



NOTE

Lysimachia candida Lindl. (Primulaceae), an Extinct Species and also a New Record Species to Taiwan

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ABSTRACT: During our Co-sponsored Project with the Herbarium of Komarov Botanical Institute, St. Petersburg, we investigated the S. Yano's specimens collected in Taiwan from 1896 to 1897. Among those of more than 400 specimens, we have found one *Lysimachia* that might be a new taxon to Taiwan. After literature surveying and examining the related specimens in several herbaria in Taiwan, this specimen was identified as *L. candida* Lindl., and was recognized to be a new record species to Taiwan. The species is also believed to be extinct since the earlier 1900s. This report gives taxonomic descriptions and palynological characters. A key for the species of the genus *Lysimachia* in Taiwan is also provided to facilitate identification.

KEY WORDS: *Lysimachia candida*, new record extinct, Primulaceae, palynology, taxonomy, S. Yano, Taiwan.

INTRODUCTION

Lysimachia L. is one of the largest genera in the family Primulaceae and mainly distributed in temperate areas of the northern hemisphere, with a few species in the tropics, Africa, Australasia and South America (Hu and Kelso, 1996; Kao and Peng, 1998; Heywood et al., 2007). The total number of species in the world varied widely from 150 (Mabberley, 1987, 2008), 160 (Heywood et al., 2007), 180 (Hu and Kelso, 1996; Kao and Peng, 1998) to about 200 species (Willis, 1985).

The first report of the genus *Lysimachia* in Taiwan was made by Forbes and Hemsley (1889). Since then, species of *Lysimachia* have been successively published by Henry (1896), Matsumura and Hayata (1906), Hayata (1908, 1911, 1917, 1921), Sasaki (1928, 1930), Mori (1936), Masamune (1954), Kao and DeVol (1978), Chen et al. (1989), Hu and Kelso (1996), and Kao and Peng (1998). According to the above publications, there are 10 species, including three endemic species, known to occur in Taiwan. These includes *L. ardisioides* Masam., *L. capillipes* Hemsl., *L. chingshuiensis* C.-I Peng & C.M. Hu, *L. congestiflora* Hemsl., *L. decurrens* G. Forster, *L. fortunei* Maxim., *L. japonica* Thunb., *L. mauritiana* Lam., *L. nigropunctata* Masam. and *L. remota* Petitm.

During the first year period, 1st August 2009–30 June 2010, of the National Science Council – Russian Foundation for Basic Research (NSC-RFBR) Co-sponsored Project “Investigation of S. Yano's specimens collected in Taiwan in 1896–1897 and

located at the Herbarium of the Komarov Botanical Institute (LE)” the first author (TYAY) visited the Herbarium of the Komarov Botanical Institute, St. Petersburg (abbreviation: LE) in February 2010. He worked with the second and third authors at the Central and East Asia Section, 4th floor and identified about 200 specimens collected by Mr. S. Yano, whom had little information only known he was a Japanese collector and visited Taiwan in 1896–1897. During the examination of specimens, he found one *Lysimachia* specimen, Yano collection number 369 (Fig. 1) which could not be assigned to any described species in the “Flora of Taiwan” (Kao and Peng, 1998). Then a duplicate specimen of Yano 369 (Fig. 2) was brought back to Taiwan for further examination. However, the specimen could not be identified until discussed with the forth author (CHC). After checking with the related species described in “Flora Reipublicae Popularis Sinicae” (Chen et al., 1989) and “Flora Fujianica” (Lin, 1989), the specimen was suspected to be the species “*L. candida* Lindl.”. Finally, identification of the specimen was confirmed through checking with the authentic specimens of *L. candida* collected from China at the Herbarium of National Museum of Natural Science, Taichung (abbreviation: TNM). The species “*L. candida*” is a new record species to Taiwan, but is also believed to be extinct in Taiwan now. A key to all species of the genus *Lysimachia* in Taiwan is provided here to facilitate identification. In addition, morphological characters of pollen grains from both LM and SEM observations, taxonomic descriptions and



line drawing of *L. candida* are given.

