RECORD OF A LEAF SPOT DISEASE AND A ROOT ROT DISEASE OF DALBERGIA SISSOO IN BANGLADESH

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Dalbergia sissoo Roxb. (sissoo) is an important multipurpose forest species. Due to its natural hardiness, fast rate of growth and the high value of the resulting wood, sissoo is prized for furniture and general constructional work (Troup 1921, Tewari 1994). On account of its timber value, the Forest Department of Bangladesh in 1992–93 initiated strip plantations of sissoo along roadsides, railway-sides and along banks of canals. An outbreak of a leaf spot disease and a root rot disease of sissoo saplings (2–3-y-old) occurred in a 4-km long roadside plantation at Garura-Tekala-Dhanmadata, Daulatpur, Khustia, in November 1995. Khustia is located at 23°58' N and 89° 02' E. The present paper deals with the symptoms of these diseases, isolation and identification of the causal organisms and the measures taken to control the diseases.

One hundred trees of *Dalbergia sissoo* were randomly selected for examination of infection of leaf spot disease and root rot disease from a plantation where these diseases have recently been reported. Small pieces of infected and healthy leaves and roots were sterilised with 0.1% mercuric chloride solution for 2 min (Booth 1971a) and plated on 2% potato sucrose agar (PSA) medium (Anonymous 1983). Plates were incubated at 27 °C. Plates containing infected leaves and roots showed sufficient mycelial growth. Plates containing healthy leaves and roots showed no fungal growth. In the case of root rot disease, besides isolating fungus from infected roots, fungus was isolated from the soil by soil dilution techniques. Suspension of 0.5-g soil was dispersed across the bottom of sterile Petri dishes and melted, cooled PSA medium was added on it. The soil particles were distributed throughout the medium by rotating the Petri dish. Inoculated plates were incubated at 27 °C for 7 days (Anonymous 1983). Fungi that grew in the culture plates were observed microscopically.

To control the leaf spot disease, the fungicide Benlate (benomyl) was sprayed once every 7 days for consecutive four weeks at the rate of 1 g/litre of water, on some infected sissoo saplings. Another fungicide, Cupravit, was sprayed similarly on some other infected plants. To control the root rot disease, the top soil of about 10–15 cm depth and of about 2 m radius around each of the affected trees was dug and then the soil was drenched thrice everyday for a fortnight with 2% formalin (commercial), i.e. 50 ml formalin/litre of water. The formalin was applied on 200 infected saplings of sissoo.

Leaf spot disease. At first, small, light reddish-orange spots appeared on the undersurface of the leaves which gradually became reddish-brown and ultimately black in colour with reddish-brown margin. The spots were irregular in shape and 1–10 mm in diameter. On the upper surface of the leaves each spot was at first marked by a chlorotic area but the spots finally took the same appearance as those on the under-surface of the leaves. The infected leaves showed premature defoliation. The ratio of trees infected with this disease to healthy looking trees was 68:32.

Transverse section of the infected leaves showed subepidermal perithecia. In culture the fungus developed profuse growth with perithecia and also conidiophores bearing conidia. Perithecia were globose with a depressed ostiole, containing cylindrical to clavate, 8-spored asci. Ascospores were hyaline to greenish, ellipsoid, 2-celled, 5-15 \times 2-4 μ m.

Paraphyses were absent. Conidiophores were simple or branched, smooth or slightly rough walled, septate, olivaceous brown, up to 150 μ m long and were formed singly from hyphae. Conidia were pale olivaceous, verrucose, cylindric, straight or slightly bent, mostly simple rarely catenulate or branched, rounded at the apex, tapering to a truncate base with a thick hilum, 8–70 × 2–3.5 μ m. The causal organism was identified as *Mycosphaerella dalbergiae* Muller and Ahmad, following Sydow and Ahmad (1939), Chupp (1954) and Holliday (1980). Previously this ascomycetous fungus was found to cause leaf spot disease in sissoo plantation in Pakistan (Huque 1964) and India (Agarwal & Sarbhoy 1980). Of the two fungicides tested to control leaf spot disease of sissoo, Benlate was found to be more effective than Cupravit.

Root rot disease. Roots were badly infected with the fungus. The bark of the infected roots became rotten and dark brown gummy substances plugged the xylem vessels. The stem near the soil level became brown. On splitting open the stem a cottony growth was observed which consisted mostly of macro- and microconidia of the pathogen. The leaves of the infected plants showed yellowing, shrivelling, wilting and premature defoliation. Many saplings died due to severe infection of the root rot disease. The ratio of root rot diseased trees to healthy looking trees was 60:40.

Mycelia developed from the diseased roots on PSA medium produced a white colony with or without violet pigment. The colony was at first floccose but in 15 days became felty and sometimes wrinkled. Mycelia were delicate, hyaline with a purple tinge. Microconidia ovoid or ellipsoid-cylindrical, arose from simple, short lateral monophialides, $5-10 \times 2-3 \mu m$. Macroconidia were produced on elaborately branched conidiophores. Macroconidia were thin walled, generally 3-5 septate, fusoid-subulate and pointed at both ends, $27-55 \times 3-5 \mu m$. Chlamydospores were produced in old cultures. The causal organism was confirmed as *Fusarium oxysporum* Schltr. following Booth (1971b). Application of 2% formalin on the soil partially minimised the disease. In Bangladesh this deuteromycetous fungus is present chiefly as a soil saprophyte but it becomes an active parasite and causes root rot disease when it comes in contact with the subterranean parts of sissoo. This fungus has also been found to cause root rot disease of *Tectona grandis* in Pakistan, *Pinus radiata* in Australia, *Pinus resinosa* in Canada (Browne 1968) and *Gmelina arborea* in India (Jamaluddin *et al.* 1988).

From the review of literature (Ahmed 1952, Jalaluddin 1970, Basak 1994), there were no records of *Mycospharella dalbergiae* causing leaf spot disease and *Fusarium oxysporum* causing root rot disease in Bangladesh. These two diseases of sissoo are, therefore, reported here as new to Bangladesh.

The present study also shows that spraying of the fungicide Benlate controls leaf spot disease of sissoo effectively and application of 2% formalin on the soil reduces its root rot disease.

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