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A Lichen Genus *Porpidia* (Porpidiaceae) from South Korea

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Taxonomic study of the crustose lichen *Porpidia* was performed in this paper. Three species are described, including two recorded species and one new record: *Porpidia macrocarpa* (DC.) Hertel & A. J. Schwab. A description of each species is presented along with morphological, anatomic, and chemical characteristics. A key to the identification of species of *Porpidia* is also presented.

KEYWORDS : Lichens, New record, *Porpidia macrocarpa,* Taxonomy

The crustose lichen genus *Porpidia* Körber is a saxicolous lichen that is widely distributed in the mountains of South Korea. The genus was firstly described by Körber [1], and it belonged to the classical family Lecideaceae and classical genus *Lecidea* [2] for a long time. It was later segregated from *Lecidea* in 1975 as the genus name *Huilia* Zahlbr. by Hertel [3], and in 1984, the same author [4] resurrected the genus name *Porpidia* as the correct name for the genus *Huilia*.

The species of *Porpidia* occur mostly on siliceous rocks, although a few are confirmed on bark, lignum, worked timber, and consolidated soil [5]. Due to their growth on rock, *Porpidia* spp. are difficult to collect, such that the number of specimens is relatively fewer than that of macro-lichens. These share some common characteristics: thallus endolithic to epilithic, 0.1 to 1.5 mm thick; continuous thalli almost completely uncracked; thallus gray to ashy gray or orange; apothecia usually sessile on thallus, disk pruinose or not, spores ellipsoid and covered with a hyaline halo, ascus tip with a dark blue tubular structure when stained in iodine solution.

Two species, *P. albocaerulescens* and *P. crustulata*, have been reported in South Korea [6]. Except for a checklist, no taxonomic study on this genus has been carried out, and therefore this work focused on the detailed taxonomic analysis of this genus from South Korea. One hundred and twenty specimens were collected from the main mountains of South Korea during 2003 to 2010. Two species, *P. albocaerulescens* and *P. crustulata*, were found during our study, together with another reported species. In total, three species are included in this paper with a key for the identification of species of *Porpidia*.

Specimens were examined using standard microscopical techniques and hand-sectioned under a Nikon SMZ645 dissecting microscope (Nikon, Tokyo, Japan). All measurements were made on material mounted in water, amyloid reactions were tested with iodine solution, and lactophenol cotton blue was used as a stain. Nikon Coolpix 4500 was used for taking photographs of the species. Thin layer chromatography was performed in solvent system C (toluene : acetic acid = 85 : 15) as described by Elix *et al.* [7] and White and James [8]. The specimens were lodged at the herbarium of the Lichen & Allied Bioresource Center, Korean Lichen Research Institute (KoLRI), Sunchon National University, Korea.

Taxonomic Treatment of the Species

Key to the genus *Porpidia* in South Korea

1. Apothecia disk heavily pruinose, thallus thick (0.5~1.2 mm) ····· *P. albocaerulescens*
1. Apothecia non-pruinose, thallus thin ····· 2
2. Apothecia less than 1 mm in diam., hymenium 60~90 μm high, spores 10~17 μm ····· *P. crustulata*
2. Apothecia 1~3 mm in diam., hymenium 80~120 μm high, spores 16~25 μm ····· *P. macrocarpa*

The Species

Porpidia albocaerulescens (Wulfen) Hertel & Knoph

Diagnostic characters. Thallus grayish green to whitish, sometimes dark to olive green when wet, continuous, slightly cracked when dry, 0.3~1.2 mm thick, surface even, marginal part usually thinner than the thallus center. Prothallus black, rather obvious when two individual thallus abut each other. Apothecia abundant, clustered and sessile, but sunken in thallus when young, 0.5~1.5 mm in diameter when mature, disk black, covered with white pruina. Hymenium 70~110 μm high, epithecium brown to dark brown, subhymenium 20~40 μm high, exciple dark brown

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to blackish in marginal part, lighter brown within. Spores ellipsoid, 17~25 × 6~10 μm.

Chemistry. Stictic acid (main), cryptostictic acid, constictic acid, and norstictic acid.

Habitat. On HCl-rocks, particularly in shady and humid areas.

South Korean distribution. Rather common, widely distributed all over South Korea, found in altitudes from sea level up to 1,600 m.

World distribution. Eastern to Southeastern Asia, Europe, and North America [5, 9, 10].

Remarks. The species was easy to recognize even in the field. It is the only pruinose *Porpidia* species in South Korea. By having a thick and smooth thallus, as well as large apothecia and thick whitish pruina, it is easy to separate from other crustose lichen species in South Korea.

