

Notes on the Genus *Arabis* L. (Brassicaceae) in Taiwan

Shing-Fan Huang^(1,2), Tsung-Hsin Hsieh⁽¹⁾ and Tseng-Chiang Huang⁽¹⁾

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ABSTRACT: The genus *Arabis* in Taiwan is revised. By comparing dry specimens and published literature, four species are recognized in Taiwan including one new record, *A. gemmifera* (Matsumura) Makino ex Hara, and one new validated variety *A. alpina* L. var. *formosana* Masamune ex S.F.Huang. By adopting the treatment of Inoue, *A. morrisonensis* Hayata is a synonym of *A. lyrata* L. ssp. *kamtschatica* (Fisch. ex DC.) Hulten and *A. kelung-insularis* Hayata is a synonym of *A. stellaris* DC. var. *japonica* (A.Gray) Fr.

KEY WORDS: *Arabis*, Revision, Taiwan.

INTRODUCTION

The genus *Arabis* contains about 100 species mainly in temperate Europe and Asia extending to North America and the southern hemisphere (Lan, 1987).

Hayata (1908) was the first botanist to report *Arabis alpina* L. and *A. taraxacifolia* in Taiwan. Later (Hayata 1911, 1913), *A. morrisonensis*, *A. kelung-insularis* and *A. lithophila* were proposed by Hayata with *A. morrisonensis* replacing *A. taraxacifolia*. These names were accepted by later botanists until Masamune (1954) listed only three names, *A. alpina* var. *formosana* Masamune, *A. morrisonensis* and *A. kelung-insularis* for Taiwan. Inoue (1971) treated *A. morrisonensis* as a synonym of *A. lyrata* ssp. *kamtschatica*. Liu and Ying (1976) took up the treatment of Masamune (1954) for the Flora of Taiwan, except they transferred *A. alpina* var. *formosana* to *A. formosana*. Inoue (1982) treated *A. kelung-insularis* as a synonym of *A. stellaris* var. *japonica*. Lan (1987) followed the treatment of Liu and Ying (1976) for the Flora of China.

Recently, some specimens collected from Nanhutashan, Taichung County, when compared with specimens kept in TAI and with published literature, were determined to be *A. gemmifera* (Matsumura) Makino ex Hara, which represents a new record to the flora of Taiwan. Because *Arabis alpina* var. *formosana* is a nude name, the validation of this variety is also carried out. Thus four species are recognized in Taiwan.

The specimens examined are all deposited in TAI, Botany Department, National Taiwan University, Taiwan.

TAXONOMIC TREATMENT

1. Department of Botany, National Taiwan University, Taipei 106, Taiwan, Republic of China.

2. Corresponding author.

Arabis L., Sp. Pl. 664. 1753; Liu & Ying in Fl. Taiwan 2: 676. 1976; Lan in Fl. Reip. Pop. Sinicae 33: 253. 1987.

Annual, biennial or perennial herbs, with simple, bifid or/and stellate hairs. Leaves entire, toothed or lyrate; radical leaves orbicular, spatulate, petiolate or sessile; cauline leaves oblong, becoming smaller upward. Inflorescences racemose. Flowers usually white; sepals 4, green, entire; petals 4, clawed, entire, longer than sepals; stamens 6, glabrous; ovary linear, glabrous; style short; stigma terminal, entire or shallowly 2-lobed. Fruit a silique, linear, compressed, glabrous, with vein(s) in pericarp. Seeds flat, winged or wingless.

About 100 species, mainly in temperate Europe and Asia extending to North America and the southern hemisphere; four species in Taiwan.

