One new species and one new record of Haematomma from China (Lecanorales: Haematommataceae) postprint

Authors: Ren Zhaojie, Tang Rong, Dong Linlin, Zhang Lulu

Date: 2020-11-27T00:00:00+00:00

Abstract

This study conducted a comprehensive investigation of over 200 specimens of the genus Haematomma collected from China, utilizing morphological, chemical, and ecological characteristics, and discovered one new species and one new record for China within the genus Haematomma. The new species is Haematomma muriformis, characterized by red apothecia, muriform spores that are relatively broad ($75_{87.5\$\times\$12.5}20$ m), and containing the chemical substances atranorin, haematommone, and arthothelin. The new record for China is Haematomma matogrossense. This paper provides detailed descriptions of the new species and the new Chinese record, offers morphological and anatomical photographs, and also presents a key to the known Chinese species of the genus Haematomma. This research enriches the data and information repository for Haematomma lichens and provides foundational materials for the compilation of the Flora Lichenum Republicae Popularis Sinicae (Flora of Lichens of China).

Full Text

A New Species and a New Record of Haematomma from China (Lecanorales: Haematommataceae)

REN Zhaojie[1], TANG Rong[2], DONG Linlin[3], ZHANG Lulu[3]*

[1]Nature Department, Shandong Museum, Jinan 250014, China
[2]The First High School of Liangshan, Jining 272600, Shandong, China
[3]Institute of Environment and Ecology, Shandong Normal University, Jinan 250358, China

Abstract

This study investigated over 200 specimens of the lichen genus *Haematomma* collected from China using comprehensive morphological, chemical, and ecological analyses, revealing one new species and one new record for the country. The new species, *Haematomma muriformis*, is characterized by red apothecia, muriform ascospores that are relatively broad (75–87.5 × 12.5–20 µm), and the presence of atranorin, haematommone, and arthothelin. The newly recorded species is *Haematomma matogrossense*. This paper provides detailed descriptions of both the new species and the new record, along with morphological and anatomical photographs, and includes a key to all known Chinese *Haematomma* species. This research enriches the data resources for the *Haematomma* genus and provides fundamental materials for the compilation of *Lichen Flora of China*.

Key words: lichenized fungi, Haematommataceae, *Haematomma*, taxonomy, chemistry

1. Introduction

The genus *Haematomma* A. Massal. comprises crustose lichens belonging to the order Lecanorales and family Haematommataceae. These lichens predominantly inhabit tropical to temperate humid and semi-humid environments. The primary diagnostic characteristics include lecanorine apothecia; a hymenium typically containing anthraquinone compounds such as haematommone or russulone, resulting in red or orange-red disc surfaces; *Haematomma*-type ascal apical apparatus; ascospores usually eight per ascus, hyaline and transparent, ranging from septate to submuriform or muriform; and branched, anastomosed paraphyses.

Established by the lichenologist Massalongo in 1852, the genus was originally placed within Lecanoraceae and included only two species. In 1970, Culberson questioned its systematic position based on chemical constituents. Hafellner (1984) subsequently established the independent family Haematommataceae based on characteristics of the ascal apical apparatus, spore morphology, and paraphyses. Initially, Haematommataceae comprised three genera: *Haematomma*, *Ophioparma* Norman, and *Loxospora* A. Massal. In 1988, Rogers and Hafellner separated *Ophioparma* to establish Ophioparmaceae, and in 1995, Staiger and Kalb separated *Loxospora* to establish Loxosporaceae. The systematic position of *Haematomma* remains controversial, with some scholars advocating for its placement within Lecanoraceae while others support the independence of Haematommataceae. This study endorses the latter position. Currently, Haematommataceae contains only the genus *Haematomma*, with approximately 40 species worldwide (Matthew et al., 2006; Aptroot, 2007; Brodo et al., 2008; Gerasimova & Ekman, 2017) and 12 species reported from China (Tang et al., 2018, 2019; Miao et al., 2019).

Our investigation of over 200 *Haematomma* specimens from China has revealed one new species and one new record for the country. This study expands knowledge of species composition and distribution of *Haematomma* in China and provides foundational data for *Lichen Flora of China*.

2. Materials and Methods

The experimental materials consisted of over 200 lichen specimens collected from China, deposited in the Lichen Herbarium of Shandong Normal University (SDNU), Lichen Herbarium of Kunming Institute of Botany, Chinese Academy of Sciences (KUN-L), Lichen Herbarium of Institute of Microbiology, Chinese Academy of Sciences (HMAS-L), Fungal Herbarium of Lichen Species and Gene Resources Research Center of Liaocheng University (LCUF), and the Bryophyte and Lichen Herbarium of the Netherlands (ABL).

