



Two new *Phragmidium* species identified on *Rosa* plants native to China

TING YANG¹, WEI CHANG¹, BIN CAO¹, CHENG-MING TIAN¹, LONG ZHAO² & YING-MEI LIANG^{3*}

¹ The Forestry Institute, Beijing Forestry University, Beijing 100083, China

² Gansu Natural Forest Protection Center, Gansu 730000, China

³ Museum of Beijing Forestry University, Beijing 100083, China

* Correspondence author: liangym@bjfu.edu.cn

Abstract

Two new *Phragmidium* species, *Phragmidium zhouquensis* and *Ph. longissima*, were identified on two native plants, *Rosa omeiensis* and *R. lichiangensis* respectively, during an investigation of the occurrence of rust fungi in western China. *Phragmidium zhouquensis* is mainly characterized by 3–9-celled teliospores bearing minute verrucae on the surface. *Phragmidium longissima* differs from other *Phragmidium* species in that it possesses echinulate urediniospores with a pore membrane at the germ pore. Phylogenetic analyses based on 28S rRNA partial gene sequences revealed that specimens of *Ph. zhouquensis* and *Ph. longissima* formed two distinct lineages. *Phragmidium longissima* is the first *Phragmidium* species to be identified on *R. lichiangensis*.

Key words: molecular phylogeny, Pucciniales, rose rusts, taxonomy

Introduction

The genus *Rosa* L. (*Rosaceae*) is of worldwide economic importance as the centre of a large ornamental shrub and cut flower industry. *Rosa* species are widely distributed throughout the temperate and subtropical habitats of the northern hemisphere (Matthews 1995). *Rosa omeiensis* Rolfe and *R. lichiangensis* T. T. Yu & T. C. Ku are two species native to central and western China (Lu *et al.* 2003).

The genus *Phragmidium* Link is a common rust fungus restricted to plants belonging to the family *Rosaceae*, especially the genera *Potentilla*, *Rosa* and *Rubus*. *Phragmidium* is characterized by *Caeoma*-type aecia with catenulate aeciospores, *Uredo*-type or *Calodion*-type uredinia with peripheral paraphyses and dark brown teliospores that are typically festooned with several transverse septa along with 2–3 germ pores per teliospore cell (Cummins & Hiratsuka 2003, Yun *et al.* 2011). Most species within this genus produce subcuticular spermogonium, caematoid aecium, uredinium and telium during the autoecious macrocyclic life cycle (Cummins & Hiratsuka 2003, Zhuang *et al.* 2012).

Approximately 60 to 65 species have been recognised as *Phragmidium*, and 30 of these have been reported to infect wild *Rosa* species and ornamental *Rosa* cultivars (Cummins & Hiratsuka 2003). Wahyuno *et al.* (2001) described seven *Phragmidium* species by analysing the morphological characteristics of a maximum of four spore stages from ten previously recorded species. These authors determined that the length, width, degree of tapering toward both ends, and apiculus length were sufficient to determine gross teliospore morphology, and these have been considered as important taxonomic characters. The cell number, wall colour, surface rugosity, and hygroscopicity of the lower part of the pedicel also have been used as taxonomic features at the telial stage. A total of 11 *Phragmidium* species have been reported on *Rosa* in China, including *Ph. butleri* H. Sydow & P. Sydow, *Ph. fusiforme* J. Schröter, *Ph. handelii* Petrak, *Ph. hashiokai* Hiratsuka f., *Ph. kamtschatkae* (F. W. Anderson) Arthur & Cummins, *Ph. montivagum* Arthur, *Ph. rosae-multiflorae* Dietel., *Ph. mucronatum* (Persoon) Schlechtendal, *Ph. robustum* J. Y. Zhuang & S. X. Wei, *Ph. rosae-omeiensis* S. X. Wei, and *Ph. tuberculatum* Jul. Müller. The latter four species have been described on *Rosa omeiensis* (Tai 1979, Wei 1988, Hiratsuka *et al.* 1992, Cao & Li 1996, 1999, Zhuang & Wei 2003, Zhuang 2005, Zhuang & Wang 2006, Zhuang *et al.* 2012, Xu 2013).

During an investigation of rust fungi in western China, two previously unknown *Phragmidium* species were