Diseases Caused by Fungi and Fungus-Like Organisms

First Report of Leaf Spots Caused by *Alternaria alternata* on *Abelmoschus manihot* in Italy

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Sunset huskmallow (*Abelmoschus manihot*, syn. *Hibiscus manihot*), Malvaceae family, is an herbaceous plant appreciated for the abundant pale-yellow blooms during the summer. In Italy, this species is grown as ornamental, in pots and in mixed borders. During the summer of 2019, 25 out of 50 plants of *A. manihot* growing in a private garden in the Biella province (northern Italy) showed leaf symptoms, starting from the base of the foliage. Necrotic spots, 0.5 to 5.0 mm in size, were brown, irregular, and randomly spread on the surface of the leaves. The most affected leaves showed yellowing and dropped. Twenty symptomatic leaves were disinfected in sodium hypochlorite (1%) for 1 min and then carefully washed in sterile water. Forty fragments (2 mm² of leaf tissue) were taken from the margins of the spots and were plated on potato dextrose agar. Dark green fungal colonies with concentric rings grew from the leaf tissue fragments. On potato carrot agar (Simmons 2007), under a light/dark regime (13 h/11 h), colonies produced conidiophores supporting clusters of branching chains of brown, ovoid to obclavate conidia, interspersed with secondary conidiophores. Conidia had one to four transverse septa and zero to one longitudinal or oblique septa, and they were 8.3 to 28.8 × 4.4 to 9.7 (average 15.1 × 6.4) µm in size ($n = 50$). If present, the beak was 2.3 to 8.6 (average 3.8) µm long. Based on these morphological features, the fungus was attributed to *Alternaria* sect. *Alternaria* (Woudenberg et al. 2015). The DNA of the isolate coded 19/44 was extracted using the E.Z.N.A. Fungal DNA Mini Kit (Omega Bio-Tek, Darmstadt, Germany). PCR was performed with the ITS (White et al. 1990), the endoPG, the rpb2, and the OPA10-2 primers (Woudenberg et al. 2015), and the resultant amplicons

were sequenced. Four sequences were obtained with 543 bp (ITS), 465 bp (endoPG), 865 bp (rpb2), and 681 bp (OPA10-2) (GenBank accession nos. MT231939, MT237634, MT237635, and MT237636, respectively). BLASTn analysis of these sequences showed 100% identity (543/543 bp) with the ITS of ex-type CBS 916.96 of *Alternaria alternata* and OPA10-2 (681/681 bp) (accession nos. AF347031 and KP124632), and 99% identity in rpb2 (858/865 bp, accession no. KC584375) and endoPG (438/444 bp, accession no. JQ811978). The pathogenicity of a representative isolate, 19/44, was demonstrated. A spore suspension of 1.0×10^5 conidia/ml was sprayed on leaves of three 7-month-old healthy plants of *A. manihot* that were then covered by plastic bags for 7 days. Three control plants of the same host were sprayed with sterile water. All plants were maintained outdoors, at temperatures ranging from 18 to 26°C. About 10 days after the inoculation, initial spots appeared on inoculated leaves. The spots expanded up to about 5 mm and were similar to those described above. *A. alternata* was reisolated from symptomatic tissues. No symptoms appeared on controls, and the attempt to reisolate the pathogen failed. *Alternaria* spp. were reported on *Abelmoschus esculentus* and on *Hibiscus* spp. (Farr and Rossman 2020). In Italy, *A. alternata* has been reported on *Hibiscus syriacus* (Garibaldi et al. 2020). To our knowledge, this is the first report of *A. alternata* on *A. manihot* in Italy, as well as worldwide. The spread of *A. alternata* from *A. manihot* to other species of *Abelmoschus* and *Hibiscus* is of concern in Italy, especially in public gardens. For this reason, the susceptibility of *Abelmoschus* and *Hibiscus* spp. to *A. alternata* should be further tested to identify resistance that could be used in management.

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The author(s) declare no conflict of interest.

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