TAXONOMIC TREATMENT

Key to taxa of *Lysimachia* in Taiwan

- 1a. Stems erect
- 2a. Flowers axillary, yellow
- 3a. Stems terete, calyx slightly shorter than corolla lobe *L. capillipes*
- 3b. Stems angled, calyx much shorter than corolla lobe *L. ardisioides*
- 2b. Flowers in terminal racemes, white to pink or purple
- 4a. Leaves obovate-spatulate, succulent *L. mauritiana*
- 4b. Leaves elliptic-lanceolate, characeous
- 5a. Pedicels ca. 3 mm long, sepal oblong-ovate, apex obtuse *L. fortunei*
- 5b. Pedicels > 10 mm long, sepal lanceolate to linear, apex acuminate
- 6a. Stems angular, corolla white to pinkish, 5–6 mm long *L. decurrens*
- 6b. Stems terete, corolla white, 6–12 mm long *L. candida*
- 1b. Stems prostrate or decumbent
- 7a. Leaves subcoriaceous, narrowly elliptic *L. chingshuiensis*
- 7b. Leaves cartaceous, usually ovate, cordate or rounded
- 8a. Leaves broadly ovate to rounded
- 9a. Leaves 0.3–1 cm long, corolla dotted with reddish brown glands *L. nigropunctata*
- 9b. Leaves 1–3 cm long, corolla not dotted with reddish brown glands *L. japonica*
- 8b. Leaves ovate to rhomboid-ovate
- 10a. Leaves 2–6 cm long, with black dots *L. congestiflora*
- 10b. Leaves 2–3 cm long, without black dots *L. remota*

Lysimachia candida Lindl., J. Hort. Soc. London 1: 301. 1846. 澤珍珠菜 Fig. 3

Erect annual or biennial herbs, sparsely pubescent or glabrous, 5–60 cm tall. Stems simple or branched, with sparsely dark brown glands. Leaves simple, alternate or sometimes with radical ones, broadly elliptic, elliptic, obovate, spatulate, cauline leaves sometimes oblanceolate or linear, base attenuate or cuneate, margins entire, apex acute, glabrous on both surfaces or sparsely pubescent on abaxial surface, sparsely dotted with dark brown or reddish brown glands on both surfaces. Radical leaves 12–60 mm long, 6–15 mm wide, petioles winged, ca. 10–50 mm long; cauline leaves 10–40 mm long, 2–12 mm wide, petioles 5–12 mm long or sessile. Racemes terminal; pedicels glabrous, 5–13 mm long; bracts lanceolate or linear, 2–10 mm long, sparsely dotted with dark brown glands. Flowers white, campanulate, 5–10 mm in diam., initially coniform; calyx lobes 5, lanceolate, 3–5 mm long, dark brown glandular striate outside, margins hyaline; corolla lobes 5, oblong to obovate, 5–12 mm long, parted to middle, apex rounded; stamens slightly shorter than corolla lobes, filaments ca. 1.5 mm, anthers ca. 1.5 mm; ovary glabrous, style ca. 4–5 mm long. Capsules brown to dark brown, subglobose, 3–4 mm in diam., pistil persistent.

Distribution: Roadside or wet areas, e.g., ditches, stream or river sides, also commonly found near cultivated fields, between altitudes of 100 and 2100 meters. Distributed in S, SE, E, and C China (Provs. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangsu, Jiangxi, S Shaanxi, Shandong, Sichuan, Xizang, Yunnan and Zhejiang), Myanmar, Vietnam and Japan. In Taiwan, only found in Taipei area in past but is now extinct in the field.

Pollen grains morphology: Grains 3-colporate; prolate to prolate-spheroidal; 20–24 × 16–18 μ; amb circular; exine 1 μ thick; ornamentation reticulate. (Figs. 4–8)

Additional specimens examined: TAIWAN: no locality, O. Warburg 10570, 1887 (fl., fr.; BM); TAIPEI (TAIPEH), S. Yano 369, 12 Apr. 1897 (fl., fr.; LE, TNM).

