

Occurrence of *Podosphaera pannosa* Teleomorph on *Rosa rugosa* from Korea

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Rugosa rose (*Rosa rugosa* Thunb.), also known as Japanese rose or beach rose, is native to eastern Asia and southeastern Siberia, where it grows on the coast, often on sand dunes. Various varieties have been widely introduced in Europe and North America for ornamental purposes, particularly in coastal landscaping due to its excellent salt-tolerance. The plant is becoming common in Korea.

Rust and powdery mildew have been described on this plant in Korea (The Korean Society of Plant Pathology, 2009). Only the anamorphic state of *Podosphaera pannosa* was recorded as powdery mildew on *R. rugosa* in Korea (Shin, 1999). In September 2009, formation of chasmothecia of *P. pannosa* was found on the leaves of *R. rugosa* planted in a hobby garden in Suwon, Korea (Fig. 1A). This finding was rather surprising, because there had been only one case report of chasmothecia of *P. pannosa* from *Rosa davurica* in Asia (Shin, 1999). Voucher specimens accommodating chasmothecia were housed at Korea University, Seoul, Korea (KUS-F24690, 24784, 25656).

Chasmothecia were partly immersed in the mycelial layer, and were amphigenous, but mostly hypophyllous, scattered or partly gregarious, 75–100 µm in diameter, and dark brown (Fig. 1B). Appendages were produced from the lower half of the chasmothecia. The appendages were mycelioid, uniform in width (4–6 µm), variable in length up to 4 times the diameter of the chasmothecia, 1–3-septate, brown at the base and becoming paler along their length.

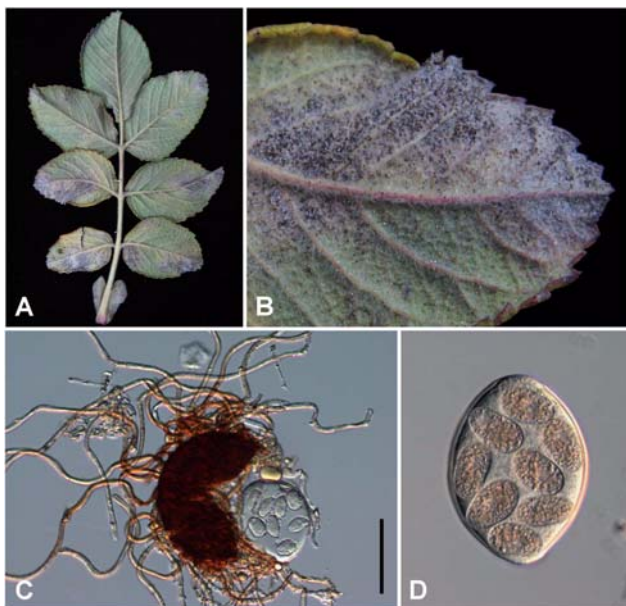


Fig. 1. Visual aspects of chasmothecia. (A) Powdery mildew infections with *Podosphaera pannosa* and formation of chasmothecia on the lower surface of leaves of *Rosa rugosa*. (B) Close-up of the leaf lesion with chasmothecia. (C) A chasmothecium of *P. pannosa* producing an ascus with eight ascospores (bar = 100 µm). (D) Ascus with eight mature ascospores (bar = 40 µm).

There was one ascus per chasmothecium (Fig. 1C). Asci were 80–100 × 60–80 µm, sometimes swelled in water, and oval to fusiform. Ascospores numbered eight per ascus and were ellipsoidal, 24–30 × 16–20 µm, and hyaline to pale yellowish due to numerous small oil drops (Fig. 1D). These data agreed with previous records of *P. pannosa* (Wallr.) de Bary (Braun, 1987; Shin, 1999).

To confirm the identification, the complete internal transcribed spacer (ITS) regions of rDNA from KUS-F24784 were amplified with the primers ITS5 and P3 (Takamatsu et al., 2009) and sequenced. The resulting sequences of 477 bp were deposited in GenBank (Accession number HQ852205). Phylogenetic analysis was performed using MEGA4 with neighbor-joining method (using Tajima-Nei distances). The Korean isolate showed > 98% sequence similarities to AF011322 (468/477 bp), AB022348 (470/477 bp), and AB525937 (473/477 bp) of *P. pannosa* found on *Rosa* spp. (Fig. 2). Therefore, the sequence analysis verified the chasmothecia on *R. rugosa* in Korea to be *P. pannosa*.

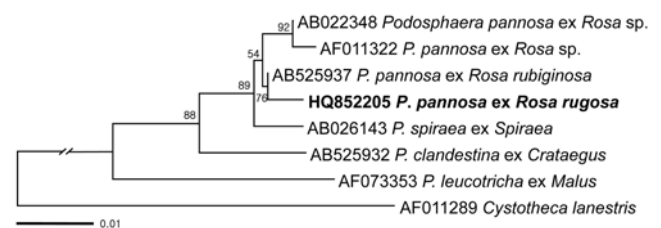


Fig. 2. Phylogenetic relationship between *Podosphaera pannosa* on *Rosa* spp. and other *Podosphaera* species, inferred by neighbor-joining method using the ITS rDNA region. Numbers above the branches represent the bootstrap values. Bar = Number of nucleotide substitutions per site.

Since the first description of the teleomorph of this species in 1819, there have been several additional records on the rare occurrence of chasmothecia in North America and Europe (cf. Braun, 1987). However, this is the first record of the occurrence of *P. pannosa* chasmothecia on *R. rugosa* globally and the second record on a *Rosa* spp. in Asia. The role of chasmothecia in the severity of powdery mildew is still unknown. Most of the powdery mildew fungi are heterothallic (Braun, 1987); an unequal distribution of mating types may partly explain the rare occurrence of chasmothecia.

References

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