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Short communication

Exserohilum rostratum: the incitant of oat leaf blight in Himachal Pradesh, India

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Abstract

During the 2023-24 *rabi* season, severe leaf blight symptoms were observed on fodder oat (*Avena sativa* L.) cultivated in Himachal Pradesh, India, a major fodder-producing state in the north-western Himalayan region. Disease incidence varied from 40 to 60% across four surveyed fields of Amb (Una) under cool temperatures, high relative humidity and prolonged leaf wetness. Symptoms initially manifested as small, purple, oval to elongated lesions with grey centres that coalesced, causing extensive leaf blighting. The pathogen was isolated from infected leaf tissues and identified as *Exserohilum rostratum* based on cultural, morphological and molecular characteristics. Pathogenicity was established through artificial inoculation of healthy oat plants, which reproduced typical symptoms within 7 days, followed by re-isolation of the fungus. This study presents the first report of leaf blight in fodder oat caused by *E. rostratum* in Himachal Pradesh, India.

Keywords: *Exserohilum rostratum,* Fodder oat, Leaf blight

Fodder oat (*Avena sativa* L.) is an important winter forage crop in Himachal Pradesh, supporting grassland-based livestock production systems in both mid- and high-altitude regions. Its extensive cultivation for green fodder is attributed to its high biomass production, palatability and nutritional value under cool climatic conditions. Green fodder oat provides abundant vitamin A and contains about 10 to 12% protein, along with key minerals like calcium (Ca) and iron (Fe), and has a dry matter content of 30 to 35% (Singh *et al*., 2015). However, the prevailing agroclimatic conditions of the state, characterised by frequent winter rainfall, extended dew periods and high relative humidity, promote the occurrence and spread of foliar fungal diseases. A field survey during the 2023-24 *Rabi* season confirmed the incidence of oat leaf blight in Himachal Pradesh and leaf blight-affected samples were collected in December from Amb, Himachal Pradesh (31°39′03.2″N 76°08′20.7″ E). Severe leaf blight symptoms, affecting over 50% of leaf area, were observed on oat in four surveyed fields (n=80). The affected plants exhibited initial symptoms as purplish, spindle-shaped spots, while later stages were brown and discoloured. To our best knowledge, this study is the first report of leaf blight of fodder oat caused by *E. rostratum* in Himachal Pradesh, India. Therefore, the present study was conducted to isolate, identify and characterize the causal agent of leaf blight in oat.

Small tissue sections (1.5 × 1.5 cm) excised from infected areas were surface sterilised with 1% sodium hypochlorite (NaOCl) for 1 minute, rinsed three times in sterile distilled water and then plated on potato dextrose agar (PDA). Plates were incubated at 25 ± 2°C for 7 days. Pure cultures were obtained by aseptically transferring hyphal tips to fresh PDA plates. Microscopic examination of these cultures revealed spores consistent with *E. rostratum*. Repeated isolations from symptomatic leaves confirmed morphological and cultural similarity to *E. rostratum*. Pathogenicity tests were performed with one representative culture on 35-day-old plants in a triplicate manner in sterile pots with a control in *in vitro* conditions (12 hour light, > 85% RH). Conidia were harvested from 7 days old culture and suspended in distilled water to a final concentration of 1×10^5 conidia/mL. Spray inoculation was done on 3 plants per pot with conidial suspension and a control with distilled water, which reproduced typical symptoms within 7 days, followed by re-isolation of the fungus. Genomic DNA was extracted with the CTAB method (Murray and Thompson, 1980) for molecular identification.

The PCR profile started with an initial denaturation at 94°C for 45 seconds, followed by annealing at 58°C for 1 minute using ITS primers, and then an extension at 72°C for 45 seconds. A total of 35 cycles were conducted, beginning with a preheating step at 95°C for 3 minutes and concluding with a final elongation at 72°C for 10 minutes in a thermocycler. The resulting PCR products were outsourced to Eurofins Genomics India Pvt. Ltd. for sequencing. The internal transcribed spacer (ITS) regions (White *et al*., 1990) were then sequenced using ITS-1 (5′-TCCGTAGGTGAACCTGCGG-3′) and ITS-4 (5′-TCCTCCGCTTATTGATATGC-3′) to perform the molecular identification.