CHINA: Fortune 12, 1845 (fl.; K). FUJIAN: SAOWU County, Herbal Group SW0182, May 2006 (fl.; TAIF, TNM). GUANGDONG: LIENSHAN County, Nanling Exped 642, 8 May 1985 (fr., fl.; TNM); LOCHANG County, Changlai Town, Nanling Exped 3887, 17 Mar. 1987 (fl., fr.; TNM). HAINAN: A. Henry 8193, Nov. 1889 (fl.; K). JIANGSU: NANJING City, Jiangsu Bot. Inst., P.P. Ling 43, 6 May 1985 (fl.; TNM). JIANGXI: IFONG County, Baoshan, S.S. Lai & H.R. Shan 1882, 25 Jun. 1997 (fl., fr.; TNM); JUOJIANG County, Longmengou, S.S. Lai & H.R. Shan 1438, 16 Jun. 1997 (fl., fr.; TNM), Mingshan, Z.M. Tan 97138, 10 Apr. 1997 (fl.; TNM); XINGZU County, Haihuei Township, H.Z. Zou 68, 18 May 1996 (fl.; TNM). YUNNAN: BAOSHAN City, Yungchang, G. Forrest 4103, Apr. 1906 (fl.; K); TALI City, G. Forrest 3840, Apr.–May 1906 (fl.; K). ZHEJIANG: HANZHOU City, S.Y. Zhang 2454, 21 May 1958 (fl., fr.; TNM), S.Y. Zhang 592287, 5 Jun. 1959 (fl., fr.; TNM).

Note: After 2010, The first author visited several herbaria in Europe to check whether there were any other specimens of *Lysimachia candida* collected from Taiwan at that time. However, he found only one *L. candida* specimen at BM (none at B, E, G, K, and L) collected by Mr. Dr. O. Warburg in 1887, but without any exact locality (Fig. 9). It is likely that *L. candida* was a kind of weed growing near wet areas and there were some populations in Taiwan during the end of the 19th century. Due to human activities and habitat changed, the populations of *L. candida* were affected in size and finally became extinct in Taiwan.

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在臺灣已滅絕同時也是新記錄種之報春花科植物—澤珍珠菜 (*Lysimachia candida* Lindl.)

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摘要：本文記錄一報春花科 (Primulaceae) 珍珠菜屬 (*Lysimachia*) 在臺灣已經滅絕的物種：澤珍珠菜 (*L. candida* Lindl.)，然本種同時也是臺灣的新記錄種植物。由於執行臺俄合作計畫發現日籍植物採集者矢野勢吉郎 (S. Yano)，在1896–1897年間採自臺灣臺北的植物標本，經鑑定後確定是臺灣新記錄種，比對過標本館標本與文獻資料，認為本種已經在臺灣絕跡。文中除了對本種有分類學描述、花粉學特徵外，並附本屬在臺灣之檢索表。

關鍵詞：澤珍珠菜、新記錄滅絕種、報春花科、花粉學、分類學、矢野勢吉郎、臺灣。



Fig. 1. The first *Lysimachia candida* Lindl. specimen in Taiwan was collected by Japanese collector, Mr. S. Yano whom collected this species on 12 April 1897 in Taipeh (Taipei) and the number is 369. The specimen was deposited at the Herbarium of the Komarov Botanical Institute (LE), St. Petersburg.



Fig. 2. Duplicate specimen of Yano 369, *Lysimachia candida* Lindl. Deposited at the Herbarium of National Museum of Natural Science, Taichung (TNM).

