

Psammogeton rani-magotrae sp. nov. (Apiaceae) a new species from Jammu and Kashmir, India

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Abstract

A new species of *Psammogeton* (Apiaceae) found in Jammu district of Jammu and Kashmir, India, is described and illustrated. It is similar to *Psammogeton canescens* and *P. shivalikense* but differing from them in having noticeably radical leaves, deeply ternate leave with acuminate apex, pale yellow flowers, an elongated stylopodium, and fruits hairs that are over three times longer than they are wide. Together with the images, a distribution map, comparison of closely related *Psammogeton canescens* and *P. shivalikense* with comparable morphologies and phenology, and a key are included.

Introduction

Psammogeton Edgew. (Apiaceae) is a tiny genus that is mostly limited to Asia and has a natural range that extends from Iran, Iraq, and central Asia (Govaerts et al. 2021). As a traditionally circumscribed the monophyly of *Psammogeton* is yet to be confirmed (Mousavi et al. 2022). In India, the native range of *Psammogeton* species is lowlands of the Jammu of Jammu and Kashmir (Fig. 1). Almost all the species of *Psammogeton* are adapted to dry rocky, stony, sandy situations particularly margins of river beds. On the basis of morphological and phylogenetic affinities *Psammogeton* is closely related to its allied genus *Aphanopleura*. *Psammogeton anethifolium*, *P. biternatum*, *P. canescens*, *P. diffusus*, *P. involucratum* and *P. shivalikense* are the species that constitute the genus in India. *Psammogeton biternatum*, *P. canescens*, *P. shivalikense* and *P. suchaniense* have all been identified in Jammu & Kashmir so far. According to Boissier (1872), Clarke (1879), Drude (1998), Hiroe and Constance (1958), Kitamura (1960), Heywood and Dakshini (1971), Nasir (1972), Babu (1977) Ahmed and Koul (1979), Hamal and Koul (1980), Sharma and Kachroo (1981), Hedge et al. (1987), Rechinger (1987), Mukherjee and Constance (1993), Katz-Downie (1999), Downie et al. (2000, 2010), Pimenov and Leonov (1993, 2004), Mohanan and Pimenov (2007), Assadi et al. (2008), Ajani and Mozaffarian (2019), Pimenov et al. (2019), a review of the taxonomic literature revealed that the species has not yet been named. By examining taxonomic literature, the correctness of the species and description has been verified. Further confirmation was also acquired by consulting herbarium specimens housed in different national and international herbaria throughout the world. By comparing these specimens and reviewing relevant literature, including Hiroe and Constance (1958), Heywood and Dakshini (1971), Babu (1977), Sharma and Kachroo (1981), Mukherjee and Constance (1993), Pimenov and Leonov (2004), it was determined that the species had not yet been reported. This may be due to the species' small size, patchy distribution in highly disturbed dry riverbank areas, and proximity to international borders where there are restrictions on free movement. The Tawi River bank west of Jammu, close to Mandal, is the place where authors found several unique sample specimens. During the field inquiry between 2018 and 2022, the location is quite near the Pakistani border. Based on these factors, as well as comparative morphology and anatomical study, the authors were able to identify and describe it as a new species.

The root, petiole, stem, and fruit of Apiaceae species exhibit sectetory chambers (vittae) that may contain schizogenic fatty channels carrying region, oil, or mucilage (Duman et al. 2000, Metcalfe and Chalk

1950). Nevertheless, anatomical traits are not employed as morphological traits in the Apiaceae family to differentiate between closely related species and genera. (Urusak and Kizilarlan 2013). The size of the pericarp, thickness, exocarp cell size, vittae, and the investigations revealed several diagnostically significant characteristics of the fruit and its velluculae in addition to a broad range of diversity in fruit morphology and morpho-anatomical parameters among the analysed taxa. The research under inquiry expands our understanding of stem and fruit morphology. These data had little taxonomic relevance because the quantitative values frequently overlapped. Micro-morphological characteristics, fruit surface characteristics, and fruit architecture therefore seem to be more useful for identifying species. In Apiaceae, the quantity and configuration of vallecular and commissural vittae inside the pericarp frequently play a significant role. Although this characteristic differs among several species in this family, the size of the vittae appears to be more informative. In addition, an identification key has been prepared to represent the similarities and differences between the closely related species of Apiaceae.

