

## *Berberis rawatii* sp. nov. (Berberidaceae) from India

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In India, 55 species of *Berberis* have been reported and 22 species are found in Uttarakhand state. *Berberis rawatii* (Berberidaceae), a new species from Chamoli and Pithoragarh districts of Uttarakhand state of India (western Himalaya) is here described and illustrated. In terms of leaf and inflorescence, *Berberis rawatii* shows affinities with *B. cretica* L. Both these species have entire leaves, fascicled inflorescences, conspicuous style and black berries, but *B. rawatii* differs in the presence of a petiole, the dorsal surface of leaf pruinose, presence of elongated-ovate glands, presence of prophylls, three ovules and pruinose fruits.

*Berberis* L. is the largest genus of Berberidaceae and in India it is represented by 55 species. The majority (>95%) of these species are found in the Himalayan region. *Berberis* was divided into two groups (*Septentrionales* and *Australes*) by Schneider (1905). *Septentrionales* is further divided into 17 sections; among these, sect. *Wallichianae* is largest with 91 species. The group *Australes* has two subgroups and 15 sections, and *Truxilienses* is largest in this group with 25 species. The first taxonomic account of the family Berberidaceae for the Indian subcontinent was published by Hooker (1875). He included six genera and 17 species in this family. This treatment was considered to be too general, and subsequent workers split these 17 taxa and added many more new taxa. Schneider (1905–1908) revised the genus *Berberis* and added 13 new species. In a more recent study, Chamberlain and Hu (1975) further revised the section *Wallichianae* and treated 11 species, including one new species i.e. *Berberis victoriana*, from the Indian region. Jafri (1975) while dealing with the Berberidaceae for the 'Flora of west Pakistan' included 15 species of *Berberis* from the Kashmir region and Rao and Hajra (1993), while treating the family for the 'Flora of India', accepted 54 species of *Berberis* from the Indian region.

Recent work by Rao et al. (1998a, b) that follow Bentham and Hooker's system of classification, report 55 species of *Berberis* in India. It is interesting to note that among all the Himalayan states, Uttarakhand has the highest number of taxa (29 including subspecies). The number of *Berberis* taxa (species and subspecies) in Pakistan, Jammu and Kashmir, Himachal Pradesh and Sikkim are 24, 25, 23 and 16, respectively (Ahrendt 1941, 1961, Jafri 1975, Rao et al. 1998a, b).

During a taxonomic study on the genus *Berberis* in Uttarakhand (western Himalaya), we collected an interest-

ing species of this genus at three localities in two districts, viz. Chamoli and Pithoragarh. After critical examination, it was revealed that our specimens did not match with any of the species described earlier. Hence, it is here described as a new species. In terms of leaf and inflorescence, the new taxon shows affinities with *B. cretica*, but it differs from the latter in terms of habit, habitat, flower size and fruits (Table 1).

### Key to the identification of deciduous *Berberis* species found in Uttarakhand state of India

- Flowers large, 14–20 mm in diameter (sect. *Angulosae*) . . . . . 2  
– Flowers usually 4–12 mm in diameter . . . . . 6
- Ovules 6–12 (subsect. *Diaphnae*, *Euangulosae*) leaves white pruinose below . . . . . *B. concinna*  
– Ovules 3–5 (subsect. *Jaeschkeanae*, *Subangulosae*) 3
- Leaves narrowly elliptic . . . . . 4  
– Leaves obovate or spatulate . . . . . 5
- Inflorescence 4–7-fid; berries oblong, estylose . . . . .  
. . . . . *B. lambertii*  
– Inflorescence simple, rarely 2-fid; berries stylose . . . . .  
. . . . . *B. osmastonii*
- Leaves 3–5; flowers 3–5 . . . . . *B. jaeschkeana*  
– Leaves 6–10, flowers 5–10. . . . . *B. apiculata*
- Inflorescence 15–30-flowered. (sect. *Vulgares*) . . . . .  
. . . . . *B. pachycantha*  
– Inflorescence 2–10-flowered. . . . . 7
- Berries usually pink to red (sect. *Polyanthe* subsect. *Subpolyanthe*) . . . . . 8  
– Berries usually black, sometime blue or white. . . . . 9
- Leaves pruinose; panicles up to 4 cm long . . . . .  
. . . . . *B. koehneana*

Table 1. Diagnostic morphological differences between *Berberis cretica* and *B. rawatii* sp.nov.