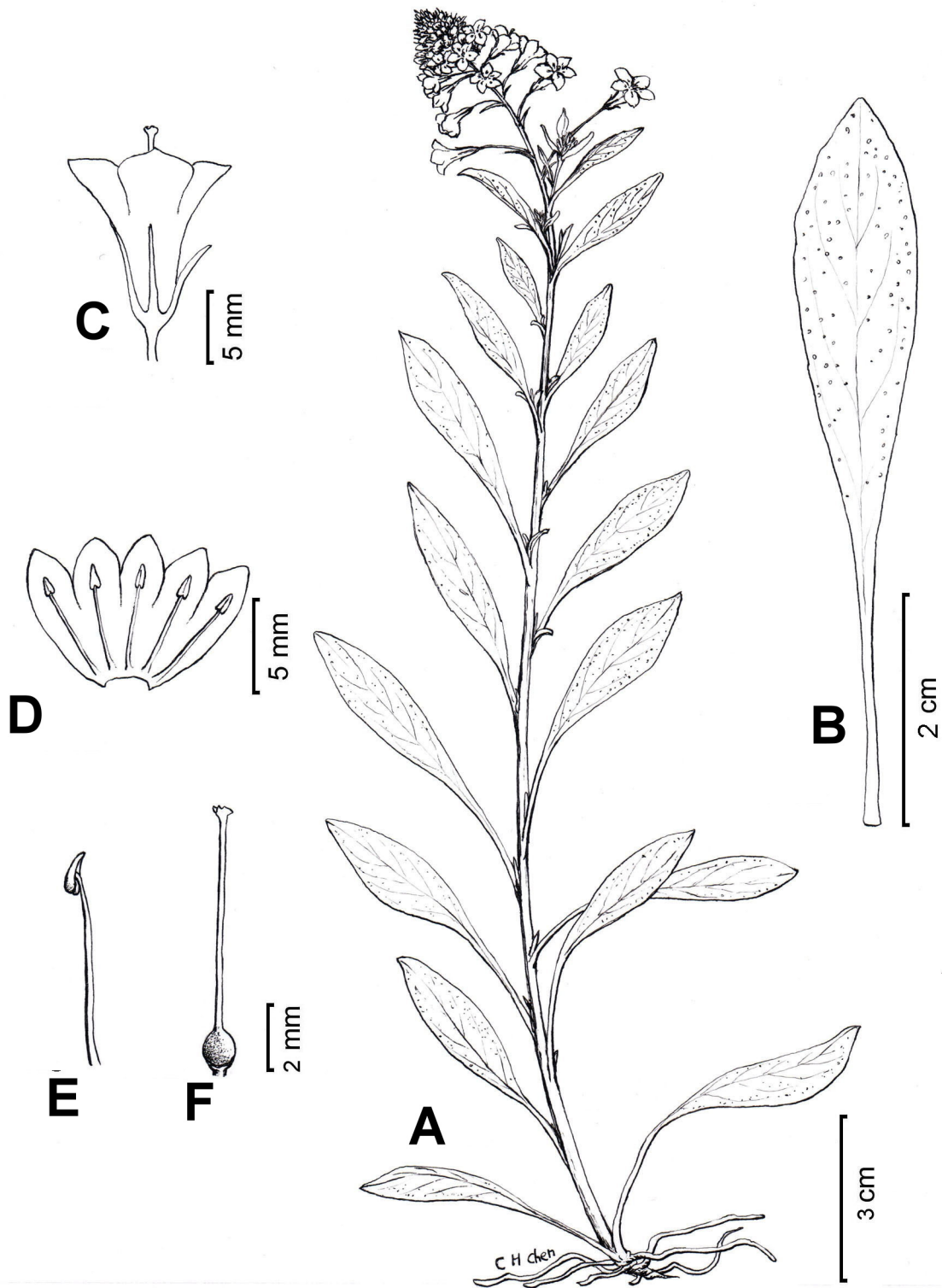


Fig. 3. *Lysimachia candida* Lindl. A: Habit. B: Leaf. C: Flower. D: Corolla and stamens. E: Stamen. F: Gynoecium.



Fig. 4. Pollen grain of *Lysimachia candida* Lindl., equatorial view, LM, X1,000.

