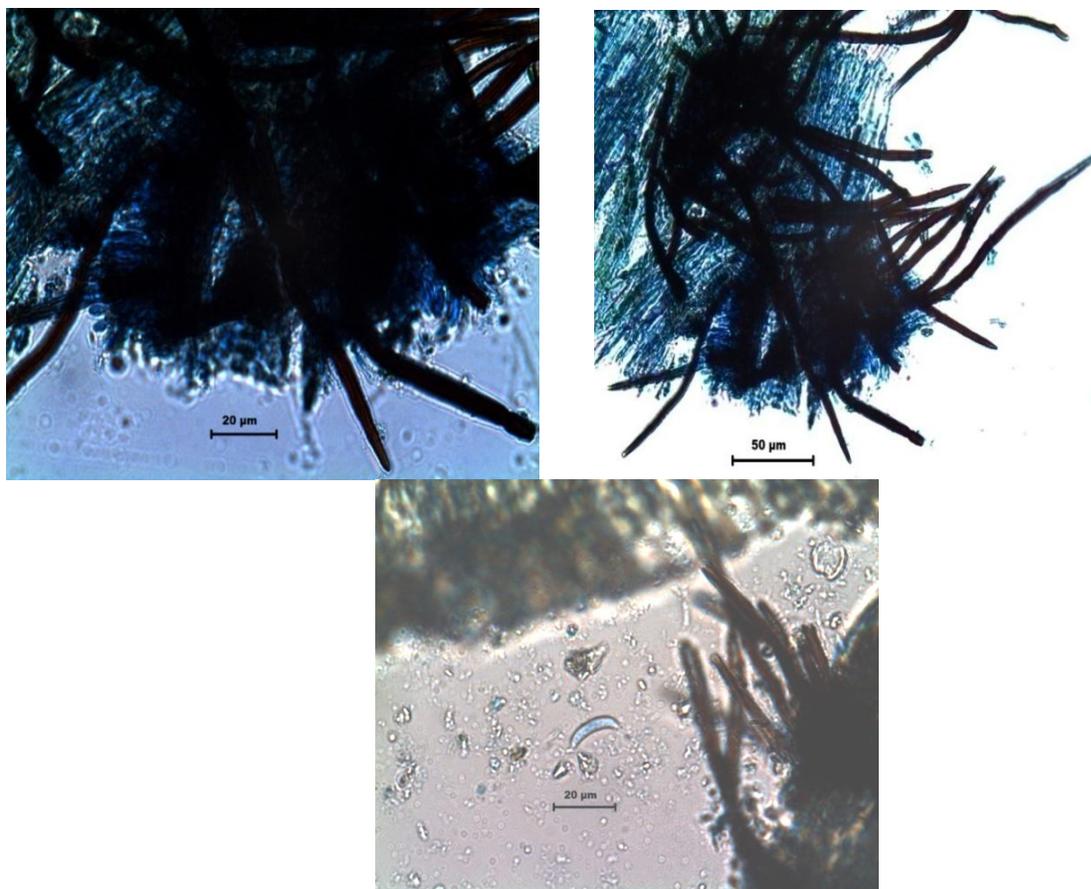
*Haplosporella bakeriana* and *H. beaumontiana* (Verma *et al.*, 1997) but they have not applied any management method to control the disease. Gupta *et al.* (1997) observed die back in mulberry at different locations in Karnataka and Andhra Pradesh. *Botryodiplodia theobromae* was isolated as causal organism. Greenhalgh (1981) reported *Collectotrichum gloeosporioides* dieback disease of many species of the genus *Protea* in Australia.

**Table.1** Occurrence of seedling die back disease in nursery

Row No.	Total number of seedlings examined	Die back affected seedlings	Disease %	Control of disease after management (%)
1	30	10	33.3	83.3
2	30	5	16.7	100
3	30	8	26.7	93.3
4	30	6	20	96.67
5	30	12	40	80
6	30	7	23.33	100
7	30	5	16.7	96.67
8	30	7	23.33	93.3
9	30	8	26.7	100
<b>Avg.</b>	<b>30</b>	<b>7.55</b>	<b>25.2</b>	<b>93.69</b>

**Fig.A-E** *Colletotrichum capsici* (A) affected seedlings of *Dalbergia latifolia* showing symptoms (B) pure culture on PDA (C-E) acervulus with prominent setae and conidium





Similar result was found in South Africa nurseries by BeniĆ and Knox-Davies, (1983) and disease was completely cured by using chemical fungicide. *Dalbergia latifolia*, being an important tree species therefore in the present study, its die back disease was controlled by application of chemical fungicide. Solano and Arauz, (1995) applied 5 fungicides against papaya anthracnose caused by *Colletotrichum gloeosporioides* and found that mancozeb and prochloraz showed the best result. Freeman et al. (1997) also assessed various fungicides like folpet, captan and propaconazole to control this pathogen and found captan at 50% was the most effective. Dubey and Ekka (2003) tried 13 fungicides to control blight disease of bitter melon (*Momordica charantia* L.) by *Colletotrichum capsici* and amongst fungicides tried, Topsin M gave the best result.

## E

Combination of bio-control agent, *Trichoderma* and fungicides showed good results for control of *Colletotrichum* (Freeman et al., 2004). Hussain et al. (2008) also used *Trichoderma* spp. and fungicide in different conc., and reported that mancozeb is the most effective against the pathogen. Five isolates of *Trichoderma viride* and two isolates of *Beauveria bassiana* were screened against *Colletotrichum gloeosporioides* for their antagonistic potentiality by dual culture plate method. Three isolates of *T. viride* and one isolate of *Beauveria bassiana* were found effective bio-control agents against anthracnose of sarpagandha (*Rauvolfia serpentina*) (Ghosh and Chakraborty, 2012).

In conclusion, a seedling disease of *Dalbergia latifolia* caused by *Colletotrichum capsici* is reported from the

first time from Central India. Incidence of the disease varies from 16.7 to 33.3%. The disease can be controlled by application of 0.2% fungicide, Ridomil and avoiding extra moisture in root zone of seedlings in nursery conditions.

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