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A New Species of *Cardamine* (Brassicaceae) from Hunan, China

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**ABSTRACT.** The new species *Cardamine hupingshanensis* K. M. Liu, L. B. Chen, H. F. Bai & L. H. Liu is described and illustrated from Hupingshan National Nature Reserve in northwestern Hunan, China. The new species is distinctive and assigned to section *Cardamine* L. according to its rhizomes, petioles sometimes with lateral leaflets, flowers, and coiled valves during dehiscence. The habitat is aquatic or subaquatic. Based on the leaf shape, it is similar to *C. circaeoides* Hooker f. & Thomson but is distinguished by its stout rhizomes and broadly obovate petals. The chromosome number is  $2n = 24$ .

**Key words:** Brassicaceae, *Cardamine*, China, Hunan, IUCN Red List.

The genus *Cardamine* L. is one of the largest genera of the family Brassicaceae, comprising at least 200 species distributed worldwide (Warwick et al., 2006). It is represented in China by about 48 species, of which nearly 30 are endemic. There are about 10 species of *Cardamine* in Hunan province (Al-Shehbaz, 2000; Huang et al., 2004). The new species, called "Shanbaicai" or "Shuiyoucai" by the native people, was found during our exploration of the wild vegetable resources in Hupingshan National Natural Reserve. It has been cultivated at Huzhou University since 2003.

***Cardamine hupingshanensis*** K. M. Liu, L. B. Chen, H. F. Bai & L. H. Liu, sp. nov. TYPE: China. Hunan: Hupingshan Natl. Natural Res., Da-

dongping cavern, 30°09'N, 110°59'E, 7 July 2006, H. F. Bai 06003 (holotype, HU; isotype, HNNU). Figure 1.

Species *Cardaminae circaeoidi* Hooker f. & Thomson affinis, sed rhizomatibus validis, foliis suborbicularibus vel reniformibus, 4–13 × 5–14 cm, sepalis ovatis, 5–6 × 3–4 mm, petalis late ovatis, 8–10 × 7–9 mm, fructibus linearibus, 20–30 × 1.5–2 mm, stylis 5–6 mm longis, seminibus oblongis, 1.2–1.8 × 0.9–1.3 mm differt.

Herbs perennial, 30–100 cm tall, aquatic or subaquatic, glabrous throughout; rhizomes stout, often with bulbils; stems erect or flexuous, columned, simple or branched above and/or basally. Basal leaves rosulate before bolting, simple, petiolate; leaf blade 4–13 × 5–14 cm, reniform or suborbicular, palmately veined, margin crenate or repand-crenate; petiole 3–12 cm, sometimes with reduced/few lateral leaflets, 2 to 4 pairs; cauline leaves resemble basal, margin serrate or crenate; basal leaves withered by flowering. Sepals ovate, 5–6 × 3–4 mm, margin often membranous; petals white, veined, broadly obovate, 8–10 × 7–9 mm; attenuate at base to a claw 1.5–2 mm; stamens 6; median filament pairs 5–6 mm, lateral filaments 3–4 mm; anther ca. 2 mm; pistil glabrous; style terete, 5–6 mm; stigma conical. Fruiting pedicels 1–2 cm, slender, straight or secund; fruit as dehiscent siliques, linear, 20–30 × 1.5–2 mm; seeds brown, yellow, or green, broadly oblong, 1.2–1.8 × 0.9–1.3 mm, wingless, 1000-seed weight 0.58–0.62 g. Chromosome number  $2n = 24$ .

