

RESEARCH ARTICLE

PATHOLOGICAL PROBLEMS AND ASSOCIATED MYCOFLORA OF CERTAIN IMPORTANT TREES OF BHIWANI (HARYANA)

*¹Hoshiar Singh Tak, ²Ajit Singh and ³Shabir Ahmad

¹Department of Botany, C.B.L.U., Bhiwani, Haryana, India

²Department of Botany, Government College Bhiwani, Haryana, India

³Department of Botany, Singhanian University, Pachar, Jhunjhnu, Rajasthan, India

Accepted 13th March, 2015; Published Online 30th April, 2015

ABSTRACT

Based on extensive forest disease survey conducted in the Bhiwani district of Haryana, certain fungal species causing various types of disease were identified on *Delonixregia*, *Bauhinia varigata*, *Cassia fitula*, *Dalbergiasisso*, *Meliaazardarach*. Stick trapping technique used for isolation of wood host plant, usually at the collar region of potentially infected host and examining for mycelial development. Various fungal disease were observed including leaf spot (*Cercosporasisso* and *Alternariaalternata*), powdery mildew (*Phyllactinadalbergiae*) stem canker (*Diatrypewhitnenensis*) white stringy rot (*Phellinusdalbergiae*), heart rot (*Hypoxylonhaematostroma* and *H.rubiginosum*) wood rot (*Xylaria multiplex*, *Dupertellatristicula* and *Daedaleopsisconfragosa*). Out of these, *Diatrypewhitmanensis*, *Duportellatristicula* are found to be exotic fungal for the study area.

Key Words:

INTRODUCTION

The association of fungus and plants is ancient and involves many different fungi. Fungi are an important group of plant pathogen most plant disease are caused by fungi but fewer than 10 % of all known fungi can colonize living plants (Blanchard and Tattar, 1981). Plant pathogenic fungi represent a relatively small subset of those fungi that are associated with plants. Most fungi are decomposers, utilizing the remains of plants and other organism as their food source. Other types of association that will be discussed here include the role of fungi. Most fungi are associated with plants as saprotrophs and decomposer. These fungi break down organic matter of all kinds, including wood and other types of plant material. Fungi are among the few organisms that can effectively break down wood and fall into two main types viz. brown and white rot fungi. There are thousands of species of plant pathogenic fungi that collectively are responsible for 70% of all known plant disease. Plant pathogenic fungi are parasites but not all plant parasite fungi are pathogens. We can further divide plant pathogenic fungi by the stage of plant host that attacked, for example- seed, seedlings or adult plants and by what part of the plant are affected-roots, leaves, shoots, stems, woody tissues, fruits or flowers. The main objective of the present study is the identification and documentation of various fungal species that attack the selected plant species and to create a baseline data for further research.

MATERIALS AND METHODS

The present study was undertaken in district Bhiwani, Haryana (Fig.1).

*Corresponding author: Hoshiar Singh Tak,
Department of Botany, C.B.L.U., Bhiwani, Haryana, India.

Stick trapping technique used for isolation of wood host plant such as rubber into the soil, usually at the collar region of potentially infected host and examining for mycelial development. To obtain pure culture, soil diluted in water or explants is plated on a selective medium as developed by Dargan *et al.* (1985). The formulation of the selective medium is malt extract 20 g, Agar 20 g, benomyl 10 mg, Ampicillin 100 mg gallic acid 500 mg tergitol NP-7- 1000 mg used. The malt and agar base medium was autoclaved and cooled to 40-60^oc before adding filter-sterile solution of all remaining component. Culture are incubated in the dark from 25-30^oc.