Morphological and anatomical analyses were conducted using a stereomicroscope (OLYMPUS SZ51) and a polarizing microscope (OLYMPUS CX21). Chemical constituents were preliminarily identified using spot tests: K (10% aqueous potassium hydroxide solution) and C (saturated sodium hypochlorite solution) were applied to the cortex and medulla. Secondary metabolites were analyzed using standardized thin-layer chromatography (TLC) following Orange et al. (2010).

Photographs were captured using a DP72 camera attached to an optical stereomicroscope (OLYMPUS SZX16) and an optical transmission microscope (OLYMPUS BX61).

3. Results and Analysis

3.1 *Haematomma muriformis* R. Tang & Z. J. Ren sp. nov. Fungal Names FN: 570731

This species differs from *Haematomma gallowayi* by its larger ascospores and distinct chemical composition.

Etymology: The epithet "muriformis" refers to the muriform ascospores.

Description: Thallus crustose, continuous, milky white, sometimes wrinkled or cracked, lacking soredia and isidia; prothallus white, feather-like. Apothecia scattered, adnate or with constricted bases; discs flat, red, pruinose absent, 0.75–2.0(–2.2) mm in diameter; margins white, distinct, flat; excipulum 130–150 µm thick; epihymenium orange-red, 12–18 µm thick, K+ purple turning negative; hymenium hyaline, 150–175 µm high; hypothecium hyaline, K–; paraphyses branched, anastomosed. Asci clavate, 6–8-spored; ascospores hyaline, muriform, straight or curved, 75–87.5 × 12.5–20 µm. Conidiomata not observed.

Chemistry: Cortex and medulla K+ yellow, C–, KC–, IKI–. TLC detects atranorin, haematommone, and arthothelin.

Substrate: Bark of *Pinus armandii* Franch.

Distribution: China (Yunnan Province).

Type specimen: China, Yunnan Province, Nanjian County, surrounding area of Wuliang Medicine Valley, 100°34 51.39 E, 24°52 2.67 N, alt. 2,348 m, 19 December 2012, L. S. Wang & X. Y. Wang 12-37653 (KUN-L, holotype).

Remarks: This species has muriform ascospores with greater width than other species in the genus. It resembles *Haematomma gallowayi* Brodo, but the latter contains placodiolic acid and zeorin in addition to atranorin and haematommone, has sorediate thalli and flexuose apothecial margins, contains 3–4 spores per ascus (versus 6–8 in *H. muriformis*), and has smaller ascospores (51–78 × 10–15.5 µm) (Brodo, 2007).

Figure 1 [Figure 1: see original paper] *Haematomma muriformis.* A. Thallus; B. Apothecium; C. Prothallus; D. Apothecium section; E. Ascus; F–G. Ascospores. Bars: A = 2 mm; B, C = 500 µm; D = 100 µm; E = 5 µm; F = 5 µm; G = 20 µm.

3.2 *Haematomma matogrossense* Kalb & Staiger, in Staiger & Kalb, Biblthca Lichenol. 59: 133 (1995) Description: Thallus crustose, continuous, pale yellow, sometimes wrinkled or cracked, lacking soredia and isidia; prothallus not observed. Apothecia red, adnate or with constricted bases, discs flat, pruinose absent, 0.3–0.5 mm in diameter; margins distinct; epihymenium orange-red, 7–16 µm thick, K+ purple turning negative; hymenium hyaline, transparent, 60–75 µm high; hypothecium hyaline, K–; paraphyses branched, anastomosed. Asci clavate, 8-spored; ascospores hyaline, septate, with 7–13 locules, straight or curved, 47–57 × 4–5 µm. Conidiomata not observed.

Chemistry: Cortex and medulla K+ yellow, C-, KC-, IKI-. TLC detects atranorin, haematommone, methylisoplacodiolic, and isopseudoplacodiolic.

Substrate: Corticolous.

Distribution: China (Yunnan Province); Americas (Brodo et al., 2008).

Specimens examined: China, Yunnan Province, Lancang County, Jingmai Mountain, 100°3 28.81 E, 22°12 50.37 N, alt. 1,135 m, 26 July 2014, L. S. Wang, D. Liu et al. 14-44424, 14-44425 (KUN-L).