Material and Methods

Based on field information recorded between 2018 and 2022 from the natural populations along the Tawi river bank. The purpose of the current research was to establish a taxonomy treatment of *Psammogeton* based on its morphological and anatomical characteristics. Herbarium sheets were made following the recommended procedures (Jain and Rao (1977), Bridson and Forman (1999)). The vouchers for the new species are kept in Indian Institute of Medicine (IIIM) at the Jammu, Janaki Ammal Herbarium with abbreviated RRLH indexed in Thiers 2018. We got in touch with a number of herbaria that house closely similar species including POWO 2023. Both living samples and the herbarium sheets were examined for the study of plant morphology. For the stereoscopic observations, a razor was utilised to make mericarp sections. The descriptive terminology for important structural characters follows Hickey (1973), Harris and Harris (2001), Kljuykov et al. (2004).

Taxonomic treatment

Psammogeton rani-magotrae sp. nov. (Fig. 2, 3, 4, 5, 6)

Diagnosis

A species is closely related to *Psammogeton canescens* and *P. shivalikense* but differing from them by its smaller stem 3-10 cm tall, internodes faintly striate, petioles 2-5 cm long, peduncles 1-3 cm long, leaf segments linear and acuminate, involucre four or five \pm 3.5 mm long bracts, involucels five \pm 3.2 mm bractlets, flowers white tinged pale yellow, filaments \pm 2.4 mm long, light purple, stylopodium and styles far smaller than length of hairs, schizocarps ellipsoid or oblong, primary ridges with variably winged and fruit hairs over three times longer than their width.

Type: India, Jammu and Kashmir, district Jammu, near Mandal 32° 66'55" N 74° 74'46" E 285 a.s.l. 25 Apr 1018, Bhellum 15778 (holotype: HBJU).

Etymology: The specific epithet refers to honour Prof/Dr Rani Magotra an eminent plant taxonomist for her contribution in cytology, taxonomy, biodiversity and Plant conservation.

Description

Annual, erect, 3-10 cm tall herbs. Root with tap root system, penetrating deep in the soil. Stem hollow, slender, , internodes prominently elongate, faintly striate. Radical leaves distinctly petiolate, petiole 2-5 cm long with sheathy leaf-base. Cauline leaves petiolate, leaflets deeply ternate, segments usually three, linear, acute, glabrous above, pubescent underneath. Inflorescence lateral or terminal leaf-opposed umbels. Peduncles 1-3 cm long, faintly ribbed. Rays unequal, peripheral longer than the central ones. Involucre 3-5 of 3-4 mm long bracts, 3-ribbed from the base. Involucels 5 of 3-3.5 mm long bractlets with ciliate margins, 3-ribbed from the base. Flowers actinomorphic, bisexual, white tinged pale yellow. Calyx reduced, adnate to ovary. Corolla polypetalous, petals 5, obovate, emarginate, slightly unequal, outer petal radiate, margins irregular, tip long pointed, tip curved or straight, white or light yellow. Stamens 5, free, filament glabrous,

+ 2.5 mm long inserted on epigynous disc. Ovary bicarpellary syncarpous, inferior, bilocular, hairy, styles , light purple, persistent, epigynous, disc present, base swollen forming stylopodium persistent, crowing the ovary, stigma capitate. Fruit a schizocarp, narrowly elliptic-oblong, slightly thin above the middle, dorsally constricted at commissures, primary and secondary ridges light purple, hairs T-shaped, tubercles at the base, primary ridges slightly winged, variable, more prominent than the secondary ridges, secondary ridges exhibit less number of hairs than the primary ridges. Mericarps slightly compressed dorsally.

Phenology

Flowering from March to April and fruiting from April to May

Additional specimens examined (Paratype)

India, Jammu district, near Mandal 32° 66'55'' N 74° 74'46'' E 285 m a.s.l. 25 Apr 1018, Bhellum 15779 (Isotype: —).