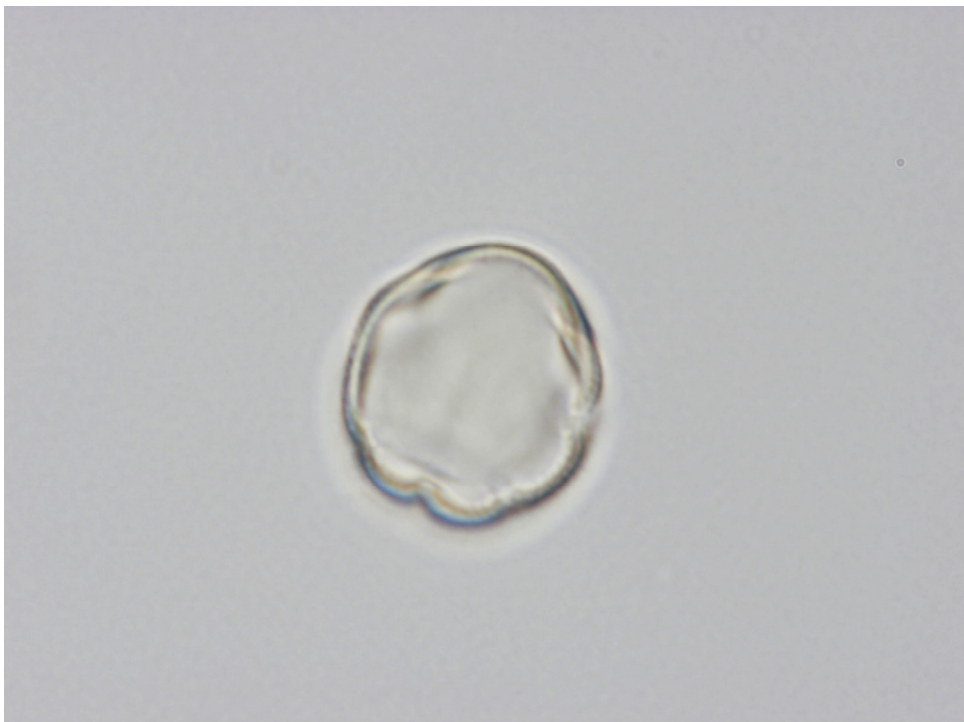


Fig. 5. Pollen grain of *Lysimachia candida* Lindl., polar view, LM, X1,000.

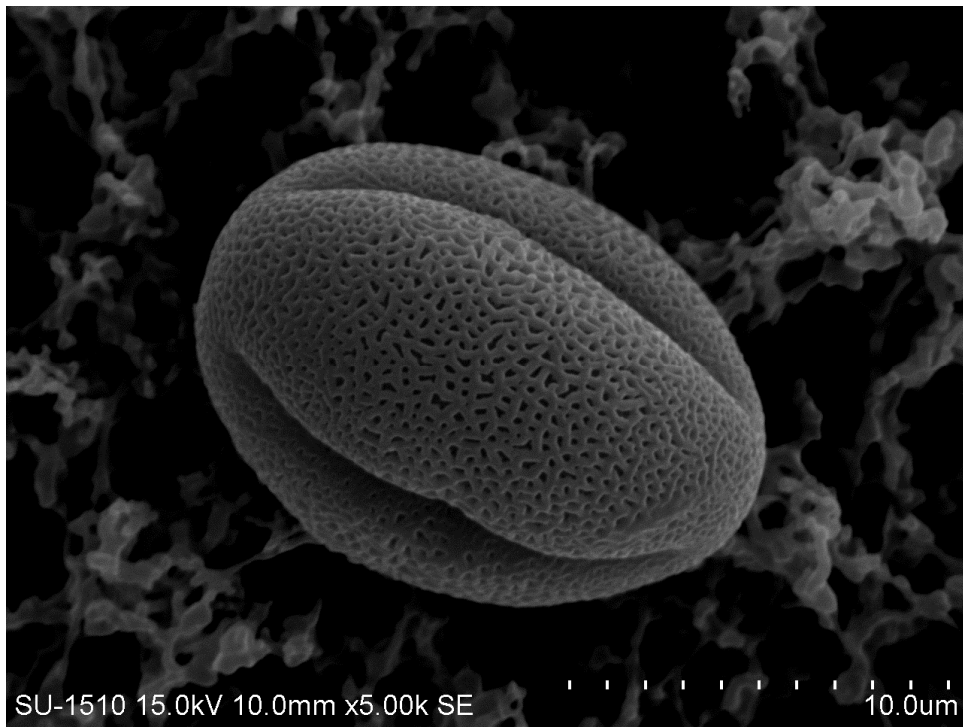


Fig. 6. Pollen grain of *Lysimachia candida* Lindl., equatorial view, SEM, X1,000.