Key to the species in Taiwan

1. Cauline leaves cordate or sagitate at base, embracing or half embracing the stem.
 2. Radical leaves 2-5.2 cm long; stigma entire; capsule with one main vein in pericarp; mountainous areas 1. *A. alpina* var. *formosana*
 2. Radical leaves 6-10 cm long; stigma shallowly 2-lobed; capsule with many veins in pericarp; coastal area 4. *A. stellaris* var. *japonica*
1. Cauline leaves petiolate or attenuate at base, not embracing the stem.
 3. Radical leaves orbicular, glabrescent; inflorescences gemmate at apex after fruiting 2. *A. gemmifera*
 3. Radical leaves spatulate or obovate, hairy; inflorescences not gemmate at apex 3. *A. lyrata* ssp. *kamtschatica*

1. *Arabis alpina* L. var. *formosana* Masamune [List Vasc. Pl. Taiwan 56. 1954, *nom. nud.*] ex S.F. Huang, var. *nov.* — A typo folio obtuso et pedicello glabro differt.

Type: Nantou Co., Loloku to Kuankao, S. F. Huang, K. C. Yang & T. H. Hsieh 5258 (Holotype, TAI).

Arabis formosana (Masamune) Liu & Ying in Fl. Taiwan 2: 676. 1976,
nom. invalid.; Lan in Fl. Reip. Pop. Sinicae 33: 263. pl. 72, figs. 1-3. 1987
Arabis alpina auct. non L.: Hayata in J. Coll. Sci. Imp. Univ. Tokyo 25: 49, 1908;
 Hayata, Icon. Pl. Formos. 1: 50. 1911.

A perennial herb. Stems hairy with simple, bifid and stellate hairs. Radical leaves sessile, oblanceolate to spatulate, rounded at apex, attenuate at base, margins sparsely serrate, 20-52 mm long, 5-11 mm broad, with stellate hairs mixed with bifid and simple hairs; cauline leaves sessile, oblong to lanceolate, becoming smaller upward, obtuse at apex, sagitate at base, entire or toothed, with hairs as radical leaves. Inflorescence racemose; flowers pedicellate; pedicels glabrescent, 7-15 mm long in fruit; sepals 4, 2 larger, 3.5-4 mm long, glabrescent; petals 4, white, obovate, 7-8 mm long, glabrous; stamens 6, 4 longer, glabrous; filaments ribbon like; anthers sagitate at base; ovary linear, glabrous; style short, glabrous; stigma terminal, entire. Capsule linear, glabrous, with one main vein in pericarp, 38-70 mm long;

fruiting stalks obscure. Seeds pale brown, margin winged, wings larger in counter funicular position.

Distribution: Species in Europe, the Himalaya, N. China and Siberia; the variety endemic.

Altitude: 2700-3900m.

Habitat: On open rocky slope, shaded slope.

Flowering: June, July.

Specimens examined:

Hsinchu: Tapachienshan, *H. Simada* 569. **Hualien:** Chungyang-chienshan, *Fuku-yama* & *T. Suzuki* 16249. **Kaohsiung:** Kuanshan, *Fukuyama* s.n. July 12, 1935. **Nantou:** Hohuanshan, *M. T. Kao* 9774. En route to Yushan, *T. C. Huang et al.* 14260. **Taichung:** Nanchutashan, *J. C. Wang* 3746, 3782.

Note: Hayata (1908) pointed out that plants of Taiwan were slightly different from the type by the leaves being subentire against more or less dentate. He thought this was individual difference so that he did not proposed a new name. Later on, Masamune (1954), who could be influenced by Hayata, proposed a new variety, *Arabis alpina* var. *formosana*, without any further information, which was a nude name and invalid. Liu and Ying (1976) took up Hayata's diagnosis and transferred the variety to a specific state but they did not apply latin diagnosis either. Thus *A. formosana* was also invalid.

When compared with the specimens of *A. alpina* from Europe kept in TAI, Taiwan's plants were slightly different in obtuse leaves and glabrous fruiting pedicels aside from Hayata's opinion. The variety state is accepted in order to validate the name and because the difference is slight.

2. ***Arabis gemmifera*** (Matsumura) Makino [in Bot. Mag. Tokyo 24: 224. 1910, *pro syn.*] ex Hara in J. Jap. Bot. 12: 901. 1936; Lan in Fl. Reip. Pop. Sinicae 33: 256. pl. 68. figs. 1-5. 1987.

