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Journal of Asia-Pacific Biodiversity

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Asia-Pacific
Biodiversity

Short communication

Drymaria villosa (Caryophyllaceae) new record for the flora of the Western Himalaya

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ARTICLE INFO

Article history:

Received 20 October 2015

Received in revised form

28 October 2015

Accepted 17 December 2015

Available online 24 December 2015

Keywords:

Drymaria

new record

Uttarakhand

Western Himalaya

ABSTRACT

The herb *Drymaria villosa* is reported first time from the Western Himalaya. This species is morphologically similar to *Drymaria cordata* ssp. *diandra* but can be distinguished by its delicate individuals, villous vestiture, orbicular to reniform leaves, auriculate oblong bifid petals, and numerous reniform seeds. The present collection of the species represents westernmost distributional limit in the Asian continent. Morphological characteristics of the species were examined, which are illustrated here. Key to differentiate it from closely allied species is also provided.

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Introduction

The genus *Drymaria* Willd. ex Schultes is a native of the New World and represented by 48 species worldwide. In the Old World, this genus is represented by two taxa: *Drymaria cordata* ssp. *diandra* (Blume) J.A. Duke and *Drymaria villosa* Schlttdl. and Cham. ssp. *villosa* (Bittrich 1993; Dequan and Gilbert 2001; Hartman 2005; Mabblerley 2008; Majumdar 1993). *D. cordata* ssp. *diandra* is found throughout the Himalaya from the Western to the Eastern Himalaya (Majumdar 1993), while *D. villosa* is known to occur in the Eastern Himalaya (Bhutan, Sikkim, Meghalaya, and West Bengal), the Central Himalaya (Nepal), and Southern India including Western Ghats (Majumdar 1968a, 1993; Nayar et al 2014; Press et al 2000), but not reported from the Western Himalaya (Pakistan, Jammu and Kashmir, Himachal Pradesh, and Uttarakhand) (Chowdhery and Wadhwa 1984; Ghanzafar and Nasir 1974; Majumdar 2002; Uniyal et al 2007). In Asia *D. villosa* was known to occur in South Asia (Bhutan, India, and Nepal) and Southeast Asia (Indonesia, Malaysia, and Java), but not in East Asia, Central Asia, and Southwest Asia. This species is absent in whole Europe but

present in Africa (Nigeria) (Global Biodiversity Information Facility, GBIF version 2.2).

During the floristic study of the family Caryophyllaceae of the Western Himalaya, India specimens of *Drymaria* spp. were collected from different localities of Uttarakhand state in different seasons. Although some specimens collected in rainy season resembled *D. cordata* ssp. *diandra* in general appearance, they were distinguished on the basis of the following features: delicate plant, presence of villous vestiture, and having numerous reniform seeds.

Materials and methods

The specimens were processed following the standard taxonomic procedures (Rao and Sharma 1990) and deposited at G.B. Pant University Herbarium, Department of Biological Sciences, CBSH Pantnagar, Uttarakhand, India. The specimens were further identified by relevant literature on the genus *Drymaria* (Duke 1961; Majumdar 1968b, 1993), and by comparing them with specimens housed at the herbaria of Botanical Survey of India and Forest Research Institute at Dehradun. A detailed description and illustrations of this species are provided here to facilitate easy its identification and differentiation from *D. cordata*.

Taxonomic accounts

Drymaria villosa Schlechtendal & Chamisso, Linnaea. 5: 232. (1830); Mizushima, Fl. East Himalaya 80. (1966); Majumdar, Fl.

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Peer review under responsibility of National Science Museum of Korea (NSMK) and Korea National Arboretum (KNA).

India 2: 532. (1993). ssp. *villosa* Duke, Ann. Missouri Bot. Gard. 48(3): 226. (1961); Majumdar, Bull. Bot. Surv. India 10 (3 & 4): 295. (1968).

