

## *Lecanora subjaponica*, a new lichen from China

Lei LÜ, Lu Lu ZHANG, Xin Li LIU, Zun Tian ZHAO and Hai Ying WANG

**Abstract:** *Lecanora subjaponica* L. Lü & H. Y. Wang from western China is described as new to science. It is the only known *Lecanora* species having (16–)32-spored asci and it is otherwise characterized by an epruinose, shiny brown apothecial disc, epihymenium lacking granules and the presence of zeorin in addition to atranorin. A worldwide key to the multispored species of *Lecanora* is also given.

**Key words:** East Asia, *Lecanoraceae*, multispored asci, taxonomy, zeorin

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### Introduction

The multispored species of *Lecanora* have been characterized in detail by Brodo (1984), Giralt & Gómez-Bolea (1991), Lumbsch (1994) and Guderley & Lumbsch (1999). This group includes nine species worldwide: *L. bruneri* Imshaug & Brodo, *L. cateïlea* (Ach.) A. Massal., *L. japonica* Müll. Arg., *L. weii* L. F. Han & S. Y. Guo, *L. loekoestii* Y. Joshi, L. Lü & J. S. Hur, *L. pleospora* Müll. Arg., *L. praesistens* Nyl., *L. sambuci* (Pers.) Nyl., and *L. strobilinoïdes* Giralt & Gómez-Bolea (Giralt & Gómez-Bolea 1991; Guderley & Lumbsch 1999; Han *et al.* 2009; Lü *et al.* 2011). The first four species are known in China (Han *et al.* 2009).

During a recent study of *Lecanora* from China, we discovered another representative of this group of taxa. It is described here as a

species new to science. We also provide a detailed key to the multispored species in the genus.

### Materials and Methods

The specimens studied are housed in SDNU (Lichen Section of Botanical Herbarium, Shandong Normal University) or HMAS-L (Lichen Section, Herbarium of the Institute of Microbiology, Academia Sinica).

Thalli were examined and measured under a stereomicroscope (COIC XTL7045B2) and apothecial anatomy was observed under a polarizing microscope (OLYMPUS CX41-32). The photograph of the thallus was taken with an OLYMPUS SZX16 camera with DP72 and the photograph of ascospores was taken using an OLYMPUS BX61 with DP72. Chemical analysis using spot tests and thin-layer chromatography followed standard methods (Orange *et al.* 2010). The TLC was performed using mainly solvent system C.

Terminology of structures follows Brodo (1984).

### Key to the multispored species of *Lecanora* in the world

- 1 Thallus K–; apothecial disc red-brown with thin margin; amphithecium lacking crystals . . . . . **L. sambuci**  
Thallus K+ yellow; apothecial disc orange, brown or dark brown with thick margin; amphithecium containing crystals . . . . . 2

L. Lü and X. L. Liu: Shandong Provincial Key Laboratory of Microbial Engineering, School of Food and Bio-engineering, Shandong Polytechnic University, Jinan, 250353, China.

L. L. Zhang, Z. T. Zhao and H. Y. Wang (corresponding author): College of Life Sciences, Shandong Normal University, Jinan, 250014, China.

Email: lichenwhy@yahoo.com.cn

- 2(1) Epihymenium not granulose . . . . . 3  
 Epihymenium granulose . . . . . 4
- 3(2) Thallus containing only atranorin; (8–)16-spored . . . . . **L. japonica**  
 Thallus containing atranorin and zeorin; (16–)32-spored . . . . . **L. subjaponica**
- 4(2) Thallus lacking atranorin; epihymenium with coarse granules; asci (12–)16(–32)-  
 spored, ascospores frequently 1-septate . . . . . **L. strobilinoideis**  
 Thallus containing atranorin; ascospores simple . . . . . 5
- 5(4) Thallus containing usnic acid . . . . . 6  
 Thallus lacking usnic acid . . . . . 7
- 6(5) Apothecial disc heavily pruinose; epihymenium with coarse granules; containing  
 atranorin in addition to usnic acid . . . . . **L. weii**  
 Apothecial disc epruinose or slightly pruinose; epihymenium with fine granules; con-  
 taining atranorin, norstictic acid and zeorin, as well as usnic acid . . . **L. loekoesii**
- 7(5) Amphithecium with large crystals; thallus without psoromic acid . . . . . 8  
 Amphithecium with small crystals; thallus with psoromic acid . . . . . 9
- 8(7) Prothallus whitish grey; apothecial disc orange-brown to reddish orange; asci 8(–16)-  
 spored . . . . . **L. pleospora**  
 Prothallus not visible; apothecial disc red-brown to blackish orange; asci (8–)12(–16)-  
 spored . . . . . **L. praesistens**
- 9(7) Apothecia densely clustered; apothecial disc red-brown, pruinose; asci (12–)16-  
 spored . . . . . **L. beneri**  
 Apothecia scattered; apothecial disc yellow-brown to orange-brown, slightly pruinose;  
 (8–)12-spored . . . . . **L. cateilea**

