

Podosphaera fuliginea (Schltl.) U. Braun & S. Takam. causes powdery mildew on an important medicinal herb, *Picrorhiza kurrooa* Royle ex. Benth. in India

Picrorhiza kurrooa Royle ex. Benth. is a perennial herbaceous medicinal plant belonging to the family Plantaginaceae (previously Scrophulariaceae). It is endemic to the Himalaya, and grows naturally on rocks and moist slopes in the alpine and subalpine regions between 3000 and 4500 m amsl. Picroside I and II are the major active constituents of the plant^{1,2}. It is used as a febrifuge, coolant, blood purifier and hepatoprotective. *P. kurrooa* is an endangered medicinal plant facing extinction due to overexploitation.

A powdery mildew disease was observed on aerial parts of *P. kurrooa* under poly-house conditions in alpine field research station at Tungnath (30°29'30.78"N, 79°13'00.44"E; 3354 m amsl) and under cultivated conditions at Pothivasa (30°30'00.07"N, 79°09'57.82"E; 2036 m amsl), Rudraprayag district, Uttarakhand during May–September 2016–2018. The disease symptoms were observed on the adaxial surface as white powdery mass which later turned brown, and the plants withered and ultimately died. Poor

flowering and low seed setting were observed in the infected plants and most of them also withered (Figure 1).

The detailed analysis of microscopic characteristics revealed that *Podosphaera fuliginea* (Schltl.) U. Braun & S. Takam³ caused powdery mildew on *P. kurrooa*. The detailed characteristics of the fungal pathogens are given below.

Mycelium white to brown, amphigenous, effuse or forming patches, persistent; hyphae straight 2.5–7 µm wide with simple or indistinct appressoria; conidiophores erect, straight, arising from the upper surface of hyphal mother cells, basal foot-cells cylindrical (45–90 × 9–15 µm), followed by 2–3 shorter cells, forming catenescence conidia; conidia ellipsoid-ovoid to doliform, 25–40 × 15–19 µm; chasmothecia not found (Figure 1 d).

Cultivation and conservation initiatives of *P. kurrooa* by Government organizations and NGOs have been adopted by high-altitude villages in Uttarakhand and farmers are highly benefited by such

cultivation. Although the crop is in the initial stage of commercial cultivation in the high-altitude villages of Uttarakhand, appearance of powdery mildew causes damage to the crop and due to this farmers are getting discouraged. The disease needs to be controlled by fungicides of biological origin so that the medicinal properties of the plant are not affected. Research can also be initiated to develop disease-resistant varieties of this plant in near future for the conservation of this valuable species for sustainable use.

A literature review showed that no report of powdery mildew caused by *P. fuliginea* on *P. kurrooa* has been recorded from India earlier.

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2. Vaidya, A. B. et al., *Papers*, 1996, **42**(4), 105–108.
3. Braun, U. and Cook, R. T. A., *Taxonomic Manual of the Erysiphales (Powdery Mildews)*, CBS Biodiversity Series No. 11, Fungal Biodiversity Centre, Utrecht, the Netherlands, 2012, pp. 141–142.

ACKNOWLEDGEMENTS. We thank the Director, High Altitude Plant Physiology Research Centre, Srinagar Garhwal for providing the necessary facilities, and Director, Agharkar Research Institute, Pune for confirmation of the species.

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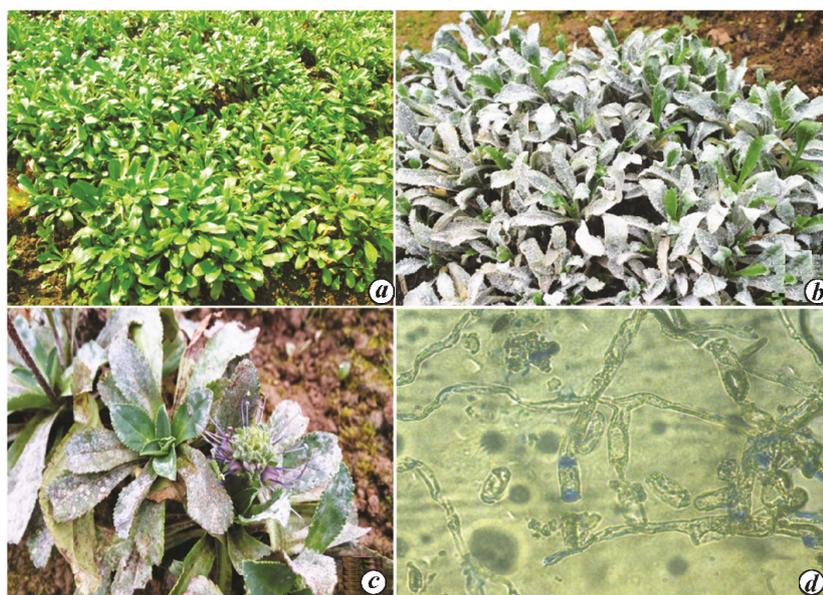


Figure 1. *Picrorhiza kurrooa*: (a) unaffected plants; (b, c) affected plants and (d) fungi with mycelium, conidiophores.