Cardamine gemmifera Matsumura in Bot. Mag. Tokyo 13: 49. 1899.

Arabis senanensis (Franch & Sav.) Makino in Bot. Mag. Tokyo 24: 224. 1910.

Arabis halleri L. var. *senanensis* Franch & Sav., Enum. Pl. Jap. 2: 279. 1879.

A prostrate herb. Stems hairy, with simple hairs and sparse bifid hairs, rooting and producing gemmae at nodes. Radical leaves petiolate, orbicular, rounded at apex, attenuate at base, margins few-lobed, glabrescent, with sparse simple and bifid hairs; petiole 5-8 mm long, blade 7-9 mm long, 6-8 mm broad, cauline leaves petiolate, oblong, apiculate, rounded at apex, attenuate at base; petiole 6 mm long; blade 11 mm long, 8 mm broad. Flowers fewer than 10, in racemes, gemmae produced at apex of rachis when fruiting. Capsule stipitate, stipes 1 mm long; capsule 3-15 mm long, 1-8-seeded. Seeds pale brown, oblong, 1 mm long.

Distribution: China (North East), Korea, Japan and Taiwan.

Altitude: 3600m.

Habitat: On the floors of *Juniperus squamata*. Scrub.

Flowering: July?, August.

Specimens examined:

Taichung: Nanhutashan, *T. H. Hsieh 1526*.

3. *Arabis lyrata* L. subsp. *kamtschatica* (Fisch. ex DC.) Hulten, Fl. Aleut Is. 202. 1937; Inoue in J. Jap. Bot. 46: 96. 1971.

Arabis lyrata L. var. *kamtschatica* Fisch. ex DC. Syst. Nat. 2: 231. 1821; Lan in Fl. Reip.

Pop. Sinitiae 33: 259, pl. 70, figs. 1-6. 1987.

Arabis morrisonensis Hayata in J. Coll. Sci. Imp. Univ. Tokyo 30: 29. 1911; Hayata, Icon. Pl. Formos. 1: 49, pl. 11. 1911; Sasaki, List Pl. Formosa 29, 1928; Massumae, Short Pl. Formosa 73, 1936; Massumae, List Vasc. Pl. Taiwan 56, 1954; Lin & Ying in Fl. Taiwan 2: 678. 1976; Lan in Fl. Reip. Pop. Sinitiae 33: 256, pl. 68, figs. 6-11. 1987. (Type: Mt. Morrison, *S. Nagasawa 680*, T1, not seen)

Arabis tarzascifolia n. sp. nov. Anders: Hayata in J. Coll. Sci. Imp. Univ. Tokyo 25: 49. 1908.

A perennial herb, branched. Stems hairy in lower part, glabrescent above, with simple hairs and sparse bifid hairs. Radical leaves spatulate, obovate, petiolate, rounded at apex, attenuate at base, margins lyrate or entire, with bifid hairs and sparse simple hairs, simple hairs abundant on young leaves, sparse on old leaves, (14-)24-42(-65) mm long, (4-)6-8(-20) mm broad; cauline leaves oblanceolate, acute to obtuse at apex, attenuate at base, without auricles at base, margins entire, toothed or lyrate, with hairs as radical leaves, becoming smaller upward. Inflorescence terminal and/or axillary racemes. Flowers pedicellate; pedicels glabrescent, 8-14 mm long in fruit; sepals 4, glabrescent, 2-2.5 mm long; petals 4, white, glabrous, 5-6 mm long; stamens 6, 4 longer; ovary linear; style short; stigma terminal, entire. Capsule glabrous, with one main vein in pericarp, (18-)30-45 mm long. Seeds brown, oblong, wingless, 1 mm long.

Distribution: North America, Alaska, Aleutian Islands, Kamchatka, Sakhalin, Korea, Japan and Taiwan.

Altitude: (1000-) 2000 to 3800 m.

Habitat: Open mountain slopes, open grasslands, forest margin, or rarely under coniferous and broad-leaved forest.

Flowering: From June to November.