Annual herb, diffuse slender, 15–45 cm long. Root thin, producing many short horizontal spreading branches, sometimes originating from lower stem nodes. Stem prostrate or ascending, slender, pubescent with villous eglandular uniseriate trichomes, internodes mostly longer than the leaves. Leaves opposite, orbicular to reniform, 5–15 × 5–15 mm long, three-to-seven veined, the blades scantily to densely villose or hirsute with eglandular uniseriate hairs, apically rounded to acute, basally cordate to truncate; petioles 1–10 mm long, hairy; the stipules 0.5–1.5 mm long, slender, scarcely distinguishable from the indument. Inflorescences cymes, five to 15 flowered; peduncles 1–5 cm long, hairy; bracts ovate-lanceolate, 0.5–1.5 mm long; pedicels 2–20 mm long, hairy. Sepals five, 2.0–3.6 × 1–2 mm long, narrowly to broadly ovate or elliptic, apex acute to obtuse, hairy abaxially, occasionally glabrous; veins three, two lateral veins fused to middle vein at sepal apex. Petals five, 2.0–3.6 mm long, bifid for half their length or more, the lobes apically acute to slightly bifid, trifold, or deeply emarginated; nerves one to four, filiform auricles present at the base of limb, either persistent or caducous, variable in number and orientation. Stamens two to four, shorter than sepals, filament 2.0–3.5 mm long, anthers oblong, yellow brown, staminode absent. Ovary ovoid-globose, 2–3 × 1.5–2 mm, style 1.0–1.5 mm long, trifold to as much as half its length. Capsules ovoid to ellipsoid, 2.0–3.5 mm long, equaling or slightly exceeding the sepals, opening by three valves to base. Seeds brown, reniform, 0.5–0.9 mm long, six to 14 per fruit, surface tuberculate (Figure 1).

Flowering and fruiting. June–September.

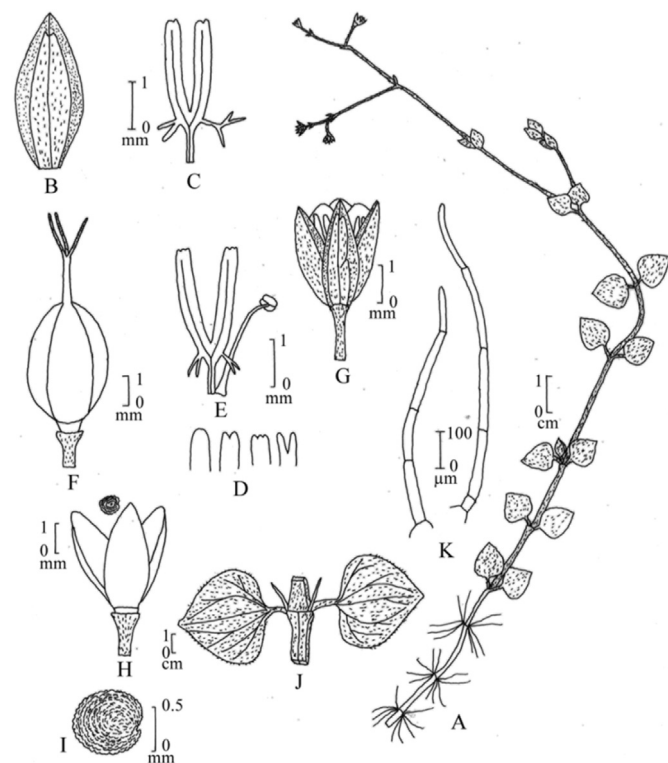


Figure 1. *Drymaria villosa*. A, plant habit; B, sepal; C, petal; D, petal apex; E, stamen and petal; F, pistil; G, fruit; H, dehiscent fruit after removing floral appendages; I, seed; J, leaf pair; K, trichomes.

Habitat. The species was seen in and collected from damp shaded sites, often near streams, under shrubs, along road side, and on the field walls of different localities in the Himalayan range of Uttarakhand, India.

Taxonomic treatment. The *Drymaria* genus is divided into 17 series (Duke 1961) and *D. villosa* belongs to the series *Villosae* Duke. The species *D. villosa* is divided into three subspecies (*Drymaria villosa* ssp. *palustris* (Schltdl. and Cham.) Duke; *Drymaria villosa* ssp. *paramorum* (Blake) Duke; and *Drymaria villosa* Schltdl. and Cham. ssp. *villosa*) on the basis of vestiture, sepal and petal length, and capsule length. Our specimens belong to *D. villosa* ssp. *villosa* owing to the following features: the presence of villous vestiture, elliptic-ovate sepals, oblong petals divided to the half or more with one to four linear auricles on either side, and capsule slightly longer or equal to the sepals (Duke 1961). Hitherto, the species was mis-identified as *D. cordata* ssp. *diandra* by earlier workers in the Western Himalaya. Both these species are present in the Western Himalaya (Uttarakhand) but they flower at different times; *D. villosa* ssp. *villosa* flowers usually in rainy season, while *D. cordata* ssp. *diandra* flowers in February–June (both species are differentiated in Table 1).

