A new leaf and sheath brown spot of foxtail millet caused by *Bipolaris australiensis*

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Abstract. A new leaf and sheath spot disease of foxtail millet caused by *Bipolaris australiensis* was found in Iran. The causal agent was isolated and Koch's postulates were demonstrated. This is the first record of this fungal disease on *Setaria italica*.

Foxtail millet (*Setaria italica* (L.) Beauv.) is an important staple food for millions of people in southern Europe and Asia (Reddy *et al.* 2006). In September and October 2008, plants of *S. italica* with severe and extensive leaf and sheath spots were found in southern Khorasan, Iran. The spots were oblong to irregularly shaped, varying in size, from 3–20 mm in diameter, dark-brown, with a lighter border and an indistinct margin, sometimes causing leaf veins to rupture (Fig. 1). Severe lodging was observed on chronically infected plants. Symptomatic tissues were excised, surface-sterilised in 0.5% (v/v) sodium hypochlorite solution, placed onto both potato dextrose agar (PDA) and malt extract agar (MEA) each amended with 250 µg/L carbendazim and incubated at 26°C in the dark.

Fungal colonies emerging from the tissue had morphological characteristics typical of *Bipolaris* spp. Colonies were initially white, but after 3 days turned grey to blackish brown, effuse, velvety and black from the reverse side of the Petri dishes on PDA. Conidiophores were septate, solitary, simple or branched,

geniculate and sympodial, smooth, reddish brown, 95–205 µm long (average 142 µm), 3–7 µm thick (average 5 µm). Conidia were straight, ellipsoidal or oblong, rounded at the ends, pale brown to reddish brown, mostly three pseudoseptate, mainly 7.5–10.0 × 15.0–27.5 µm in size. A flattened hilum was seen on the basal cell of the conidia (Fig. 2). On the basis of this morphology and the descriptions by Sivanesan (1987), the fungus was identified as *B. australiensis* (M.B. Ellis) Tsuda & Ueyama. A culture of *B. australiensis* is preserved at the Iranian Fungal Culture Collection, Tehran, Iran as IRAN 1655C.

Pathogenicity tests were performed separately with two single-spore isolates grown for 15 days on Petri dishes containing one-quarter-strength PDA; 30-day-old foxtail millet seedlings were spray-inoculated with a 20 mL conidial suspension (10⁵ conidia/mL) plus 0.05% Tween 20, and placed into closed, translucent, plastic bags lined with wet cotton. Plants were incubated at 22–25°C for 48 h after which time the covers were removed. Control plants received only sterile

Fig. 1. Leaf-spot symptoms on a foxtail millet leaf.

Fig. 2. *B. australiensis*, conidiophore and conidia.

Fig. 3. Pathogenicity test on sheath of foxtail millet, exhibiting brown spot symptoms after 9 days.

distilled water. Disease symptoms similar to those observed in the field appeared after 7–9 days (Fig. 3). No symptoms developed in control treatments and no fungus was isolated from these tissues. *B. australiensis* was reisolated from the induced symptoms fulfilling Koch's postulates.

Bipolaris australiensis has been reported previously to be pathogenic on *Chloris* and *Pennisetum* species in Australia, Kenya and India (Smiley *et al.* 1996; Fang *et al.* 2007). Further, *B. australiensis* was reported as the causal agent of brown leaf spot of *Cynodon* spp. and pearl millet, leaf spot of betelvine (*Piper betle*) and date palm from China, India, Pakistan

and Iraq, respectively (Chand and Singh 1966; Shahzad and Zareen 1999; Fang *et al.* 2007; Fayad and Mania 2008). This is the first report of *B. australiensis* as a pathogen of foxtail millet.

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References

- Chand JN, Singh B (1966) A new *Helminthosporium* disease of bajra. *Current Science* **35**, 240.
- Fang KF, Huang JB, Hsiang T (2007) First report of brown leaf spot caused by *Bipolaris australiensis* on *Cynodon* spp. in China. *Plant Pathology* **56**, 349. doi:10.1111/j.1365-3059.2007.01538.x
- Fayad MA, Mania AO (2008) Study of date palm leaf spots disease in Basrah and effect of some factors (age of palm, wax content) on infection. *Arab Journal of Plant Protection* **26**, 81–88.
- Reddy VG, Upadhyaya HD, Gowda CLL (2006) Characterization of world's foxtail millet germplasm collections for morphological traits. Internet Resource: <http://www.icrisat.org/journal/cropimprovement/v2i1/v2i1characterization.pdf> (verified August, 2006).
- Shahzad S, Zareen A (1999) Leaf spot of betelvine in Pakistan. *Pakistan Journal of Botany* **31**, 437–443.
- Sivanesan A (1987) Graminicolous species of *Bipolaris*, *Curvularia*, *Drechslera*, *Exserohilum*, and their teleomorphs. *Mycological Papers* **158**, 1–261.
- Smiley RW, Dernoeden PH, Clarke BB (1996) 'Compendium of Turfgrass Diseases.' St Paul, MN, APS Press, 98 pp.

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