Representative specimens examined. Mt. Halla, Jeju Island, 33°22'47.3" N, 126°33'43.0" E, alt. 1,270 m, Hur090128. Bogil Island Jeonnam Prov., 34°08'77.8" N, 126°32'77.7" E, alt. 2 m, Hur100003. Mt. Jiri, Hadong-gun, Gyeongnam Prov., 35°18'355" N, 127°35'214" E, alt. 1,473 m, Hur091183. Mt. Duta, Pyeongchang-gun, Gangwon Prov., 37°33'94.3" N, 128°35'02.5" E, alt. 355 m, Hur100691. Mt. Suri, Anyang City, Gyeonggi Prov., 37°22'004" N, 126°53'612" E, alt. 194 m, Hur101224.

Porpidia crustulata (Ach.) Hertel & Knoph

Remarks. This species was not found during our study, but it has been reported by Moon [11] on Mt. Sorak. Unfortunately, we did not find the species after several field surveys on Mt. Sorak.

The species is characterized by having thin thallus (less than 0.5 mm), short hymenium (60~90 μm high), small spores (10~17 μm long), small and numerous apothecia (less than 1 mm in diameter), and non-pruinose black disk. It is similar with *P. macrocarpa* but differs in having smaller spore size, hymenium height, and apothecia size.

South Korean distribution. Rare, reported only on Mt. Sorak [11].

World distribution. It has been reported all over the world, from temperate to alpine or arctic climates [10].

Porpidia macrocapa (DC.) Hertel & A. J. Schwab (Fig. 1A~1C)

Diagnostic characters. Thallus greenish gray to whitish gray, sometimes partly orange, epilithic or less frequently

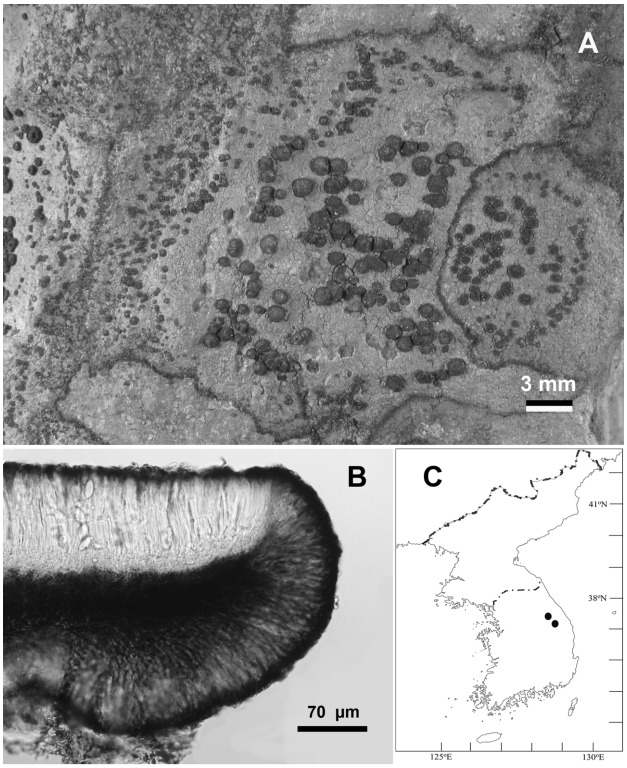

Fig. 1. Morphological characteristics and distribution of *Porpidia macrocapa.* A, Habit of *Porpidia macrocapa* (DC.) Hertel & A. J. Schwab; B, Exciple section of *P. macrocapa*; C, Distribution of *P. macrocapa* in South Korea.

endolithic, smooth or rugulose in some old parts, rather thin, 0.1 to 0.5 mm in diameter. Clear black prothallus present in the marginal part. Apothecia abundant and clustered, sessile in mature thallus, sunken when young, 0.5~2.0 (~3.0) mm in diameter, black or dark brown, disk non-pruinose, usually flat. Hymenium 70~100 μm high, epithecium usually olive brown, subhymenium 20~40 μm high, exciple composed of elongated cells radiating from hypothecium, dark brown to blackish in margin and paler within. Spores ellipsoid, 18~23 × 6~9 μm.

Chemistry. Stictic acid and cryptostictic acid (all accessory); or no compound.

Habitat. HCl-rock, on exposed but humid area.

South Korean distribution. Rare, it is found only in Gangwon province at an altitude around 800~1,200 m.

World distribution. Asia, Europe, and North America [9, 10, 12].

Remarks. The species might be confused with *P. crutulata* when its apothecia are small, but it has a higher

hymenium and larger spores (usually around 20 μm long), whereas *P. crustulata* has spores always shorter than 17 μm. Some *P. albocaerulescens* specimens with unclear pruina on disk might be confusing, but *P. macrocarpa* has much thinner thallus, smaller spores, and darker exciple.

Specimens examined. Mt. Eungbok, Hongcheon-gun, Gangwon Prov., 37°51'359" N, 128°30'974" E, alt. 1,192 m, Hur090664. Mt. Jang, Sangdong-eup, Yeongwol-gun, Gangwon Prov., 37°08'38.7" N, 128°51'04.2" E, alt. 762 m, Hur100866.

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