A New Record of the Genus *Mycobilimbia* (*Ramalinaceae*) from South Korea

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The study introduces the genus *Mycobilimbia*, from South Korea. *M. philippina* is reported here as being new to the country. Characteristic features of the species are crustose thallus, globose apothecia, K-proper exciple and hypothecium, *Biatora*-type asci, 3-septate fusiform ascospores, and a lack of secondary compounds.

KEYWORDS : Chiaksan National Park, Crustose, Lichen taxonomy, New record

Introduction

Lichen taxonomy has recently gained prolific attention in South Korea. In recent years, several researchers have made a significant contribution to the taxonomy, classification, and systematics of Korean lichens [1-24]. Nevertheless, the present work introduces the first record of the genus *Mycobilimbia* from South Korea, which further indicates the existence of many other taxa that have yet not been studied adequately, and some exhaustive collections are requisite to concluding the floristic status of the lichen flora in South Korea.

The genus *Mycobilimbia* (*Lecanorales*, *Ramalinaceae*) is currently accepted as c. 24 species world-wide. Many of the elements that were previously placed in this genus have been transferred to *Lecidea*, *Bilimbia*, *Opegrapha*, *Epiphora*, *Toninia*, *Bacidia*, *Romularia*, and *Dactylospora* [25]. Characteristic features of *Mycobilimbia* include: lichenized growth form; crustose, granular thallus $\pm$ lacking cortex; indistinct medulla; chlorococcoid green alga; biatorine, flat to globose apothecia; radiating prosoplectenchymatous proper exciple; colorless to pigmented hymenium; unbranched to sparingly branched paraphyses; colorless, pale brown to reddish-brown hypothecium; *Biatora*-type asci; hyaline, simple to trans-septate, colorless ascospores, and lack of secondary metabolites [26]. Since its resurrection, the genus has faced several taxonomic complexities [27] and has therefore been separated into three groups. The first group is now assigned to another genus, *Myxobilimbia*,

which differs from *Mycobilimbia* chiefly in having warted perispore. The second group contains *M. tetramera* (the type) and relatives, while the third group is comprised of the species with simple ascospores (*Lecidea hypnorum* group) [26, 28].

Material and Methods

During the ongoing taxonomic studies of crustose lichens, a specimen lodged in the herbarium of the Korean Lichen Research Institute (KoLRI), Suncheon National University, South Korea, was identified and studied here. The species belongs to Chiaksan National Park (Mt. Chiak) in the province of Gangwon, South Korea. The national park is located on the mountain and covers an area of approximately 181.6 km², expanded by natural forests of *Quercus mongolica* and *Q. acuta*.

Morphological, anatomical, and chemical examination of the specimen was performed. SMZ-168 and NIKON C-PS 1068908 dissecting microscopes (Nikon, Tokyo, Japan) were used for observation of morphological features. The anatomy of apothecia was determined under an OLYMPUS BX50 compound microscope (Olympus, Tokyo, Japan). Due to scarcity of the material, only ten apothecial sections were examined thoroughly for confirmation of the taxa. Thin hand cut sections were observed in water and lectophenol blue solution. All measurements were taken under higher magnification of 40 $\times$ and 1,000 $\times$ prior to application of KOH. Chemical analysis was performed

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as described by Orange *et al.* [29].

Results and Discussion

Taxonomic treatment of the species.

Mycobilimbia philippina (Vain) D. D. Awasthi (Fig. 1A~D)

Proc. Indian Acad. Sci., P. Sci. 97: 501 (1987).

≡ *Bilimbia philippina* Vain.; Ann. Acad. Sci. Fenn., Ser. A 15: 76 (1921).

Description. Thallus epilithic, growing among mosses, crustose, green, pale-green to olive-green, rimose, rather thick, evanescent, adopting the surface texture of the substratum, 95~115 µm thick, speckled with black dotted immature to degraded ascomata, surface ± coarsely granulate or warted, ± corticate, lacking crystals, medulla imperceptible,

photobiont chlorococcoid green alga, secondary alga absent, prothallus absent.

Ascomata apothecial, flat, later on becoming globose, up to c. 0.5~1 mm wide, disc initially flat, black to dark brown in color, later on becoming convex to entirely globose, brown to reddish brown in color, epruinose. Margin concolorous with disc, soon to become reflexed or excluded in mature apothecia. Proper exciple annular, hyaline, pale to dark or reddish brown, merging with hypothecium, c. 80~90 µm wide. Epihymenium indistinct to absent. Hymenium hyaline to slightly pale, clear, 85~95 µm high. Hypothecium reddish brown, 200~300 µm high. Paraphyses rather lax, simple, septate, unbranched to branched, anastomose and conglutinate with granules at apices. Ascus clavate, 8-spored, *Biatora*-type, 60~70 × 10~12 µm. Ascospores hyaline, fusiform, 16~21 × 5~7 µm, predominately 4-celled, few immature ascospores are 2-celled.

Chemistry. Thallus K–, PD–, C–, KC–, proper exciple K–, N–, hypothecium K–, N+ purplish; no chemical in thin layer chromatography.

Ecology and distribution. The species was collected from metamorphic rocks based on unknown sediments, at an altitude of 945 m in Chiaksan National Park (Mt. Chiak) and reported here as a new record for South Korea. The species is known worldwide, from Eastern Palaetropical countries, including India and Nepal [30].

Remarks. *Mycobilimbia philippina* is remarkably characterized by crustose, green, pale-green to olive-green, rimose thallus, globose, reddish-brown apothecia, hyaline to red-brown proper exciple, transversely 3-septate fusiform ascospores, and a lack of chemical compounds. The species most closely resembles *Mycobilimbia hunana* (Zahlbr.) Awasthi, reported from Eastern Himalayas of India, and Nepal, with 3-septate measuring 23~30 × 6~9 µm, dark brown to black apothecial disc, and red-brown hypothecium; however, the latter species differs primarily in having crowded apothecia and a terricolous habitat. *Biatora tetramera* (De Not.) Coppins (= *Mycobilimbia tetramera* Vitik., Ahti, Kuusinen, Lommi & Ulvinen) is also similar to *M. philippina*, with 3-septate, fusiform, straight ascospores measuring 16~28 × 5~8 µm, and reddish brown hypothecium, but has K+ purplish hymenium and exciple, more affluent apothecial pigmentation, and a muscicolous or terricolous habitat. It should be noted here that placement of the species in *M. philippina*, as reported in the present study, is provisional, and is based on fewer characters [30].

Specimen examined. Gangwon Province, Chiaksan National Park, Mt. Chiak, N 37°17'56.9", E 128°02'47.2", alt 945 m, on rock, Hur 040582 (KoLRI).

Fig. 1. *Mycobilimbia philippina* (Vain.) Awasthi. A, Habit; B, Apothecia in higher magnification; C, Proper exciple (arrow indicates hyaline hyphae); D, Ascospores in higher magnification (scale bars: A = 2 mm, B = 1 mm, C = 50 µm, D = 20 µm).

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