From August to November 2020, a previously unseen powdery mildew disease was encountered repeatedly on New Guinea impatiens (Impatiens hawkeri, syn. Impatiens 'New Guinea' hybrid) in Uijeongbu, Korea. It occurred on plants growing in partial shade along high buildings or walls, but not on those planted in sunny gardens. Symptoms included white, effuse, amphigenous mycelial patches on leaves and stems, reducing the aesthetic value of plants (Fig. 1).

Microscopic examination of freshly collected leaves revealed the following morphological characteristics: upright conidiophores (110–210 × 10–12 µm) producing 2 to 5 catenescent conidia, and ellipsoid to doliiform conidia (26–38 × 16–22 µm) containing conspicuous fibrosin bodies. In autumn, scattered chasmothecia were found on leaves, mainly on the lower surface (Figs. 2–3). These measured 80–100 µm in diameter, had mycelioid appendages, and contained a single ascus with 8 ellipsoid to ovoid ascospores (16–20 × 12–16 µm) (Fig. 4). These characteristics were consistent with the description of Podosphaera xanthii in Braun & Cook (2012).

To confirm the morphology-based determination, genomic DNA was extracted from a representative specimen (KUS-F32140, Korea University herbarium, Seoul, Korea). PCR products were amplified using the primer sets ITS1F/PM6 for the internal transcribed spacer (ITS) and PM3/TW14 for the large subunit (LSU) of rDNA (Takamatsu & Kano, 2001). The sequences obtained in this study (GenBank Accession Nos. MW750225 (ITS) and MW750226 (LSU)) were compared with other sequences in GenBank using BLASTn. The analysis showed 100% identity with other P. xanthii sequences (e.g., AB462799, AB462803 for ITS, and MT919354, LC371331 for LSU) and neighbour-joining analysis of ITS sequences placed the Korean isolate in a well-supported clade with the reference sequences of P. xanthii (Fig. 5).

Podosphaera (previously Sphaerotheca) powdery mildews on Impatiens spp. have been previously assigned to P. balsaminae (Braun & Cook, 2012; Farr & Rossman, 2021). However, P. balsaminae was shown to be limited to the Asian materials of Podosphaera on I. noli-tangere (Ito & Takamatsu, 2010). The remainder of Podosphaera powdery mildews on...
**Figure 2** Powdery mildew colonies caused by *Podosphaera xanthii* on abaxial leaf surface of *Impatiens hawkeri*.

**Figure 3** Chasmothecia of *Podosphaera xanthii*.

**Figure 4** *Podosphaera xanthii* found on *Impatiens hawkeri*. 
A: Chasmothecium with one ascus and mycelioid appendages. 
B: Chasmothecium with one ascus containing mature ascospores. 
C: Ascus containing eight ascospores.

**Figure 5** Neighbour-joining tree based on internal transcribed spacer sequences of *Podosphaera xanthii* and other *Podosphaera* spp. retrieved from GenBank. The isolate obtained in this study is shown in bold.
Impatiens spp. were proved to belong to or were tentatively assigned to the P. xanthii complex (Braun & Cook, 2012).

Podosphaera powdery mildews on New Guinea impatiens seem to be uncommon considering the world-wide cultivation of the host as a potted and garden plant. Previously, Wolcan (2004) recorded P. balsamia on I. hawkeri from Argentina, and Garibaldi et al. (2012) recorded Podosphaera sp. on I. hawkeri from Italy. We prove here that the earlier collection from Italy also represents P. xanthii (Figure 5). To our knowledge, this is the first confirmed report of powdery mildew caused by P. xanthii on New Guinea impatiens. This finding could be useful for the breeding programme of Impatiens spp. and future plantings of New Guinea impatiens in gardens.

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REFERENCES
Braun, U., & Cook, R. T. A. (2012). Taxonomic manual of the Erysiphales (powdery mildews), CBS Biodiversity Series 11. Utrecht, The Netherlands: Centraalbureau voor Schimmelcultures.
Farr, D. F., & Rossman, A. Y. (2021). Fungal Databases, U.S. National Fungus Collections, ARS, USDA. https://nt.ars-grin.gov/fungaldatabases/. Accessed 15 March 2021.
Garibaldi, A., Gilardi, G., Poli, A., & Gullino, M. L. (2012). First report of powdery mildew of Impatiens New Guinea, caused by Podosphaera sp., in Italy. Journal of Plant Pathology, 94, S4.105.
Ito, M., & Takamatsu, S. (2010). Molecular phylogeny and evolution of subsection Magnicellulatae (Erysiphaceae: Podosphaera) with special reference to host plants. Mycoscience, 51, 34–43 https://doi.org/10.1007/S10267-009-0005-3
Takamatsu, S., & Kano, Y. (2001). PCR primers useful for nucleotide sequencing of rDNA of the powdery mildew fungi. Mycoscience, 42, 135–139 https://doi.org/10.1007/BF02463987
Wolcan, S. M. (2004). Podosphaera balsaminae on Impatiens balsaminae and Impatiens × hawkeri. Australasian Plant Pathology, 33, 133–134 https://doi.org/10.1071/AP03075

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