| Character              | <i>B. cretica</i>    | <i>B. rawatii</i>         |
|------------------------|----------------------|---------------------------|
| Shrub height (cm)      | 60–75                | 30–45                     |
| Leaves (mm)            | 10–17 × 4–7          | 20–35 × 5–8               |
| Leaf apex              | acute                | mucronate                 |
| Petiole                | absent               | 0.5 mm                    |
| Dorsal surface of leaf | epruinose            | pruinose                  |
| Pedicel (mm)           | 2–5                  | 9–10                      |
| Prophylls              | absent               | present                   |
| Outer sepals (mm)      | 4.0 × 2.5            | 5–6 × 2.0–2.5             |
| Inner sepals (mm)      | 4.0–4.5 × 3.0        | 5–6 × 2.0–2.5             |
| Petals (mm)            | 4.0–4.7 × 3.0        | 4–5 × 2.0–2.5             |
| Glands                 | oblanceolate         | elongated-ovate           |
| Stamens (mm)           | 3.5–4.5              | 4.0–4.5                   |
| Style (mm)             | 0.5–0.7              | 0.7–1.0                   |
| Ovules                 | two                  | three                     |
| Berries                | ellipsoid, epruinose | globose-obovoid, pruinose |

- Leaves epruinose; panicles up to 4 cm long . . . . .  
 . . . . . *B. kunawurensis*  
 9. Style conspicuous; inflorescence fascicled (sect. *Heteropodae* subsect. *Creticae*) . . . . . 10  
 – Style absent (subsect. *Pseudoumbellatae*); inflorescence umbellate or subumbellate . . . . . *B. pseudoumbellata*  
 10. Prophylls absent, sepals 3. . . . . *B. cretica*  
 – Prophylls present, sepals 6. . . . . *B. rawatii*

***Berberis rawatii* U. L. Tiwari and B. S. Adhikari sp. nov. (Fig. 1, 2)**

*Berberidi creticae foliis integris, inflorescentiis fasciculatis, stylis conspicuis et baccis nigris similis, sed ab ea praesentia petiolorum et prophyllorum, foliorum paginis superioribus et fructibus pruinosis, glandulis elongato-ovatis (nec oblanceolatis), ovulis 3 (nec 2) differt.*

**Type:** India, Uttarakhand, Muniyalikhet, Pindar valley, 2340 m a.s.l., 16 Apr 2009, Umeshkumar L. Tiwari UKT-935 (holotype: WII).

Shrub, 30–45 cm tall. Stem glabrous, sulcate, grey, internodes 15–20 mm long, with 3-fid, yellow, 6–7 mm long spines. Leaves 20–35 × 5–8 mm, narrowly oblong-elliptic, apex mucronate with spine on the tip, base attenuate, margin entire, rigid, dull green above, pruinose below with few elevated veins, petiole 0.4–0.5 mm long. Older leaves 2–3 spinose-serrulate. Inflorescence fascicled, with 3–7 flowers. Pedicels 9–10 mm long. Prophylls 1.0–2.5 × 1.0–1.5 mm, obovate with acute apex, yellow with pink tinge. Outer sepals 5–6 × 2.0–2.5 mm, ovate, yellow. Inner sepals 5–6 × 2.0–2.5 mm, ovate, yellow. Petals 4–5 × 2.0–2.5 mm, obovate, entire, apiculate at apex, yellow. Glands elongated-ovate, 0.5–0.6 mm long. Stamens 4.0–4.5 mm long, truncate at apex. Filaments 3.0–3.5 mm long. Ovules 3. Berries black, conspicuously pruinose, globose-obovoid, 6–7 × 2.0–2.5 mm, including the 0.7–1.0 mm long style. Seed pale red, ovoid.

**Distribution, habitat and conservation status**

*Berberis rawatii* is distributed in Muniyalikhet, Pindar Valley (Chamoli), Samkot and Munsiyari (Pithoragarh),

Uttarakhand, India. It inhabits open southwest-facing dry grassy slopes in association with *B. asiatica* and *B. osmastonii*. *Berberis rawatii* falls in the ‘Endangered’ (EN) B1 a.b (v) category following IUCN (2003). The geographical range is extremely narrow and the population is fragmented. The geographical extent of habitat (limestone formations), in which this species grows in both the districts, is less than 10 km<sup>2</sup>. In total, less than 500 individuals have been found. The species requires immediate in-situ conservation which may include protection of habitat.

**Phenology and etymology**

Flowering occurs in Apr and fruiting in May–Jun. The species has been named after the well-known plant ecologist Dr G. S. Rawat.

**Similar taxa**

*Berberis rawatii* belongs to *B.* sect. *Heteropodae* with *B. cretica* as its closest ally. *Berberis cretica* is reported from Crete, Cyprus and Greece (Linnaeus 1753, Ahrendt 1961, Strid 1986, Strid and Tan 2002). However, its occurrence in the Indian sub-region is doubtful as evident from subsequent literature. *Berberis vulgaris* var. *cretica* was said to be distributed from Garhwal to Baltistan (Hooker 1875), but this variety has now been merged with *B. cretica* (Rao and Hajra 1993, Rao et al. 1998b). Both *Berberis rawatii* and *B. cretica* have entire leaves, fascicled inflorescences, conspicuous style and black berries, but *B. rawatii* differs in the presence of a petiole (absent in *Berberis cretica*), the dorsal surface of leaf pruinose (epruinose in *B. cretica*), presence of elongated-ovate glands (oblanceolate in *B. cretica*), presence of prophylls (absent in *B. cretica*), three ovules (two in *B. cretica*) and pruinose fruits (epruinose in *B. cretica*).

