
Volume 10
Number 2
2000

NOVON



The Status of *Dimorphostemon* and Two New Combinations in
Dontostemon (Brassicaceae)

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ABSTRACT. *Dimorphostemon* is reduced to synonymy of *Dontostemon*, and the combined genus consists of 10 species distributed primarily in China, adjacent Russia, and Mongolia. The new combinations *Dontostemon pinnatifidus* and *D. pinnatifidus* subsp. *linearifolius* are proposed, and detailed descriptions and distributions of the two taxa are given. A key to all species of *Dontostemon* is presented.

The genus *Dontostemon* Andrzejowski ex C. A. Meyer consists of 10 species distributed primarily in China (all 10 spp.), neighboring Russia (9 spp.), and Mongolia (7 spp.). The range of *D. glandulosus* (Karelin & Kirilov) O. E. Schulz extends into India, Kashmir, Kazakstan, Nepal, and Tajikistan, and that of *D. dentatus* (Bunge) Ledebour includes Korea and Japan.

The taxonomic limits of *Dontostemon* have been controversial mainly because various authors placed different emphasis on one character, the union vs. separation of median stamens. In eight species, the median stamens are united, but the degree of union varies from half to full length of the filaments. These species are kept in *Dontostemon* by all treatments. In two species, *D. pinnatifidus* (Willdenow) Al-Shehbaz & H. Ohba and *D. glandulosus*, the median stamens are free, and these have been segregated into *Dimorphostemon* Kitagawa and *Alaïda* Dvořák. There are no other

morphological characters that separate the eight species with united staminal filaments from the two species with free filaments.

In our opinion, *Dontostemon* (including *Dimorphostemon* and *Alaïda*) is a natural genus, and there are several genera of the Brassicaceae (e.g., North American *Streptanthus* Nuttall and *Caulanthus* S. Watson) that have species with free or connate median stamens. In *Thelypodium howellii* S. Watson (western North America), one subspecies has the median stamens free and the other has them partly to completely united (Al-Shehbaz, 1973). In our opinion, the union of the median stamens alone does not justify the splitting of a natural genus into poorly defined segregates.

Although *Dontostemon pinnatifidus* is known under different specific epithets in *Dontostemon* or *Dimorphostemon*, none of these epithets has priority. The species was first described as *Sisymbrium asperum* Pallas (Reise Russ. Reich. 3: 740. 1777), which is a later homonym of *S. asperum* L. (Sp. Pl. 2: 659. 1753). In transferring *S. asperum* Pallas as the sole species of *Dimorphostemon*, Kitagawa (1939) correctly considered *Cheiranthus* (as *Cheilanthus*) *pinnatifidus* Willdenow (Sp. Pl. 3(1): 523. 1800), *Hesperis pinnata* Persoon (Syn. Pl. 2: 203. 1807), *Hesperis pilosa* Poiret and *H. punctata* Poiret (Encycl. Méth. Suppl. 3: 157, 195. 1813), and *Sisymbrium pectinatum* DC. (Syst. Nat. 2: 485. 1824) as conspecific with his *Dimorphostemon asper* Ki-

tagawa (not *D. asper* (Pallas) Kitagawa, as listed by Kitagawa; see article 58.3 in Greuter et al., 1994). Forty years later, Kitagawa (1979) proposed a new combination, *Dimorphostemon pinnatus* (Persoon) Kitagawa, based on the second earliest available epithet, *H. pinnata*, and did not list *Cheiranthus pinnatifidus* in the synonymy. Earlier, Golubkova (1974a, b) proposed the combination *Dimorphostemon pectinatus* (DC.) Golubkova, thus adopting the fifth oldest epithet for the species. Strangely, Golubkova (1976) maintained *D. pectinatus* and followed de Candolle (1824) and Kitagawa (1939) in reducing the earlier published epithets to synonymy. Willdenow's epithet (*pinnatifidus*) clearly is the earliest (1800) available name for the species, and a new combination is herein proposed.

Dvořák (1972) proposed the new genus *Alaida*, but this name is illegitimate because it included *A. pectinata* (DC.) Dvořák, which is a synonym of the type of *Dimorphostemon*, *Dimorphostemon asper* (= *Dontostemon pinnatifidus*). A key for the determination of the 10 species of *Dontostemon* is presented.

