Diseases Caused by Parasitic Plants

First Report of Leaf Wilt Caused by *Cuscuta japonica* on Generally Insusceptible Host Plant *Rhus typhina* in China

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Plants live in a world populated by various microbial pathogens and herbivores including bacteria, fungi, oomycetes, nematodes, and insects. Apart from these, plants are also parasitized by other plants, commonly called parasitic plants, which account for about 1% of all plant species in the world (Nickrent 2020). *Rhus typhina*, commonly called staghorn sumac, native to eastern North America in the family Anacardiaceae, is widely cultivated as an ornamental deciduous shrub throughout the temperate world. In 1959, it was deliberately introduced to China from Hungary (Pan and You 1994). Used for ornamental purposes and rehabilitation of degraded lands, it has been planted all over the Yellow River basin of China. Most importantly, it has a wide resistance to insects and diseases, because no serious herbivorous insects or disease problems are reported on it (Wang et al. 2008). Therefore, staghorn sumac is generally considered as an insusceptible plant. However, in a routine field investigation from September 17 to 23, 2019, *R. typhina* was found to be parasitized by dodder (*Cuscuta* spp.) in Lushan Mountain (coordinates: 36°21'21.12"N, 118°7'31.45"E; elevation: 469 m), Zibo City, Shandong Province, China. Within a 30-m² area, about 20 individuals of *R. typhina*, approximately 3 m tall, were heavily parasitized by the dodder with leafless stems and flourishing flowers. Here, dodder was focused as a pathogen, because most pinnately compound leaves of staghorn sumac parasitized by this dodder were chlorotic, wilted, and even dead. Some petioles were clearly broken or dropped from the stems of staghorn sumac due to the heavy weight of the dodders' dense spicate inflorescences. In contrast, the leaves of staghorn

sumac not parasitized by this dodder were all green. The dodder on staghorn sumac can be readily identified as *Cuscuta japonica* based on our frequent field investigation of its morphological characteristics, including slight yellow and stout stems with purplish spots, spicate inflorescences, cupular calyx, shallowly five-lobed campanulate to tubular corolla, and lobes of corolla much shorter than tube. Species reconfirmation was performed by sequencing the complete plastome, because the plastome could provide more variable sites than ITS to distinguish dodders. For total genomic DNA extracted from stems of this dodder, the whole plastome was generated via genome-skimming method as described in Qu et al. (2019a). Plastome annotation was conducted by using PGA (Qu et al. 2019b). One 120,914-bp plastome sequence with annotation information was deposited in GenBank (accession no. MN882700). BLAST analysis of this plastome sequence against the NCBI nucleotide database reconfirmed this dodder as *C. japonica* due to 99.90% identity and 100% query coverage to the subject sequence (accession no. MH780080). Furthermore, phylogenetic analysis found that this dodder clustered with reported *C. japonica*. Finally, this dodder found in Shandong Province was identified as *C. japonica* based on combined evidence of morphological characteristics, sequence similarities, and phylogenetic relationships. A specimen of *R. typhina* parasitized by *C. japonica* was deposited at the herbarium of the College of Life Sciences, Shandong Normal University (no. 092037B). To the best of our knowledge, this is the first report of *C. japonica* parasitizing *R. typhina* in China, and *C. japonica* can be considered as a pathogen that can cause leaf wilt of generally insusceptible host plant *R. typhina*. It is interesting to note that *C. japonica* is native to China, and the introduced *R. typhina* can easily become a weed affecting native plants.

References:

- Nickrent, D. 2020. Taxon 69:5.
- Pan, Z. G., and You, Y. T. 1994. Growing Exotic Trees in China. Beijing Science and Technology Press, Beijing, China.
- Qu, X. J., et al. 2019a. Genome Biol. Evol. 11:2789.
- Qu, X. J., et al. 2019b. Plant Methods 15:50.
- Wang, G. M., et al. 2008. J. Integr. Plant Biol. 50:522.

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