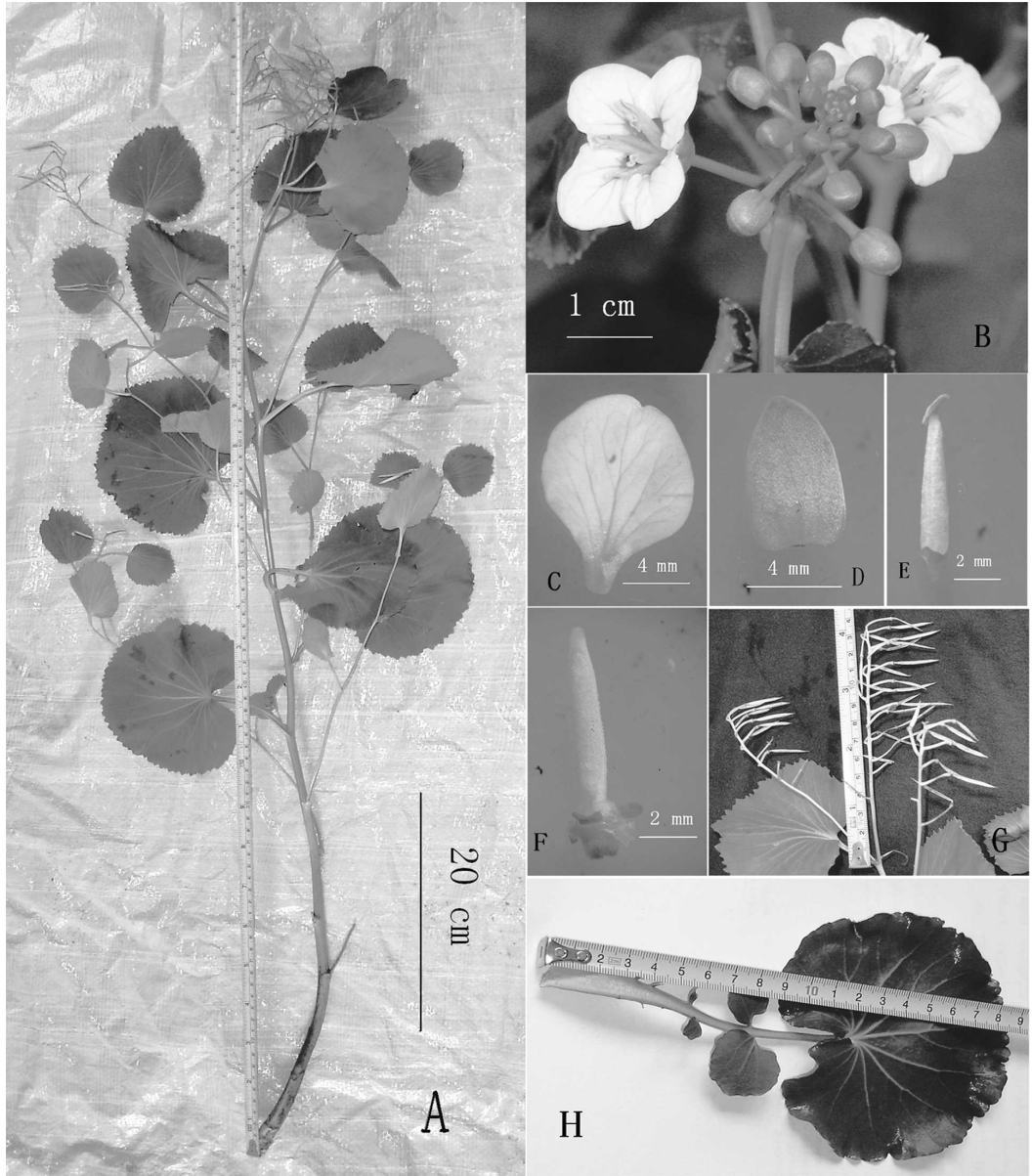


Figure 1. *Cardamine hupingshanensis* K. M. Liu, L. B. Chen, H. F. Bai & L. H. Liu. —A. Habit. —B. Inflorescence and flower. —C. Petal. —D. Sepal. —E. Stamens. —F. Pistil. —G. Siliquae. —H. Basal rosette leaf. Photographs from the holotype H. F. Bai 06003 (HU).

The chromosome number of *Cardamine hupingshanensis* is  $2n = 24$ , which has never been reported before within *Cardamine* except *C. pratensis* L. ( $2n = 16, 24, 28-34, 38-44, 48, 56, 96$ ), and its karyotype is characterized by eight metacentric, 12 submetacentric, and four subteliocentric chromatids (Stebbins, 1971; Lihová & Marhold, 2006; Warwick et al., 2006).