RESULTS AND DISCUSSION

Different fungal species were identified causing various types of disease on selected plant species viz. *Delonixregia*, *Bauhinia varigata*, *Cassia fitula*, *Dalbergiasisso*, *Meliaazardarach*. Various fungal disease were observed including leaf spot (*Cercosporasisso* and *Alternariaalternata*), Powdry mildew (*Phyllactinadalbergiae*) stem canker (*Diatrypewhitnenensis*) white stringy rot (*Phellinusdalbergiae*), heart rot (*Hypoxylonhaematostroma* and *H.rubiginosum*) wood rot (*Xylaria multiplex*, *Dupertellatristicula* and *Daedaleopsisconfragosa*). Out of these *Diatrypewhitmanensis*, *Duportellatristicula* are found to be exotic fungal for the study area. A finding has been reported on *Acacia nilotica* and *Albezialebbek*, in an earlier communication by Dargan and Dulat (1993). Many of the same fungi that kill seedling can also infect the roots of mature plants and cause root and crown rot disease. The infection often occurs through wounds and result in lesions or death of part or all of root system. This is the first time survey of the study area to represent the pathogens and the diseases for the selected plants. The selected plant species, pathogen, diseases and symptoms of the diseases are given below.

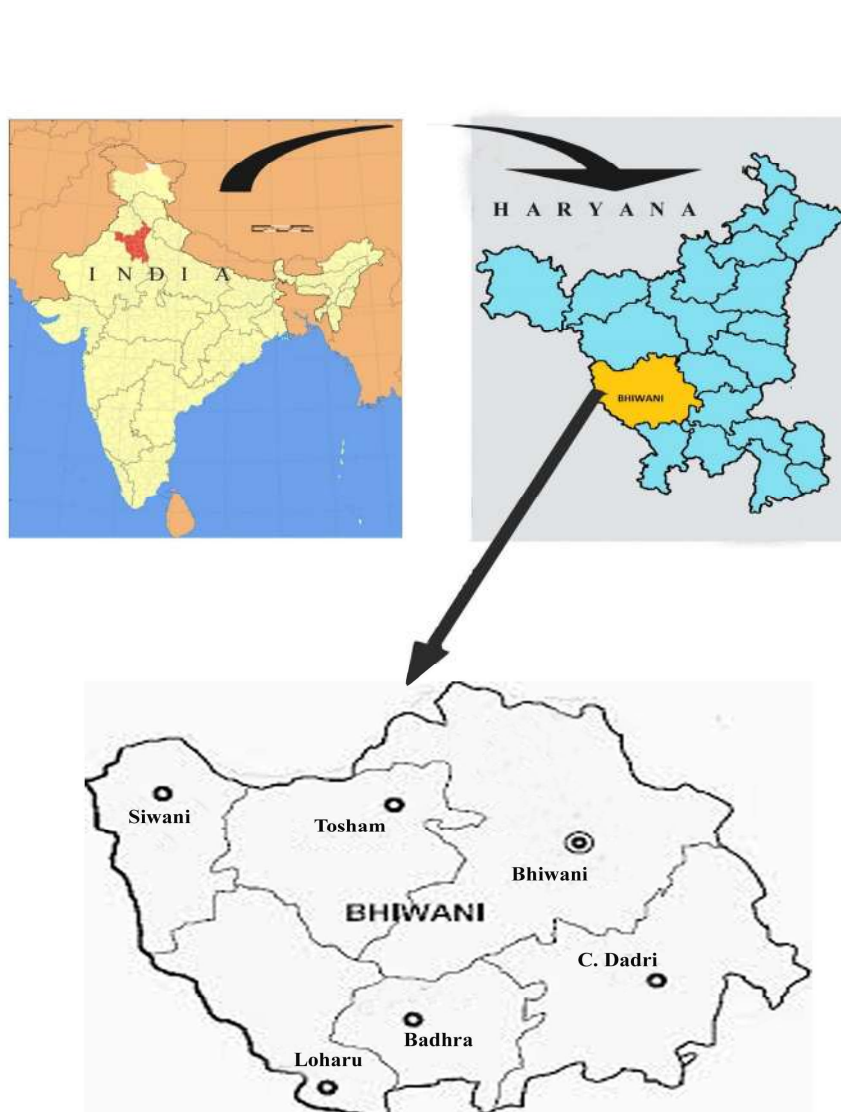


Figure 1. Geographical location of study area

1. ***Delonixregia (Gulmohar)***:- It is a large deciduous, evergreen tree with fern like leaves. Leaves are pinnate, slightly hairy about 30 cm long. Leaflets are oblong in 18 to 30 pairs, flowers are large, showy, red, yellow. In the Haryana it is planted in the institutes and university as a garden tree. It is an important multipurpose genus.