KEY TO THE SPECIES OF *DONTOSTEMON*

- 1a. Plants glandular.
- 2a. Petals (10–)12–18 × (4–)6–8 mm; fruits flattened; anthers not apiculate, 1.5–2 mm long *D. hispidus* Maximowicz
- 2b. Petals 2–8 × 0.5–3(–5) mm; fruits terete; anthers apiculate, 0.2–0.8 mm long.
- 3a. All leaves entire; median stamens united; stems with minute twisted trichomes *D. integrifolius* (L.) C. A. Meyer
- 3b. At least basal leaves dentate, serrate, or pinnatifid; median stamens free; stems glabrous or with straight trichomes.
- 4a. Petals obovate, (5–)6–8 mm long; filaments of median stamens abruptly expanded and toothed below anther; seeds apically margined; anthers 0.6–0.8 mm long *D. pinnatifidus* (Willdenow) Al-Shehbaz & H. Ohba
- 4b. Petals spatulate, 2–4(–4.5) mm long; filaments of median stamens gradually expanded to base, toothless; seeds not margined; anthers 0.2–0.4 mm long *D. glandulosus* (Karelin & Kirilov) O. E. Schulz
- 1b. Plants not glandular.
- 5a. At least some stem leaves petiolate, dentate *D. dentatus* (Bunge) Ledebour
- 5b. Stem leaves sessile, entire.
- 6a. Plants annual or biennial, never woody basally; stems with minute twisted trichomes.
- 6b. Plants perennial with woody base; stems glabrous or with straight trichomes.
- 7a. Petals broadly obovate, 5–7(–8) × 2–3 mm, apex submarginate; anthers oblong, 0.7–0.8 mm; ovules 15 to 25 per locule *D. integrifolius* (L.) C. A. Meyer
- 7b. Petals narrowly oblanceolate, 3–5 × 0.6–1 mm, apex obtuse; anthers ovate, 0.4–0.5 mm; ovules 30 to 50 per locule *D. micranthus* C. A. Meyer
- 8a. Stems glabrous; leaves somewhat fleshy, subleathery; fruit strongly arcuate or twisted.
- 9a. Fruit terete, strongly arcuate, 1.5–2.5 cm × 1–1.7 mm; style 1.5–2.5 mm long; plants 5–10 cm tall; sepals 3–4 mm long; median stamens 3.5–4 mm long *D. crassifolius* (Bunge) Maximowicz
- 9b. Fruit compressed, strongly twisted, 3–5 cm × 2–2.5 mm; style rarely to 0.5 mm long; plants 15–50 cm tall; sepals 5–6 mm long; median stamens 6–8 mm long *D. elegans* Maximowicz
- 8b. Stems sparsely to densely pilose; leaves not fleshy, herbaceous; fruit straight or rarely slightly curved.
- 10a. Plants pilose with subappressed trichomes rarely to 1 mm long; fruit 1–2.5 cm × 0.9–1.1 mm; seeds to 1.4 mm long, not margined; cotyledons incumbent *D. perennis* C. A. Meyer
- 10b. Plants hirsute with spreading trichomes to 3 mm long; fruit (2.5–)3–5 cm × 1.4–2 mm; seeds to 2.5 mm long, margined or winged; cotyledons accumbent *D. senilis* Maximowicz

Dontostemon pinnatifidus (Willdenow) Al-Shehbaz & H. Ohba, comb. nov. Basionym: *Cheiranthus pinnatifidus* Willdenow, Sp. Pl. 3(1): 523. 1800. TYPE: Siberia, *Stephan s.n.* (holotype, B-W #12111).

Herbs annual or biennial, (5–)10–40(–60) cm tall, sparsely to densely glandular. Stems erect, often simple, branched above. Basal and lowermost stem leaves sparsely to densely pubescent with simple tri-

chomes to 2 mm long, sparsely to moderately glandular; petiole 2–10(–15) mm long; leaf blade lanceolate to elliptic or oblong, (0.7–)1.5–4.5(–6) cm × (1.5–)3–10(–15) mm, base attenuate to cuneate, margin coarsely dentate or serrate to pinnatifid, ciliate, apex acute. Middle and upper stem leaves narrowly linear and entire, or elliptic to lanceolate and dentate to serrate. Fruiting pedicel ascending to divaricate, often straight, (0.3–)0.5–1.5(–2.3) cm long, glandular. Sepals oblong, 2–3(–4) × (0.8–)1–1.5 mm, apically sparsely hairy or glabrous. Petals white, broadly obovate, (5–)6–8 × (2.5–)3–4(–5) mm, apex emarginate; claw 1–3 mm long. Filaments of median stamens 2–3 mm long, free, abruptly expanded and toothed below anther; filament of lateral stamens 1.5–2.5 mm long, slender; anthers oblong-ovate, 0.6–0.8 mm long, apiculate. Ovules 8 to 30 per locule. Fruit (1.1–)1.5–4(–5) × (0.8–)1–1.3 mm, straight, erect to ascending, torulose, terete; valves sparsely to densely glandular, with prominent midvein and marginal veins; style 0.5–1.5 mm long; stigma slightly lobed. Seeds brown, oblong-ovate to narrowly oblong, 1.1–2.3 × 0.7–1 mm, narrowly margined distally; cotyledons obliquely accumbent to incumbent. Flowering and fruiting June–September.

