ระยะห่างจากขอบกระดาษด้านบน 1.5 นิ้ว

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Morpho-molecular characterization of phoma-like fungi from *Morus alba* in northern Thailand; a novel species (*Boeremia albae*) and a new host record (*B. maritima*)

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ABSTRACT

Boeremia was established to accommodate phoma-resembling fungi. Its species occur in terrestrial ecosystems as endophytes, saprobes and pathogens, except one species reported from a marine ecosystem. *Boeremia* species are characterized by hyaline, thin-walled, and aseptate (occasionally 1(–2)-septate) conidia that are variable in shape, and hyaline, straight or slightly curved, thick-walled, and 1-septate ascospores that are usually constricted at the septum. In the past, host associations were used to delimit *Boeremia* species. However, since *Boeremia* taxa have overlapping morphological characters and are cryptic, it renders taxonomic identification arduous. Therefore, the use of other approaches including multi-gene phylogenetic analyses are imperative. Recommended DNA markers for species delineation are the internal transcribed spacer (ITS, nuclear rDNA consisting of ITS1-5.8S-ITS2) and large subunit (28S, D1–D2 domains of nuclear 28S rDNA) loci, and the genes for actin (*ACT1*), beta-tubulin (*TBB1*), RNA polymerase 2 (*RPB2*) and translation elongation factor 1α (*TEF1*). Here, we applied morphological and molecular phylogenetic analyses to establish a new taxon (*B. albae*), and a new host and geographical record for *B. maritima* associated with leaf spots of *Morus alba* (Moraceae) in northern Thailand. By providing sequence data for three additional gene regions, our phylogenetic analyses impart a stable phylogenetic placement of the ex-type strain of *B. maritima*, as illustrated. This is the first study that reports *Boeremia* species from *M. alba*, and *B. maritima* from a terrestrial habitat.

1. Introduction

Morus alba (Oleaceae), also known as white mulberry, is a deciduous tree native to China (Ercisli and Orhan 2007; Dat et al., 2010). It is widely grown in tropical, subtropical and temperate countries, including Africa, Brazil, India, Korea and Thailand (Sánchez 2000; Dat et al., 2010). *Morus alba* has high economic significance and almost all parts of the trees are used in industries. The leaves are used as teas, infusions, and salad ingredients (Zhang et al., 2018), and are particularly important in the production of silk as they are fed to silkworm larvae, which convert the leaf protein to silk protein (Ghosh et al., 2017). Fruits are eaten directly or processed into wines, jams and juices. Mulberry fruits are one of the most nutritious agricultural products available to consumers as they are rich in carbohydrates, proteins, fats, minerals, and vitamins (Nayab et al., 2020). The leaves and fruits of *M. alba* also possess various therapeutic compounds. They are used as a functional food, and have anti-diabetic, anti-inflammatory, anti-cancer and neuroprotective potentials, among others (Manzoor et al., 2022). The roots are boiled and added to soups and casseroles by virtue of their anthelmintic activity (Łochyńska and Oleszak 2013).

Diverse fungal groups have been reported from *Morus alba* worldwide. Examples are *Cercospora morina* in Thailand (Meeboon et al., 2007); *Colletotrichum* spp. in China (Xue et al., 2019); *Eutypella citricola* in China (Zhu et al., 2021); *Lasiodiplodia undulata*, *Pseudocercospora*

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