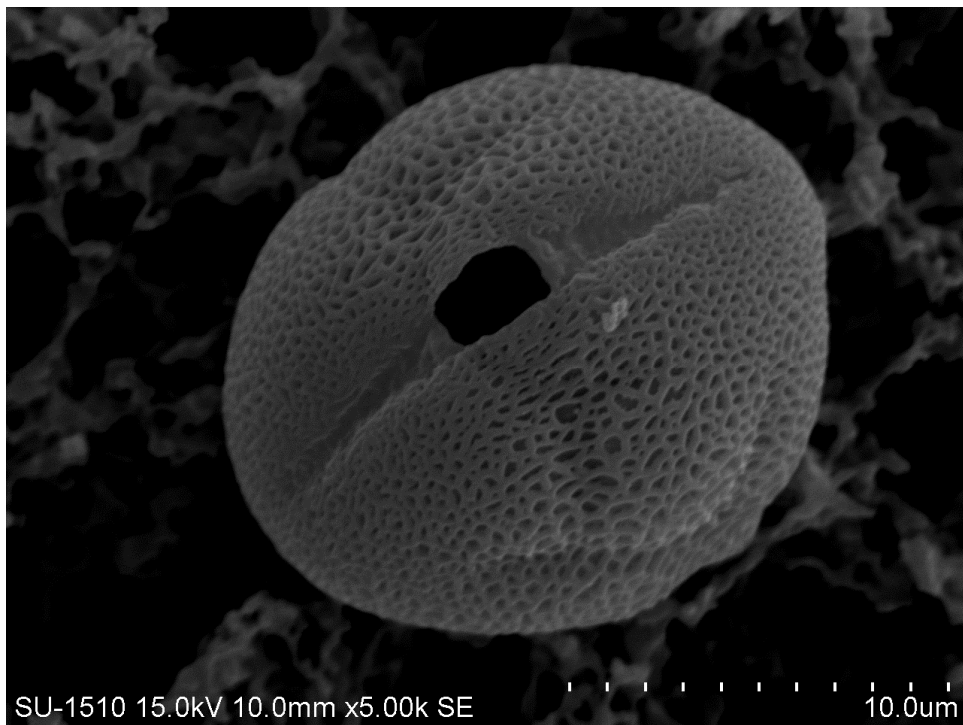


Fig. 7. Pollen grain of *Lysimachia candida* Lindl., equatorial view, SEM, X1,000.