Field surveys showed 40 to 60% disease incidence of oat leaf blight, with more than 50% of the leaf area affected. From four samples, three monosporic cultures were recovered on PDA with 75 % isolation rate. Cultures exhibited morphology characteristic of *E. rostratum*, with conidia that were dark brown, straight to slightly curved (44.23 to 58.57 × 11.90 to 14.11 µm) (n=20) (Fig 1B), containing four to eight septa and a prominent hilum (Samuels and Sivanesan, 1989). After 7 days on PDA, colony colouration ranged from dark grey to greyish white, with circular growth and regular margins (Fig 1A). Sequences were deposited in GenBank (NCBI) under accession number PX837032 (ITS). BLAST analysis revealed high similarity (99.74%) of the isolates to *E. rostratum* (Fig 2). A maximum-likelihood phylogenetic tree based on ITS sequences was aligned using CLUSTALW and a maximum-likelihood tree was built using MEGA 12.1 with a bootstrap value of 1000. To fulfil Koch's postulates, pathogenicity tests were conducted on healthy oat leaves. Initial symptoms included purplish spots that developed into spindle-shaped necrotic lesions with grey centres after seven days of artificial inoculation (Fig 1D). Re-isolation from symptomatic inoculated plants followed by morphological and molecular characterization verified the pathogen as *E. rostratum.* Based on colony morphology, microscopic features, pathogenicity and molecular confirmation, the pathogen was classified as *E. rostratum*. Although *E. rostratum* is known to cause leaf blight in several crops worldwide, its occurrence on fodder oat in Himachal Pradesh was not documented previously. Previous studies identified *E. rostratum* as the pathogen responsible for leaf spot in banana (Lin *et al.,* 2011), sugarcane (Ahmadpour *et al*., 2013), rubber tree (Liu *et al*., 2016) and maize (Xie *et al*., 2022; Aggarwal *et al*., 2025). These findings extend the known host range of the pathogen, highlighting its ability to infect a wider array of plant species beyond those previously reported. High disease severity during the vegetative phase can significantly reduce green fodder yield, leaf-to-stem ratio, and forage quality, with a potential negative impact on livestock productivity in hill-region grasslands. The disease poses a potential threat to oat-based forage and grassland systems in Himalayan agro-ecosystems. This is the first confirmed report of *E. rostratum* causing leaf blight of fodder oat (*Avena sativa*) in Himachal Pradesh, India.

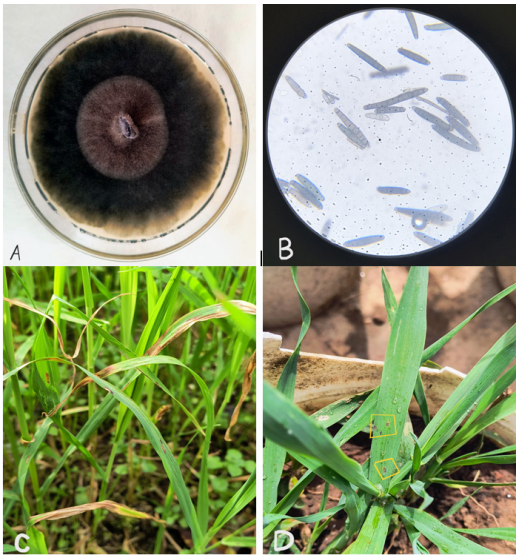

Fig 1. (**A**) *Exserohilum rostratum* culture on PDA; (B) Conidia (40x magnification); (C) Characteristic disease symptoms of oat leaf blight observed in surveyed fields; (D) Pathogenicity test: symptom appeared 7 days after inoculation

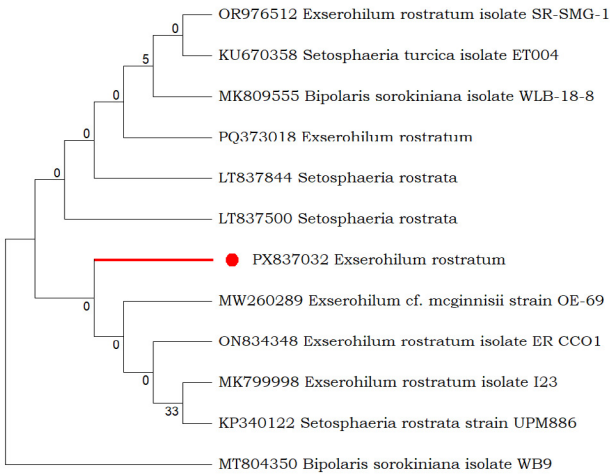

Fig 2. Phylogenetic tree (dendrogram) inferred from ITS ribosomal gene sequences using the maximum likelihood method with 1000 bootstrap replicates

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