Specimens examined:

Chiayi: Lulinshan, *Jan & Kao s.n.* July 13, 1957. Hinchu: Kuanwu, *T. C. Huang 6688*, Tapachienshan, *M. T. Kao 8500*; Hualien: Hohuanshan, *M. T. Kao 7813*; Tayuling to Sungshauelou, *S. F. Huang & T. H. Hsieh 4877*. Ilan: Taipingshan, *Chuang & Kao 4139*. Kaohsiung: Yakou, *Y. C. Jeng 2587*. Miaoli: Sishuichan, *C. M. Kao 8543*; Hsinchuenshan, *J. C. Wang et al. 4936*. Nantou: Tunyuan to Yunhai, *T. C. Huang et al. 5706*; Yushan, *C. C. Chuang 2903*. Taichung: Chingshan, *S. F. Huang 647*; Hsueshan, *J. C. Wang et al. 4466*. Taipei: Wulai, *C. C. Chuang 2072*. Taitung: Chuyun, *Yamamoto & Mori 523*.

4. *Arabis stelleris* DC. var. *japonica* (A. Gray) Fr. Schmidt in Mem. Acad. Sci. St.-Petersb. ser. 7. 12(2): 111, 1868; Inoue in J. Jap. Bot. 57: 315. 1982.

Arabis kelunginsularis Hayata, Icon. Pl. Formos. 3: 18. 1913; Sasaki, List Pl. Form. 29. 1928; Masamune, Short Fl. Form. 75. 1936; Masamune, List Vasc. Pl. Taiwan 56. 1954; Liu & Yang in Fl. Taiwan 2: 676. pl. 445. 1976; Lan in Fl. Reip. Pop. Sinicae 33: 272. 1987. (Type: Insul. Kelung, S.Sasaki s.n. May 1910, TI, not seen).
Arabis lithophila Hayata, Icon. Pl. Formos. 3: 18. 1913. (Type: Fukkikaku, S.Sasaki s.n. April 1910, TI, not seen).

A perennial herb. Stems erect, hairy, with simple hairs mixed with sparse bifid and stellate hairs. Radical leaves sessile, spatulate, with stellate hairs and sparse bifid and simple hairs, denser beneath, rounded at apex, attenuate at base, margins wavy or slightly toothed, 6-10 cm long, 1.5-2.5 cm broad; cauline leaves sessile, rounded at apex, sagittate at base, with hairs as radical leaves, becoming smaller upward. Inflorescences paniculate; flowers pedicellate; pedicels glabrescent, 5-8 mm long in fruit; sepals 4, 3 mm long, glabrous; petals 4, white, obovate, 5 mm long, glabrous; stamens 6, 4 longer, glabrous; ovary linear, glabrous; style short; stigma terminal, shallowly 2-lobed. Capsule with many parallel veins in pericarp, 30-52 mm long, glabrous. Seeds dark brown, orbicular, very narrowly winged on margin, 1.5 mm long.

Distribution: Amur, Sakhalin, Japan, Korea and Taiwan.

Altitude: 0-50 m.

Habitat: On open coastal rock.

Flowering: April.

Specimens examined:

Han: Toucheng, Chuang 7626. **Taipei:** Chinshan, T. C. Huang 2275; Shihmen, T. C. Huang 8262.

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台灣槲子芥屬(十字花科)之小誌

黃星凡^(1,2)、謝宗欣⁽¹⁾、黃增泉⁽¹⁾

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摘 要

根據臘葉標本及已發表之文獻, 訂正台灣之槲子芥屬(*Arabis*)植物, 總共確認四種。葉芽槲子芥(*A. gemmifera*)為新紀錄植物, 台灣槲子芥(*A. alpina* var. *formosana*)為新有效變種。根據最近之分類處理, 玉山槲子芥之學名變更為 *A. lyrata* subsp. *kamtschatica*, 基隆槲子芥之學名變更為 *A. stellaris* var. *japonica*。

關鍵詞: 槲子芥屬, 訂正, 台灣。

1. 國立台灣大學植物學系, 台北市 106, 台灣, 中華民國。

2. 通信聯絡員。