Introduction pathway. This species is a native of Tropical America and reached Southeast Asia through the Pacific Ocean (Baker 1963). In India, it got introduced from Indonesia (Majumdar 1968b) and is considered an alien element. The species was probably introduced to the Bay of Bengal in India through the Gulf of Thailand and subsequently to Southern India and the Eastern Himalaya, or via land route from Thailand to Burma and subsequently to the Eastern Himalaya. After its establishment in the Eastern Himalaya, it has spread to the Central Himalaya and now up to the eastern end of the Western Himalaya in Uttarakhand state of India.

Impact on local flora. The Himalaya, as a whole, represent one of the biodiversity hot spots where a large number of species, including endemic elements, find suitable habitats to flourish. Introduction and successful spread of any alien species here may pose a threat to native species occupying similar habitats. In India, this species was first reported from the Eastern Himalaya in 1963 and subsequently in 1968 from South India (Majumdar 1968a). More recently, this species has also invaded another biodiversity hotspot, the Western Ghats (Nayar et al 2014), and a biodiversity-rich region of the Eastern Ghats (Dhatchanamoorthy et al 2015) in India. It is obvious that three biodiversity hotspots in Indian peninsula (the Himalaya, Eastern India, and the Western Ghats) have been invaded by this tropical American species that may replace native flora in specific habitats.

Specimen examined. India, Uttarakhand, District Rudraprayag: Parkandi (1300–1700 m.a.s.l.), 20 July 2014, Satish Chandra s.n.,

Table 1. Comparison of *Drymaria cordata* and *Drymaria villosa*.

Characters	<i>D. cordata</i>	<i>D. villosa</i>
Plant habit	Biennial–perennial	Annual
Stem hairs	Glandular	Eglandular
Vestiture	Scabrous	Villous
Leaves	Cordate	Reniform
Leaf surface and margin	Glabrous	Hairy
Sepal	Incurved	Straight
Petal	Petal lobe entire, obtuse and auricle absent	Petal lobe emarginated, acute and auricle present
Stamen	2 (3)	2–4
Style	2 or 3, free to base	3, connate up to half of length
Seed	1–2 per fruit	6–19 per fruit
Seed shape	Torpedo shaped (1.5–3 mm long)	Orbicular to reniform (0.5–0.9 mm long)

745; Gobind Ballabh Pant University of Agriculture & Technology Herbarium, Pantnagar; Makkumath (1800–2000 m.a.s.l.), 22 July 2014, Satish Chandra *s.n.*, 746; Gobind Ballabh Pant University of Agriculture & Technology Herbarium, Pantnagar; District Chamoli: Badaganw (2500–2800 m.a.s.l.), 26 August 2015, Satish Chandra *s.n.*, 749; Gobind Ballabh Pant University of Agriculture & Technology Herbarium, Pantnagar; District Pithoragarh: Tawaghat (1200–1300 m.a.s.l.), 17 July 2013, Satish Chandra & D.S. Rawat *s.n.*, 747; Gobind Ballabh Pant University of Agriculture & Technology Herbarium, Pantnagar; District Nainital: Jolikot (1000–1200 m.a.s.l.), 10 June 2014, Satish Chandra & D.S. Rawat, *s.n.*, 748; Gobind Ballabh Pant University of Agriculture & Technology Herbarium, Pantnagar.

Keys for identification of Indian *Drymaria* species

- (1) Stem hairy in villous vestiture, sepals straight, styles unite up to middle, seed small and six to 19 per fruit
*D. villosa*
 - Stem glabrous to stipitate glandular, sepals incurved, styles free to base, seed large and one or two per fruit
*D. cordata*

Conclusion

The species *D. villosa* is a new addition to the flora of the Western Himalaya. This species is totally different from *D. cordata* and flourishing very well at the altitudinal range of 1000–3000 m.a.s.l. in moist habitats of different localities in the Himalayan range of Uttarakhand. This report provides the westward distributional limit of the species in the Himalaya and the westernmost distributional limit in Asia. This species has not been reported westward beyond this limit in South Asia till date, although its successful spread from the Eastern Himalaya indicates that it may spread westward in future.

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