### The New Species

#### **Lecanora subjaponica** L. Lü & H. Y. **Wang sp. nov.**

MycoBank No.: MB 563785

Epihymenium egranulosum. Asci clavati, (16–)32 spori.  
 Thallus atranorinum et zeorinum continens.

Typus: China, Yunnan Province, Kunming, Mt. Jiaozhi,  
 alt. 3800 m, on bark, 27 October 2008, Wang 20083503  
 (SDNU—holotypus).

(Fig. 1A)

*Thallus* corticolous, crustose, grey to yellow-  
 grey, continuous, rough to verruculose, eprui-  
 nose, esorediate, margin definite. *Prothallus*  
 absent.

*Apothecia* numerous, sessile to adnate,  
 0.5–1.6 mm diam., lecanorine; *disc* reddish  
 brown to dark brown, concave to plane, shiny,  
 epruinose; margin usually paler than the  
 thallus (whitish grey), rather thick, persis-  
 tent, smooth, entire to occasionally flexuose.

*Amphithecium* containing numerous small  
 crystals (*campestris*-type) soluble in K; cortex  
 distinct, hyaline, 50–75 µm thick, basally  
 not expanded. *Epihymenium* reddish brown,  
 7.5–10.0(–12.5) µm high, without granules  
 (*allophona*-type). *Hymenium* hyaline, not  
 interspersed with oil droplets, 50.0–62.5 µm  
 high. *Subhymenium* hyaline, 10–15 µm high.  
*Hypothecium* hyaline, not interspersed with oil  
 droplets, 37.5–50.0 µm high. *Paraphyses* sim-  
 ple, not pigmented. *Asci* clavate, (16–)32-  
 spored (Fig. 1B). *Ascospores* simple, hyaline,  
 ellipsoid, (7.5–)8.2–11.8(12.5) × (4.0–)4.5–  
 5.5(6.0) µm.

*Pycnidia* not observed.

*Chemistry*. Spot tests: thallus K+ yellow,  
 C–, KC–, P–. Secondary metabolites: atra-  
 norin and zeorin.

*Etymology*. The specific epithet '*subjaponica*'  
 refers to the similar species *L. japonica*.

