

RESEARCH NOTE

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First Report of the Lichen Species, *Heterodermia flabellata* (Fée) D. D. Awasthi, and Updated Taxonomic Key of *Heterodermia* in South Korea

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Heterodermia flabellata (Fée) D. D. Awasthi was found as a new lichen record in Jeju Island of South Korea in 2012. A detailed taxonomic description and comments are provided for the taxa. An updated key for all recorded species of *Heterodermia* from South Korea is given.

KEYWORDS : *Heterodermia*, Jeju Island, Lichen, New record, Updated key

The first detailed survey of the genus *Heterodermia* in Korea was carried out by Park [1]. According to her description, 12 species were identified with a key and a small description. The Korean lichen checklist published by Hur *et al.* [2] included eight additional species described by Kurokawa [3], Moon [4], and Kashiwadani *et al.* [5]. A recent taxonomic and molecular phylogenetic study conducted by Wei *et al.* [6] showed that the *Heterodermia* in South Korea is a monophyletic group. Further, they provided a simple key for the 18 species of *Heterodermia* in South Korea. In the same year, Wang *et al.* [7] found another species of *Heterodermia*, *H. squamulosa*, as a new record. Thus 21 species of *Heterodermia* have been reported in South Korea to date. During the current study, another *Heterodermia* species, *H. flabellata* (Fée) D. D. Awasthi, was recorded from the Gwanum Temple area at Jeju Island, South Korea. Hence, the total number of *Heterodermia* species recorded in S. Korea is now 22. This paper provides a detailed taxonomic description and illustrations of the lichen species *H. flabellata* (Fig. 1) together with an updated key for the genus *Heterodermia* in South Korea.

The lichen samples were identified using dissecting and light microscopes. A dissecting microscope (SMZ645; Nikon, Tokyo, Japan) was used to identify the morphological characters of the thallus, reproductive structures, color, size and shapes. A compound light microscope (Zeiss Scope.A1; Carl Zeiss, Oberkochen, Deutschland, Germany)



Fig. 1. Morphological characters of *Heterodermia flabellata*.

was used to study the anatomy of the thalli and fruiting bodies. All measurements were made from materials mounted in water and stained with lactophenol cotton blue. Spot test reactions were conducted on hand sections of the thalli and apothecia under the compound microscope. Additionally, thin layer chromatography (TLC) was performed in solvent system C (toluene : acetic acid = 85 : 15) as described by Orange *et al.* [8]. Vouchers have been deposited in the herbarium of the Lichen and Allied Bio-resource Center at the Korean Lichen Research Institute (KoLRI), Suncheon National University, South Korea.

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Updated taxonomic key to the lichen genus *Heterodermia* in South Korea

1. Thallus isidiate, isidia marginal or laminal, lower surface corticate *H. isidiophora*
 1a. Thallus lacking isidia, lower surface corticate or decorticate 2
2. Lower surface corticate 3
 2a. Lower surface decorticate 8
3. Rhizines marginal, concolorous with the thallus, irregularly branched, medulla P+ yellow *H. rubescens*
 3a. Rhizines not marginal, all over the lower surface 4
4. Thallus sorediate 5
 4a. Thallus esorediate 7
5. Medulla P+ yellow, norstictic or salazinic acid present *H. pseudospeciosa*
 5a. Medulla P- or pale yellow, norstictic acid or salazinic acid absent 6
6. Laciniae linear-elongate, margins of apothecia crenate or lacinulate *H. speciosa*
 6a. Laciniae short, margins of apothecia sorediate *H. tremulans*
7. Thallus with numerous squamules, norstictic and salazinic acid present *H. dissecta*
 7a. Thallus without squamules, norstictic and salazinic acid absent *H. diademata*
8. Marginal and laminal cilia numerous, cilia concolorous with thallus *H. comosa*
 8a. Cilia absent 9
9. Medulla yellow, P-, apothecia rather small *H. firmula*
 9a. Medulla white 10
10. Yellow pigment present on the lower surface, K+ purple 11
 10a. Yellow pigment absent, K- 18
11. Thallus sorediate 12
 11a. Thallus esorediate 14
12. Soredia capitate, non-labrifiform and on lower surface *H. subascendens*
 12a. Soredia farinose and labrifiform 13
13. Lower surface purple black at the center, norstictic and salazinic acid present *H. propagulifera*
 13a. Lower surface not purple black at the center, norstictic and salazinic acid absent *H. obscurata*
14. Lower surface purple black at the center 15
 14a. Lower surface white at the center 16
15. Rhizines long and white, norstictic acid absent *H. loriformis*
 15a. Rhizines black, medulla K+ yellow, norstictic acid present *H. dendritica*
16. Unidentified substance present on the TLC other than atranorin and zeorin 17
 16a. Unidentified substance not present on the TLC, medulla P+ pale yellow or P- *H. hypochraea*
17. Medulla P+ deep yellow *H. pandurata*
 17a. Medulla P- *H. flabellata* (new record)
18. Thallus sorediate 19
 18a. Thallus esorediate 21
19. Numerous squamules mixed with granules along the margins of lobes and with some on the surface *H. microphylla*
 19a. Squamules absent, soredia marginal or terminal .. 20
20. Soredia marginal, long black squarrose rhizines projecting beyond the thallus *H. boryi*
 20a. Soredia farinose terminal and labrifiform *H. japonica*
21. Numerous squamules along the margin *H. squamulosa*
 21a. Squamules absent along the margin *H. hypoleuca*
- Heterodermia flabellata* (Fée) D. D. Awasthi, *Geophytology* 3: 113 (1973).**
 Thallus foliose, grayish white, attached to the substratum almost to the lobes end, laciniae irregularly branched, linear-elongate, minutely notched, 0.7~2.5 mm broad, plane or somewhat convex, smooth, without soredia and isidia. Somewhat pruinose at the lobes end, medulla white, thallus lacking lower cortex, middle of the lower surface white, deep yellow pigment on the lower surface with marginal rhizines; rhizines white to jet black, simple or squarrosely branched, 1~2 mm long. Apothecia not seen.
- Chemistry.** Thallus K+ yellow; medulla. K+ yellow, C-, KC-. PD-, or PD+ pale yellow; pigmented undersurface K+ purple. TLC: atranorin, zeorine, and unidentified yellow substance.
- Remarks.** *H. flabellata* closely resembles *H. obscurata* in that it produces the same undetermined yellow

pigment, but differs in that it lacks soredia. Externally, it also resembles *H. hypoleuca*, but the spores are larger and the undersurface is pigmented [3]. According to Kurokawa [3], *H. flabellata* is restricted to tropical and subtropical regions and does not extend into temperate areas. However, *H. flabellata* var. *rottboldii* was reported from China by Wei [9].

Habitat and altitude. Gwanum Temple, Ara-dong, Jeju-si, Jeju-do; On mosses of bark of *Quercus* sp., 595 m alt. 33°25'29.46" N 126°33'30.01" E, R. G. U. Jayalal, J. S. Hur and J. S. Park, 122024, 1 Jul 2012.

Geographical distribution. **Asia:** India, Sri Lanka [10], New Caledonia [3], Malaysia [11], China [9]. **Europe:** Azores [12], **Central America:** Mexico, Costa Rica, **West Indies:** **South America:** Colombia, Venezuela. **Africa:** French Guinea, Ivory Coast [3].

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