**Distribution.** *Cardamine hupingshanensis* is found in China, restricted to Hunan province, from 800–1400 m. The distribution of this new species indicates that it is rare. Only three populations containing a total of 2000 to 2500 individuals were found in Hupingshan National Natural Reserve. The type population consists of only about 800 individuals in a small stream (sometimes with plants submerged at

bases) under partial to full shade of trees near the Dadongping cavern.

*IUCN Red List category.* Because the areas of habitat have declined gradually and the species is endemic to stream habitats, *Cardamine hupingshanensis* should be considered Endangered (EN) according to IUCN Red List criteria (IUCN, 2001). Strict conservation measures to safeguard the known populations are urgently needed. *Cardamine hupingshanensis* has three allopatric populations distributed among the Dadongping cavern, Hangrangping village, and Huping village in Hunan province.

*Phenology.* Observed as flowering from May to June; fruiting from June to July.

*Relationships.* *Cardamine hupingshanensis* is similar to *C. circaeoides*, which differs in its smaller spatulate petals (4–8 × 1.5–4 mm) and ovate or oblong sepals (2–3.5 × 0.8–1.5 mm), as well as by its slender rhizomes and stem. The leaf blade of *C. circaeoides* is always cordate or ovate, and longer than wide, while *C. hupingshanensis* always has a reniform or suborbicular leaf blade.

*Paratypes.* CHINA. **Hunan:** Hupingshan Natl. Natural Res., Hangrangping, 7 July 2007, *H. F. Bai 200702* (HU); Huping village, 6 July 2007, *H. F. Bai 200705* (HU).

KEY TO THE SPECIES OF *CARDAMINE* IN HUNAN, CHINA

- 1a. Cauline leaves simple, rarely obscurely 2- or 3-lobed; cauline leaves resemble basal leaves.
  - 2a. Petals broadly obovate, 8–10 × 7–9 mm . . . . . *C. hupingshanensis*
  - 2b. Petals ovate or oblong, 4–8 × 1.5–4 mm . . . . . *C. circaeoides*
- 1b. Cauline leaves trifoliolate, pinnatisect or pinnately compound; basal leaves variously shaped.
  - 3a. Petals purple, lavender, or pink.
    - 4a. Cauline leaves sessile. . . . . *C. griffithii* Hooker f. & Thomson
    - 4b. Cauline leaves petiolate.
      - 5a. Lateral leaflets 2 to 11 pairs, similar to but slightly smaller than terminal leaflet . . . . . *C. macrophylla* Schur
      - 5b. Lateral leaflets 1 or 2 pairs, subequal or terminal larger . . . . . *C. fragariifolia* O. E. Schulz
  - 3b. Petals white.
    - 6a. Plants with long stolons.
      - 7a. Stolons bearing simple leaves; cauline leaves sessile; seeds broadly winged . . . . . *C. lyrata* Bunge
      - 7b. Cauline leaves petiolate; seeds wingless. . . . . *C. calcicola* W. W. Smith
    - 6b. Plants without stolons.
      - 8a. Herbs annual, cauline leaves shortly petiolate; lateral lobes 2 to 10 on each side of midvein *C. hirsuta* L.
      - 8b. Herbs biennial or rarely annual.
        - 9a. Petals oblanceolate; cauline leaves with petiole auriculate, auricles lanceolate or linear . . . . . *C. impatiens* L.
        - 9b. Petals obovate, spatulate or spatulate to oblong-oblanceolate.
          - 10a. Rhizomes slender; stems flexuous . . . . . *C. leucantha* (Tausch) O. E. Schulz
          - 10b. Rhizomes stout or thick; stems erect.
            - 11a. Basal leaves trifoliolate . . . . . *C. anhuiensis* D. C. Zhang & J. Z. Shao
            - 11b. Basal leaves pinnate . . . . . *C. hygrophila* T. Y. Cheo & R. C. Fang

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