Diseases Caused by Parasitic Plants

First Report of the Parasitic Invasive Weed Field Dodder (*Cuscuta campestris*) Parasitizing the Confamilial Invasive Weed Common Morning-Glory (*Ipomoea purpurea*) in Shandong, China

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Funding: The study was financially supported by China Postdoctoral Science Foundation (2019M662429) and open research project of “Cross-Cooperative Team” of the Germplasm Bank of Wild Species, Kunming Institute of Botany, Chinese Academy of Sciences. Plant Dis. 105:1230, 2021; published online as <https://doi.org/10.1094/PDIS-09-20-1934-PDN>. Accepted for publication 3 November 2020.

Common morning-glory (*Ipomoea purpurea* [L.] Roth, Convolvulaceae), an annual herbaceous vine native to South America, was first recorded to be cultivated in China in 1890, and since then it has invaded all provinces of China. It was one of the 18 alien invasive species in China (MEE 2014). As an invasive weed, it can readily invade dry lands, orchards, and nurseries and compete for sunlight by wrapping other plants. On 20 September 2019 and 18 July 2020, *I. purpurea* was found to be parasitized by a dodder species (also Convolvulaceae) in Lushan Mountain (36°21'N, 118°3'E, 569 m elevation), Shandong province, China. Within an area of ~100 m², dozens of individuals of common morning-glory were parasitized by the leafless stems of dodder. After removal of the haustorial connection of the dodder stem from the *I. purpurea* stem, brownish black lesions around uneven holes were visible on the *I. purpurea* stem, with broken haustoria clearly visible to our naked eye remaining in the *I. purpurea* stem. Anatomical results showed that the haustoria of dodder penetrate *I. purpurea* stem and xylem elements to connect the vascular systems of both the parasitic and host plant. Based on morphological characteristics of stems, inflorescences, calyx, corolla, stamens, and capsules as described in Costea et al. (2006), this dodder was identified as *Cuscuta campestris* Yunck. (i.e., field dodder). Field dodder is readily distinguished from *C. chinensis* and *C. australis* in China by the capsules with persistent corollas enveloping 1/3 or less of its base and the spreading and inflexed corolla lobes with acute to acuminate apices. To further confirm the identity of the species, total genomic DNA was extracted and sequenced using the genome-skimming method as described in Qu et al. (2019). An 831-bp region of 18S-ITS1-5.8S-ITS2-26S for the dodder studied was assembled,

examined, and deposited in GenBank under accession number MN718805. The new sequence has 100% similarity with other available sequences of *C. campestris* (accession nos. KT383104, KT383150, and KY968857). Phylogenetic analysis also placed the new dodder accession with other accessions of *C. campestris*. In addition, the plastome sequence of the dodder studied was assembled (86,727 bp in length) and deposited in GenBank under accession number MN708214, and a BLAST analysis found that it was 99.98% similar to that of *C. gronovii* (accession no. AM711639). The plastome of *C. gronovii* was published by Funk et al. (2007). However, Costea et al. (2015) indicated that Funk et al. (2007) misidentified *C. campestris* as *C. gronovii*. Furthermore, our phylogenetic tree strongly supported the identification of the dodder studied as *C. campestris*. Therefore, the dodder on common morning-glory in Shandong province was finally identified as *C. campestris* according to morphological and molecular evidence. The specimen of *C. campestris* on *I. purpurea* was deposited at the herbarium of the College of Life Sciences, Shandong Normal University (voucher no. 092012B). Field dodder, the second most common dodder species in North America, is the most widespread *Cuscuta* weed in the world and has been found in Africa, Asia, Australia, Europe, and South America (Holm et al. 1997). To our knowledge, this is the first report of the parasitic invasive weed *C. campestris* parasitizing the invasive weed *I. purpurea* in Shandong province of China. This is also the first report of *Cuscuta* species parasitizing confamilial *Ipomoea* species, which is especially noteworthy given that the genus *Cuscuta* is sister to the genus *Ipomoea*. This study provides a good model for exploring gene flow between species of closely related genera with different lifestyle. Another implication of this study is that customs and departments of inspection and quarantine need to quarantine the seeds or plants of both dodders and common morning-glories.

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The author(s) declare no conflict of interest.

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Keywords: parasitic plants, ornamentals, herbaceous/flowering plants, plastome, pathogen detection

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