Distribution and habitat

Psammogeton rani-magotrae is currently known from its type locality Mandal, Jammu region, India. It grows on dry and sandy places at the elevation of 285 m, about 10 Km towards south-west of Jammu. The new species grows in association with *Arenaria serpyllifolia* L., *Artemisia scoparia* Waldst. & Kitam., *Aristida hystrix* L. f., *Boerhavia diffusa* L., *Calotropis procera* (Aiton) Dryand., *Crassula tillaea* Lest.-Garl, *Evolvulus alsinoides*(L.) L., *Filago pyramidata* L., *Ifloga spicata* (Forssk.) Sch. Bip., *Indigofera cordifolia* Roth, *I. linifolia*(L.f.) Retz., *I. linnaei* Ali, *Lactuca dissecta* D. Don, *Misopates orontium* (L.) Raf., *Saccharum spontaneum* L., *Sida acuta* Burm. f., *Taphrosia purpurea* (L.) Pers.

Table 1. Morphological comparison among *Psammogeton rani-magotrae* and its closely allied species *P. canescens* and *P. shivalikense*

Characters	<i>P. Rani-magotrae</i>	<i>P. shivalikense</i>	<i>P. canescens</i>
Stem length	3-10 cm, unbranched	1-3 cm, unbranched	(5-)8-30 cm, branched
Leaf segments (cm)	1-2 ternatisect, obcuneate	1-2 ternatisect 2-ternatisect	1-2 ternatisect 2-ternatisect
Involucres (mm)	± 3, 3-3.5 long	± 2, 3-4 long	± 5, 4-5 long
Involucels (mm)	± 4, 3-3.5 long	± 4, 2.5-3.2 long	± 6, 3.5-4.5 long
Peduncles (cm)	1.5-2.5	0.6-1.0	upto 9
Petal colour	White tinged Pale yellow	Pale purple turning white tinged pinkish	white tinged purple
Fruit length (mm)	± 1.5	± 1.4	± 1.8
Fruit shape (mm)	Narrowly elliptic	Ovoid-oblong	Ellipsoid-oblong
Hairs on fruits	As long as twice the length of fruits	Less than twice the length of fruits	Less than twice the length of fruits

Key to closely related species of *Psammogeton* Edgew.

1. Stem branched ————— 2
- Stem unbranched ————— 4
2. Umbels with reduced peduncle —————
- P. suchaniense*
- Umbels with well developed peduncles ————— 3
3. Basal branches widely divergent; leaves 2– or 3–pinnatisect, with segments cuneate, glabrous schizocarps ovoid —————
- P. biternatum*

– Basal branches dichotomously branched, not widely divergent; leaves 1- or 2-ternatisect, with segments obcuneate, pubescent or glabrescent; schizocarps ellipsoid-oblong

P. canescens

4. Flowers white tinged purplish pink; schizocarps ovoid-ellipsoid; hair less than double the length of fruit width

P. shivalikense

– Flowers white tinged pale yellow; fruits elliptic-oblong; hair as long as double the length of fruit width

P. rani-magotrae

Discussion

Psammogeton is a small genus (sixteen species) endemic to Asia. According to the qualitative and quantitative traits, the new species was recognised as emerging from Jammu, based on morphological and anatomical studies. Further information on phenology, ecology, floral components, and fruit shape is also included. The fruit is as long as three times as wide and grooved stem. In conclusion, all of these comparable characteristics (Table 1) justify its isolation from closely related species were established. The subtropical regions of Jammu and Kashmir, India, are where it is really found to be distributed. There may have been less taxonomists interested in Umbelliferae in the past. Our population of new species is clearly different from the other known species of *Psammogeton*, which confirms that this region is remarkably crucial for diversity and evolutionary tendencies. A few species of this genus have already been described from this region of north-west India including (Hamal and Koul 1989), (Ahmed and Koul 1980) from Jammu and Kashmir (Babu 1977) from Dehra Dun of Uttarakhand State, (Sharma and Kachroo 1981) from Jammu and (Bhellum and Magotra 2023a,b) from both Samba and Jammu districts of Jammu and Kashmir. Majority of the species in this genus are distinguished by their white tinged purple or pink blooms. The white tinged pale yellow blooms in *Psammogeton rani-magotrae* set it apart from the other species of this genus that are currently accepted.

Data available statement

The data have been included in the research paper. There is no any additional data available for this research design.

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Conflict of interest

The authors declare no potential conflict of interest either financial or otherwise.

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