Disease:-Root rot.

Pathogen:- *Phellinusnoxius*

Symptoms:- The disease characterized by slowly enlarging disease. Centres and a thick, dark brown mycelial sheath around the bases of infected trees. The fungal attacked young seedling causing shrivelling and leaf death and shedding. The seedling did not die due to the attack of the fungus. Hyphae light brown, septate, branched upto 3.5µm in diameter, thin walled, conidia light brown, smooth, obclavate, generally beaked, beaks conical or cylindrical with rounded ends, 3-7 transverse septa, 25-46x8.5-17 µm, usually formed singly. (Plate- 1 & Figs 1-2).

2. ***Bauhinia verigata- (Kachnar)***:- It is also large sized deciduous tree, bark of which is ashy to dark brown, nearly smooth, leaf clefted half way down into two rounded lobes. The bark is used for dyeing and tanning and the best for fibres. Flowers bud and fruits are used as vegetable and the leaves for fodder. Often grown in gardens or on road side in Haryana.

Disease:- Root rot, White spongy rot.

Pathogen:- *Ganodermalucidum*

Symptoms:- General wilting of the tree leading to complete mortality. Sporophores of the fungus present at the base of the tree, attached to the root. Sporophores, stipitate, corky, becoming woody later 4-11 x 5-8x3-5 cm; stalk lateral to central, varnished, reddish brown shiny, encrusted, cylindrical, upto 12 cm long and 3 cm thick; upper surface shiny reddish brown with laccate crust, smooth, zonate, margin thick and white; context dark brown to light brown, upto 2 cm thick, hymenial surface white when fresh, light yellowish- brown when dry, pores small, rounded, basidiospores dark brown,

broadly ellipsoid, truncate at one end, thick walled, outer wall smooth, inner wall echinulate. Skeletal hyphae brown, aseptate, unbranched, generative hyphae pale brown thin walled, septate, with clamps binding hyphae pale brown branched, thick walled. (Plate- 1 & Figs 3-6).

Sporophores broadly effused, inseparable from the wood when dry, velvety to touch when fresh, rigid and woody when dry, upto 3mm thick, margin not different from pore surface; hymenial surface coffee brown, pores 3-5 per mm, almost rounded, 126-155 x 105 – 134 μ m, pore tubes stratose.