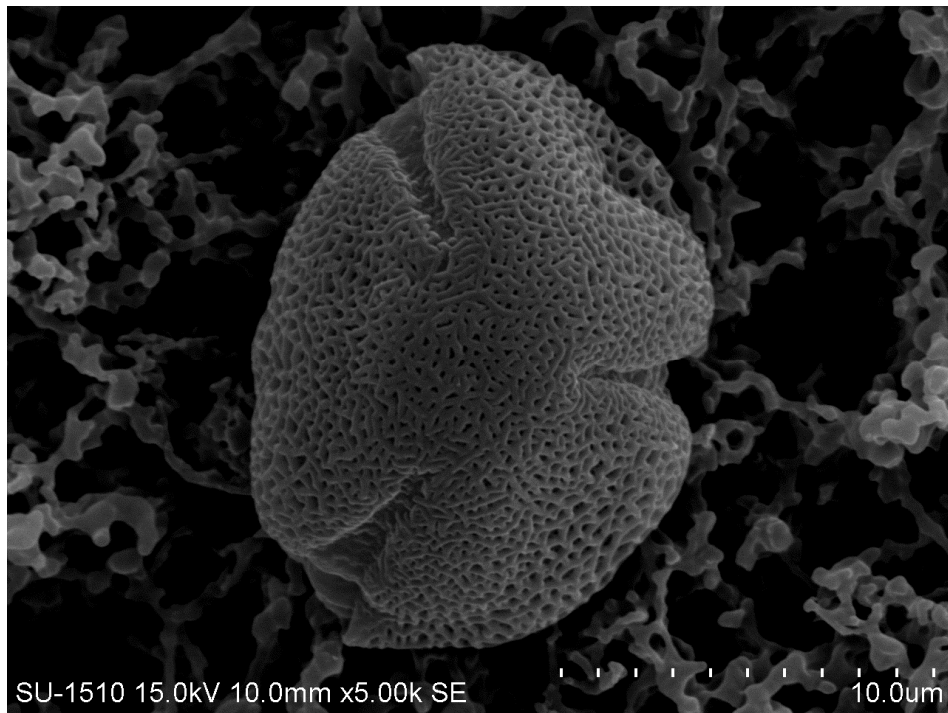


Fig. 8. Pollen grain of *Lysimachia candida* Lindl., polar view, SEM, X1,000.

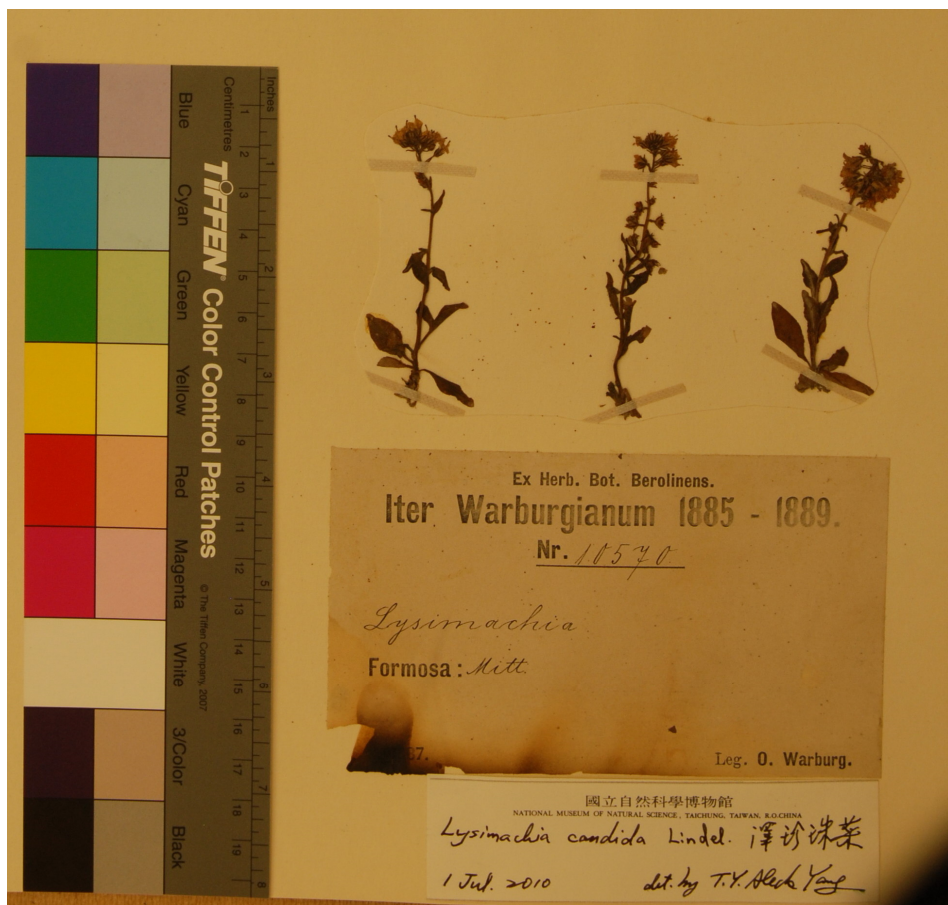


Fig. 9. *Lysimachia candida* Lindl. specimen also collected from Taiwan by Mr. Dr. O. Warburg in 1887 and deposited at the Natural History Museum of London (BM).