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Morphology, Phylogeny and Ecology of Hyphomycetes Hyperparasitic to Rusts

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Rust is one of the most destructive diseases on economically important plants such as agricultural and horticultural crops, as well as forest trees [1]. Chemical treatment is the most effective means to control rust, but use of the chemical fungicides involves inevitable risks to human health and environment [2]. Unfortunately, biocontrol is currently impracticable for rust disease management [3]. It is necessary to exploit biocontrol agents to help prevent rust diseases. As a fundamental research for future development of biocontrol agents for rusts, biodiversity of hyperparasites occurring on rust fungi was investigated. During 2006-2010, 197 fungal isolates of the rust hyperparasites were collected and isolated from various combinations of mycohosts and plant hosts in many regions of Korea. Based on morphological and molecular data, they were identified as 8 genera and 12 species. Besides, phylogenetic relationships between the hyperparasites and related taxa were inferred.

A total of 114 isolates of *Pseudovirgaria* were obtained from rust pustules of *Phragmidium* spp. and *Pucciniastrum agrimoniae* infecting rosaceous plants. Phylogenetic analysis using multigene sequences revealed a high level of genetic variability among many isolates of *Pseudovirgaria* and close correlation between the isolates and mycohosts. Only two species of *Pseudovirgaria*, *P. hyperparasitica* and *P. grisea* are often difficult to distinguish by their morphological similarity, but on the molecular basis they were clearly differentiated from each other. There had been no previous record of *P. grisea* outside Europe, but the present study has proved its presence in Korea. Among six distinct groups (five of *P. hyperparasitica* and one of *P. grisea*) within the *Pseudovirgaria* isolates, each lineage of *P. hyperparasitica* was closely associated with specific mycohosts and thus might have cospeciated with their mycohosts, which probably led to coevolution. Although *P. grisea* possesses a host preference for *Phragmidium* species occurring on *Rubus*, it was not specific for a mycohost. *P. grisea* seems to evolve in the direction of having a broad mycohost range.

Seventeen isolates of *Verticillium*-like fungi were isolated from rust sori. Based on morphological data and DNA sequence analysis, the isolates were identified as three *Lecanicillium* species, viz. *L. attenuatum*, *Lecanicillium* sp. 1, *Lecanicillium* sp. 2, and *V. epiphytum*. The unidenified two species of *Lecanicillium* appear to be previously unknown taxa.

Sixty-six isolates of miscellaneous hyphomycetes belonging to 6 species of 5 genera were obtained from pustules of rust fungi. On the basis of morphological and molecular analyses, the miscellaneous hyphomycetes growing on rusts were identified as *Acrodontium crateriforme*, *Cladophialophora pucciniophila*, *Cladosporium cladosporioides*, *Phacellium vossianum*, *Ramularia coleosporii*, and *R. uredinicola*.

References

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