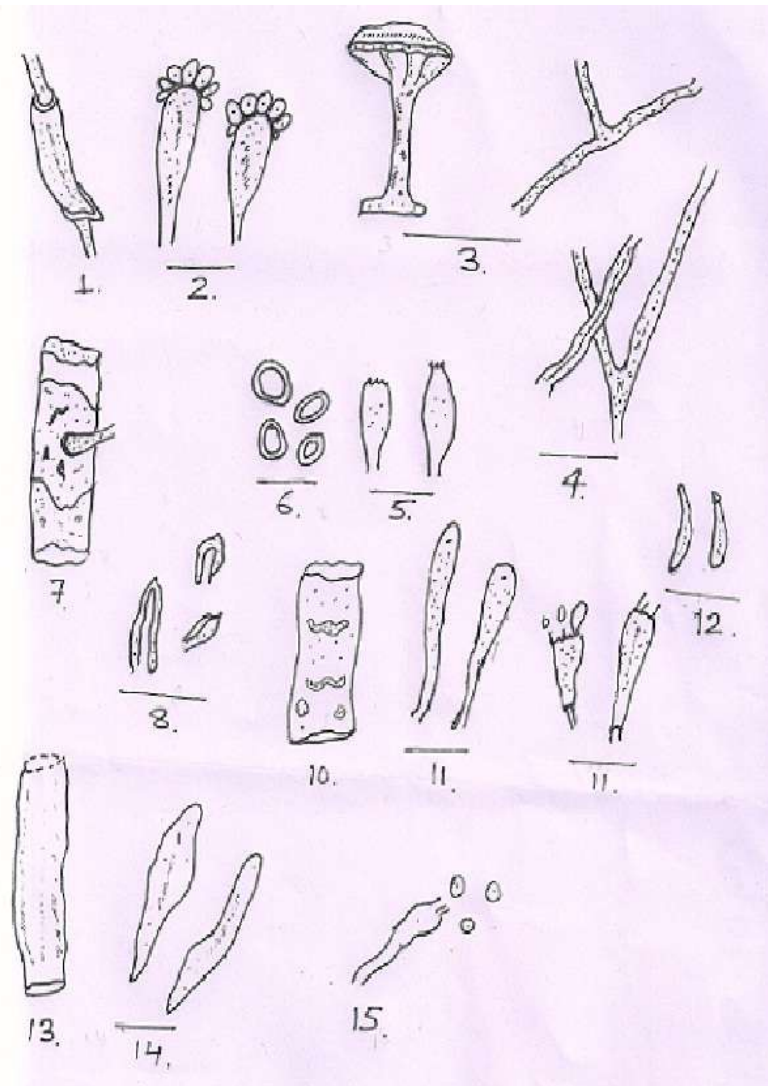


Plate.1. Fungus. Fig. 1-2. Hyphae- *Phellinus noxius*, Fig. 3-6. Sporophores- *Ganoderma lucidum*, Fig. 7-8. Sporophores- *Phellinus contigua*, Fig. 9-10. Basidiocarpe- *Schizophyllum commune*, Fig. 11-12. Sporophores- *Trametes ravidia*, Fig. 13-14. Basidiospores- *Scytinostromacystidium*, Fig. 15. Sporophores- *Foinesinteus*

3. ***Cassia fistula* (Amaltas):-** It is a small tree with pinnate leaves. Flowers are pink and fragrant. This is native of Malaya but also planted in India along road side for shade and in gardens for its pink flowers. Also used as fodder and fuel wood. *C. fistula* is colonized by number of fungal species in India (Bilgrami et al., 1991). During the present investigation, three fungal species were collected from the infected stem of the tree species.

1. **Disease:-** White fibrous rot.

Pathogen:- *Phellinus contigua*

Symptoms:- Coffee brown effused sporophores on the dead stump as well as living stem of *C. fistula*. Infected wood turns brittle and shows yellowish-white fibrous rot.

Basidia hyaline clavate, upto 3.5 μ m broad; basidiospores dark brown, thick walled 4.8-6.4x4.0-4.8 μ m, subglobose apiculate, hyphal system dimitic, skeletal hyphae yellowish brown aseptate, unbranched, thick walled with narrow lumen, generative hyphae pale brown, septate, unbranched, thin walled without clamps. (Plate- 1 & Figs. 7-8). The species has been previously reported from South India, infecting hard wood species, however, there is no previous report on occurrence of this disease on *C. fistula* from India.

2. **Disease :-** Wood rot

Pathogen :- *Schizophyllum commune*

Symptoms :- Small white basidiocarps present on the bark as well as exposed heart wood on the stem. Basidiocarps fan shaped white, hard and corky when dry, generally solitary,

sometimes in small groups, mostly sessile, attached to woody substratum by a broad base, sometimes stalked, white when fresh as well as on drying, the margins turn inward on drying, lower surface light brownish-grey possessing lamellate gills at different length and depths. Radiating towards the margin, longitudinally splitting in to two halves which curl outwards on drying, context light brown. Hyphal system dimitic, skeletal hyphae hyaline, unbranched, 6.8 μm brown, thick walled, generative hyphae pale, branched, septate, with clamps cystidia elongated encrusted, hyaline basidia hyaline 20.0-25.0x3-6 μm with 4 sterigmata; basidiospores. (Plate- 1 & Figs 9-10). The species has been previously reported on various angiosperm as hosts from India (Bilgrami et al., 1991).