Dontostemon pinnatifidus can be divided into two morphologically well-defined subspecies that have not yet been collected from the same locality, though both grow in the Chinese provinces of Gansu, Qinghai, and Xinjiang.

KEY TO THE SUBSPECIES OF *DONTOSTEMON PINNATIFIDUS*

- 1a. Plants pilose, moderately to densely glandular, middle stem leaves elliptic to lanceolate, serrate to dentate or rarely pinnatifid, (3–)5–10(–15) mm wide; seeds oblong to ovate, 1.1–1.8 mm long; cotyledons obliquely accumbent to obliquely incumbent subsp. *pinnatifidus*
- 1b. Plants glabrous, very sparsely glandular, middle stem leaves narrowly linear, entire, 0.5–1(–1.5) mm wide; seeds narrowly oblong, 2–2.3 mm long; cotyledons incumbent . . . subsp. *linearifolius*

Dontostemon pinnatifidus* subsp. *pinnatifidus

Dimorphostemon shanxiensis R. L. Guo & T. Y. Cheo, Bull. Bot. Lab. North-East. Forest. Inst., Harbin 1980(6): 29. 1980. Syn. nov. TYPE: China. Shanxi: Wutai Shan, 16 July 1907, *Y. Yabe s.n.* (holotype, NAS).

Erysimum glandulosum Monnet, Notul. Syst. (Paris) 11: 241. 1912. Syn. nov. TYPE: China. E Tibet: Tongolo, Kiala, 10 June 1894, *J.-A. Soulié 2471* (holotype, P).

Erysimum hookeri Monnet, Notul. Syst. (Paris) 11: 242. 1912. Syn. nov. TYPE: China. E Tibet: Tongolo, Kiala, 13 Apr. 1894, *J.-A. Soulié 2460* (holotype, P; isotype, P).

Plants sparsely to densely pilose, moderately to densely glandular. Middle stem leaves elliptic to lanceolate, serrate to dentate or rarely pinnatifid, (3–)5–10(–15) mm wide. Seeds oblong to ovate, 1.1–1.8 mm long; cotyledons obliquely accumbent to obliquely incumbent.

Grassy plains, hillsides, rocky slopes, roadsides; 1100–4600 m. China (Gansu, Hebei, Heilongjiang, Nei Mongol, Qinghai, Shandong, Sichuan, Xinjiang, Xizang, Yunnan), India, Mongolia, Nepal, Russia.

Because subspecies *pinnatifidus* is very widespread and well represented in herbaria, no specimens are cited here. The types of *Dimorphostemon shanxiensis*, *Erysimum glandulosum*, and *E. hookeri* are morphologically indistinguishable from plants of *D. pinnatifidus* and, therefore, herein reduced to synonymy.

Dontostemon pinnatifidus* subsp. *linearifolius

(Maximowicz) Al-Shehbaz & H. Ohba, stat. et comb. nov. Basionym: *Sisymbrium glandulosum* (Karelin & Kirilov) Maximowicz var. *linearifolium* Maximowicz, Fl. Tangutica 61. 1889. TYPE: China. [Qinghai:] sandy shores of Lake Kukuror, 10,200 ft., 9 July 1880, *N. M. Przewalski s.n.* (holotype, LE; isotypes, LE, P).

Plants glabrous, very sparsely glandular. Middle stem leaves narrowly linear, entire, 0.5–1(–1.5) mm wide. Seeds narrowly oblong, 2–2.3 mm long; cotyledons incumbent. Flowering and fruiting July–August.

Sand dunes, flood plains, grasslands; 3100–4500 m. Endemic to China (Gansu, Qinghai, Xinjiang).

Specimens examined. CHINA. **Qinghai:** between Madoi and Bayanka La, 34°44'N, 98°7'E, *Meihe, Liu & Sonamco 98–35605* (GOET, MO); Sari (Darlag) Xian, Huleanma, Jianshe Xiang, S side of Huang He and SW of confluence with Dari He (Dar Qu), 33°43'40"N, 99°21'1"E, *Ho, Bartholomew & Gilbert 1154* (BM, CAS, HNWP, MO); Maqin Xian, Naheqingma, Youyun Xian, between Dari and Huashixia, 33°18'39"N, 99°10'53"E, *Ho, Bartholomew & Gilbert 1329* (BM, CAS, HNWP, MO). **Xinjiang:** Ruoqiang, Yueya river to Aqqikkol, *Wu, Ohba, Wu & Fei 2278* (TI); Ruoqiang, Bing He, *Wu, Ohba, Wu & Fei 4212* (KUN, TI).

A rather rare taxon known to us only from the specimens cited above.

Acknowledgments. We are grateful to Brigitte Zimmer and Manfred Bässler (B) for their help in providing information on the type of *Cheiranthus pinnatifidus* in the Willdenow herbarium. We thank Tatyana Shulkina (MO) for her help in translating various Russian literature, and Neil A. Harriman for his critical review of the manuscript.

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