Remarks: This species resembles *Haematomma flexuosum* Hillmann but differs in containing atranorin, isoplacodiolic acid, isopseudoplacodiolic acid, and haematommone, and in having fewer spore locules (5–7) than *H. matogrossense.*

Figure 2 [Figure 2: see original paper] *Haematomma matogrossense.* A. Thallus and apothecium; B. Apothecium section; C. Ascospores. Bars: A = 5 mm; B = 100 µm; C = 5 µm.

3.3 Key to Chinese *Haematomma* Species Based on our specimen identifications, we present the following key to Chinese *Haematomma* species:

Key to Chinese *Haematomma* Species

9. Apothecia with yellow pruina; ascospores with 8–15 locules ····· *H. caperaticum*

4. Discussion and Conclusion

Our classification and statistical analysis of over 200 specimens reveal that China currently hosts 14 *Haematomma* species, primarily distributed in southwestern and southern regions, extending northward to the Qinling Mountains. These lichens predominantly grow on tree trunks at elevations of 1,000–3,000 m, though *Haematomma accolens* can occur below 1,000 m and *H. rufidulum* above 3,000 m. *Haematomma africanum* and *H. wattii* exhibit relatively wide distributions in China. The characteristic pigments of the genus are haematommone and russulone; among Chinese species, nine contain haematommone and five contain russulone.

Of the 14 *Haematomma* species found in China, all except *H. caperaticum* occur in Yunnan Province. The new species *H. muriformis* and the new record *H. matogrossense* were collected from Nanjian County and Lancang County in Yunnan, respectively. Prior to this study, *H. matogrossense* had only been reported from Brazil in the Americas (Brodo et al., 2008). These findings demonstrate that Yunnan Province harbors rich *Haematomma* resources, likely attributable to its unique geographical location and climatic conditions. Further intensive research in this region is warranted.

Acknowledgments

We thank Dr. Wang Lisong and Mr. Wang Xinyu from Kunming Institute of Botany, Chinese Academy of Sciences, for assistance with specimen collection and photography. We also thank the curators of KUN-L, HMAS-L, LCUF, and ABL for providing access to specimens.

References

APTROOT A, SAIPUNKAEW W, SIPMAN HJM, et al., 2007. New lichens from Thailand, mainly microlichens from Chiang Mai [J]. *Fungal Divers*, 24: 75-134.

BRODO IM, 2007. Notes on the genus *Haematomma* from Sabah, Malaysia [J]. *Bib Lichenol*, 95:

BRODO IM, WILLIAM LC, CHICITA FC, 2008. *Haematomma* (Lecanoraceae) in North and Central America [J]. *Bryologist*, 111(3): 363-423.

GERASIMOVA J, EKMAN S, 2017. Taxonomy and nomenclature of seven names in *Bacidia* (Ramalinaceae, Lecanorales) described from Russia[J]. *Phytotata*, 316(3): 292-296.

MASSALONGO AB, 1852. *Ricerche sull' Autonomia dei Licheni Crostosi* [M]. Verona: Friziero:

MATTHEW PN, ROBERT L, JOSÉ LC, et al., 2006. A first assessment of the Ticolichen biodiversity inventory in Costa Rica: the genus *Haematomma* (Lecanorales: Lecanoraceae) [J]. *Lichenologist*, 38(3): 251-262.

MIAO CC, TANG R, DONG LL, et al., 2019. *Haematomma pluriseptatum* sp. nov. from China [J]. *Mycotaxon*, 134 (4):637-641.

ORANGE A, JAMES PW, WHITE FJ, 2010. *Microchemical methods for the identification of Lichens* [M]. 2nd ed. London: British Lichen Society: 1-101.

ROGERS RW, HAFELLNER J, 1988. *Haematomma* and *Ophioparma*: two superficially similar genera of lichenized fungi [J]. *Lichenologist*, 20(2): 167-174.

STAIGE B, KALB K, 1995. Haematomma-studien: I. Die flechtengattung *Haematomma* [J]. *BibLichenol*, 59: 3-198.

TANG R, YAN SK, SUN MJ, et al., 2018. New records of *Haematomma* and *Ophioparma* from China [J]. *Mycotaxon*, 133:175-181.

TANG R, ZHANG X, WANG CX, et al., 2019. Four new records of *Haematomma* from Southern China [J]. *Mycotaxon*, 134 (2):321-328.

Note: Figure translations are in progress. See original paper for figures.