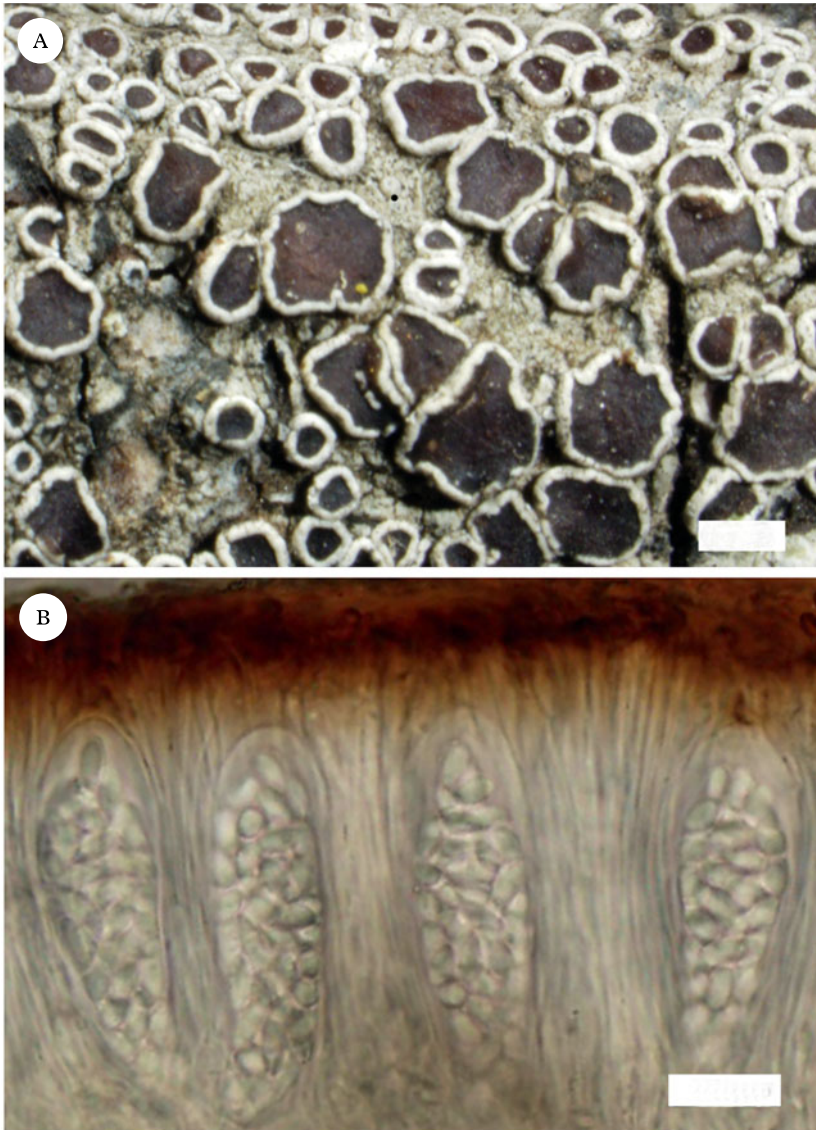


FIG. 1. *Lecanora subjaponica*. A, habit; B, asci and ascospores. Scales: A = 1 mm; B = 20  $\mu$ m. In colour online.

*Ecology and distribution.* At present *L. subjaponica* is known from Shaanxi, Sichuan, Yunnan and Xizang Provinces where it is found growing on the bark of various deciduous trees at high elevations of 2400–3800 m.

*Notes.* This species is characterized by the epruinose, shiny apothecial disc, not granu-lose (*allophana*-type) epihymenium, (16–)32-

spored ascus and by the presence of zeorin in addition to atranorin. *Lecanora subjaponica* is the only species among all known multi-spored species of the genus having such a high number of spores per ascus. *Lecanora japonica* and *L. loekoesii* resemble *L. subjaponica*. However, *L. japonica* has (8–)16-spored asci and produces atranorin only,

while *L. loekoessii* has (12–)16-spored asci, a granulose (*pulicaris*-type) epihymenium, and contains usnic and norstictic acids in addition to atranorin and zeorin.

*Additional specimens examined.* **China:** Shaanxi Prov.: Meixian, Mt Taibai, alt. 2400 m, on bark, 2011, *Dong* 20114052A (SDNU). Sichuan Prov.: Kangding, Mt Paoma, alt. 2700 m, on bark, 2006, *Du* 20084144, 20084145 (SDNU). Yunnan Prov.: Jianchuan, Mt. Shibao, alt. 2600 m, on bark, 2008, *Wang* 20081509, *Sun* 20083410, *Du* 20083446 (SDNU); Kunming, alt. 2600 m, on bark, 2008, *Ren* 20081121-1 (SDNU); Lijiang, Mt. Yulong, Ganhaizi, alt. 3150 m, on bark, 1964, *Wei* 076802 (HMAS-L). Xizang Prov.: Nielamu, Quxiangdexintang, alt. 3550 m, on bark, 1966, *Wei & Chen* 098272 (HMAS-L).

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## REFERENCES

- Brodo, I. M. (1984) The North American species of the *Lecanora subfusca* group. *Beihefte Nova Hedwigia* **79**: 63–185.
- Giralt, M. & Gómez-Bolea, A. (1991) *Lecanora strobiloides*, a new lichen species from north-eastern Spain. *Lichenologist* **23**: 107–112.
- Guderley, R. & Lumbsch, H. T. (1999) Notes on multi-spored species of *Lecanora* sensu stricto. *Lichenologist* **31**: 197–210.
- Han, L. F., Zhao, J. C. & Guo, S. Y. (2009) *Lecanora weii*, a new multisporous species of *Lecanora* s. str. from northeastern China. *Mycotaxon* **107**: 157–161.
- Lumbsch, H. T. (1994) Die *Lecanora subfusca*-Gruppe in Australasien. *Journal of the Hattori Botanical Laboratory* **77**: 1–175.
- Lü, L., Joshi, Y., Elix, J. A., Lumbsch, H. T., Wang, H. Y., Koh, Y. J. & Hur, J. S. (2011) New and noteworthy species of lichen genus *Lecanora* (Ascomycota; Lecanoraceae) from South Korea. *Lichenologist* **43**: 1–9.
- Orange, A., James, P. W. & White, F. J. (2010) *Microchemical Methods for the Identification of Lichens*. 2nd edition. London: British Lichen Society.