3. Disease:- White spongy rot.

Pathogen:- *Trametes ravidia*

Symptoms:- Effuse –reflexed, white sporophores, becoming reddish-brown at places, present on living stem. The infected wood gave whitish appearance and showed clear signs of rot. Sporophore sessile, effuse-reflexed, sometimes adjoining pilei laterally fuse, attached by a broad base, flexible when fresh, rigid when dry, 0.3-0.7x0.2-15.0x0.3-1.0 cm upper surface white when fresh, becoming reddish brown at places when dry, uneven, azonate margin thinning out, incurved when dry. Context creamish white, hymenial surface white when fresh, turning straw coloured when dry, pores nearly rounded to elongated 1-4 per mm, usually extending upto the margin, pore tubes 2-3mm long. Basidia hyaline, clavate, sterigmata hyaline, upto 2.4 μm long, basidiospores hyaline, thin walled, oblong-elliptic, guttulate, 4.8-7.7x2.8-3.2 μm . Skeletal hyphae pale, unbranched, aseptate, thick-walled 3-5 μm in diameter, binding hyphae hyaline, septate, highly branched. (Plate- 1 & Figs. 11-12). The fungus has generally been reported on stumps and logs of conifers and rarely on hard woods (Bakshi, 1971).

4. Dalbergiasisso (Shisham):- The tree mainly found in Bengal, Bihar and Madhya Pradesh, Punjab and Haryana. It is a tree much resembling the *D. Latifolia* but with smoother stem, longer leaf rachis obtuse leaflets and broader pods. Planted occasionally in gardens. During the present investigation, only one fungus was found associated with the tree.

Disease:- Heart rot.

Pathogen:- *Scytinostromacystidium*

Symptoms:- Heart wood shows signs of rotting. Since the sap wood is not affected, the living tree shows healthy appearance. Frutifications develop on wounded exposed heart wood. Frutifications resupinate membranous, adnate, widely effused, upto 580 μm thick in section; hymenial surface white to margin thinning, paler concolorous, adnate; context ranged hyphae; cystidia cylindrical to subfusiform, often arising from different parts of the context, immersed, heavily encrusted all over except at the base. Incrustations subhyaline and soluble in 10% KOH solution, the walls thick subhyaline. Hyphal system dimitic, skeletal hyphae 1.5-2.5 μm wide, irregularly and dichotomously branched, non septate, walls subhyaline, thick generative hyphae 1.5-3.0 μm wide, branched, septate, clamps absent, walls subhyaline, thin, non dextrinoid and acyanophilous. Basidia 24.3x7.2-8.0 μm utriform, 4-spored, basidiospores 4.4-5.1x3.2-3.5 μm globose to subglobose,

shortly apiculate, walls smooth, dark brown. (Plate- 1 & Figs. 13-14). The species had been previously reported from Punjab by Rattan (1977) at root stock of *Principia* sp. from Pathankot.

5. Syzygiumcumini (Jamun):- A glabrous evergreen large sized tree with light coloured thick and rough bark leaves broadly oblong or elliptic-oblong. Flowers white or greenish white fragrant. Commonly planted in Haryana as a road side tree or along canal banks. Also cultivated for its edible fruits. Its wood is used as a construction timber and for making of boats etc. Fruits are edible and seeds are used as fodder.

Disease:- White spongy rot

Pathogen:- *Fomeslinteus*

Symptoms:- The wood of the infected stump becomes brittle, degraded and appear white. Reddish-brown frutification present prominently in patches at the base of the stump. Sporophores sessile, appanate to imbricate, 1.5-12x0.8-4.5x1.5cm, upper surface dull reddish brown, matted, tomentose, zinate, woody, margin thin, light in colour, hymenial surface light brown to rusty brown, soft and velvety to touch, pores round to slightly angular. Skeletal hyphae yellow to brown, aseptate, unbranched, thick celled upto 3.8 μm wide; generative hyphae light yellow, septate, branched, thin walled 2.5 μm in diameter. Basidia almost hyaline, clavate 15.0-18.0x4.0-5.0 μm , basidiospores light yellow, 3.5-4.0x3.2-3.5 μm , oval to subglobose in shape. (Plate- 1 & Fig. 15). Bagchee (1950) reported *F. Caryophylli* on *S. Cumini* from India.

Conclusion

A great diversity of fungi was seen among the host plants studied, which includes some ubiquitous forms along with some host specific species. The role of these fungi within the hosts is still unknown. Benefits to hosts plants such as the antagonism of pathogenic fungi or insect through mutual interaction could be speculated. Fungi of these host plants may have pharmaceutical potential. In this regard investigations of interactions of these plants and their symbiotic fungi would be the next direction for future research.

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