Diseases Caused by Fungi and Fungus-Like Organisms

First Report of *Puccinia pelargonii-zonalis* Causing Rust on *Pelargonium × hortorum* in Xinjiang Province, China

Jin Sun,¹ Guo Qing Wang,² Jia Ge Song,³ and Biao Xu^{3,4†}

¹ Department of Resource and Environment, Xichang University, Xichang, Sichuan 615013, China

² Administration Bureau of Tuomuer Mountain National Nature Reserve, Aksu, Xinjiang 843006, China

³ Innovative Institute for Plant Health, Zhongkai University of Agriculture and Engineering, Guangzhou, Guangdong 510225, China

⁴ College of Life Sciences, Tarim University, and Province-Ministry Joint Key Laboratory of Protection and Utilization of Biological Resources in Tarim Basin, Aral, Xinjiang 843300, China

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Geranium (*Pelargonium × hortorum*) is an ornamental plant cultivated throughout the world. In May 2019, typical symptoms of rust with nearly 90% disease incidence were observed on leaves of *P. × hortorum* growing in pots in a scenic spot in the ancient city of Kashgar, Xinjiang province, China. Early symptoms of the disease appeared as small lesions with pale-yellow halos on the lower leaf surfaces. Infected tissues subsequently formed a concentric circle of sori on lesion reaching a final diameter of 0.5 to 1.5 cm, which resulted in leaf blighting and premature drying. Two representative specimens were deposited in the Mycological Herbarium of Tarim University (HMUT 8001 and HMUT 8002). Urediniospores were globose or subglobose to ovoid, light brown, echinulate, thin-walled with two conspicuous subequatorial pores, 19.8 to 27.3 × 17.8 to 23.6 μm (24.3 × 21.7 μm average, *n* = 30). Telia and teliospores were not seen. The size and characteristics of urediniospores were similar to those of *Puccinia pelargonii-zonalis* as described by

Doidge (1932). To confirm the identification, genomic DNAs were extracted directly from sori on diseased leaves from isolates HMUT 8001 and HMUT 8002. The part of the nuclear large subunit (LSU, 28S) rDNA was amplified and sequenced following Aime et al. (2006) and deposited in GenBank (accession nos. MT648851 and MT648852). An NCBI BLAST search indicated 99.6% identity of the LSU (772/775 nucleotides) with *P. pelargonii-zonalis* on *P. × hortorum* (KX999887) from Australia (Marin-Felix et al. 2017). A phylogenetic analysis based on the LSU sequences using maximum-likelihood and Bayesian methods placed the Xinjiang isolates from *P. × hortorum* in the same clade as the reference sequences of *P. pelargonii-zonalis*. A pathogenicity test was performed to confirm Koch's postulates. Leaves of three healthy potted plants were sprayed with a spore suspension (2 × 10⁵ spores/ml). Sterile water was sprayed on three healthy seedlings as controls. Inoculated and control plants were covered with a plastic bag and placed in a moist chamber with 90% relative humidity at 25°C. Initial symptoms were observed as small, light-yellow spots on the upper surface after 15 days, but not in the control plants. *P. pelargonii-zonalis* has been previously reported on *P. × hortorum* in Argentina, Australia, Canada, Georgia, Greece, India, Mexico, New Zealand, Norway, Portugal, South Africa, the United States, and Venezuela (Farr and Rossman 2021). Geranium rust was first found in Yunnan province in southwestern China (Zhou and Zhuang 2005). However, this is the first report of geranium rust in Xinjiang province in northwestern China. The occurrence of the disease seriously affected the ornamental and economic value of *P. × hortorum*.

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[†]Indicates the corresponding author.
B. Xu; biaoxu2008@hotmail.com