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■ Six new *Phytophthora* species from ITS Clade 7a including two sexually functional heterothallic hybrid species detected in natural ecosystems in Taiwan

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Abstract

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During a survey of *Phytophthora* diversity in natural ecosystems in Taiwan six new species were detected. Multigene phylogeny based on the nuclear ITS, β -tubulin and *HSP90* and the mitochondrial *cox1* and *NADH1* gene sequences demonstrated that they belong to ITS Clade 7a with *P. europaea*, *P. uniformis*, *P. rubi* and *P. cambivora* being their closest relatives. All six new species differed from each other and from related species by a unique combination of morphological characters, the breeding system, cardinal temperatures and growth rates. Four homothallic species, *P. attenuata*, *P. flexuosa*, *P. formosa* and *P. intricata*, were isolated from rhizosphere soil of healthy forests of *Fagus hayatae*, *Quercus glandulifera*, *Q. tarokoensis*, *Castanopsis carlesii*, *Chamaecyparis formosensis* and *Araucaria cunninghamii*. Two heterothallic species, *P. xheterohybrida* and *P. xincrassata*, were exclusively detected in three forest streams. All *P. xincrassata* isolates belonged to the A2 mating type while isolates of *P. xheterohybrida* represented both mating types with oospore abortion rates according to Mendelian ratios (4–33 %). Multiple heterozygous positions in their ITS, β -tubulin and *HSP90* gene sequences indicate that *P. xheterohybrida*, *P. xincrassata* and *P. cambivora* are interspecific hybrids. Consequently, *P. cambivora* is redescribed as *P. xcambivora* without nomenclatural act. Pathogenicity trials on seedlings of *Castanea sativa*, *Fagus sylvatica* and *Q. suber* indicate that all six new species might pose a potential threat to European forests.

Keywords: BIOSECURITY; BREEDING SYSTEMS; EVOLUTION; FLOW CYTOMETRY; PHYLOGENY; PHYTOPHTHORA CAMBIVORA; RADIATION

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