**Additional specimens studied (paratypes)**

India. Uttarakhand: Muniyalikhet, Pindar Valley (30°03′22.5″N, 079°44′31.3″E, 2810 m a.s.l., southwest-facing aspect, 34° slope), Chamoli, 14 Apr 2010, Umeshkumar Tiwari UKT-2055 (DD), on the way to Samkot

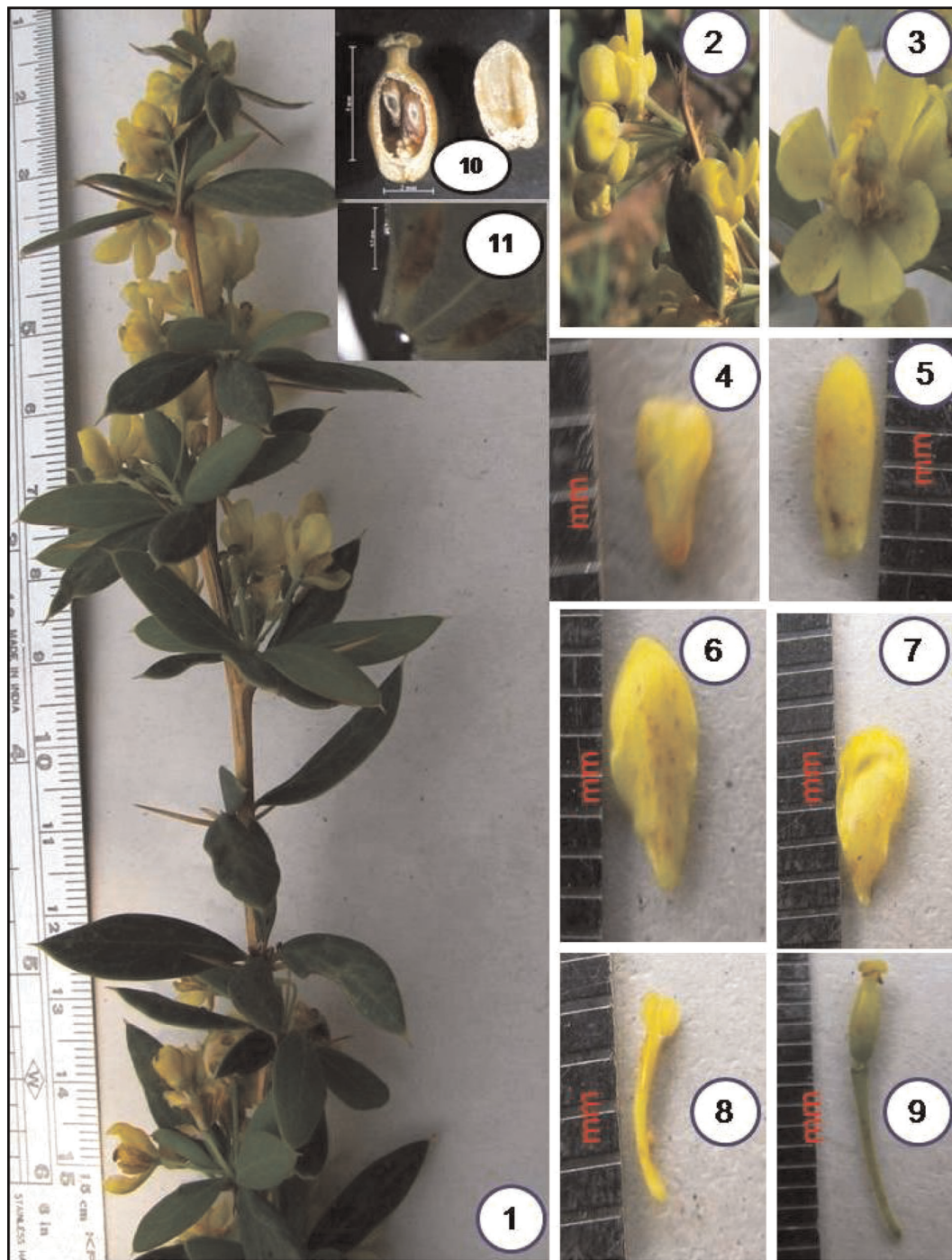


Figure 1. Photographs of *Berberis rawatii* sp. nov.: 1: Twig; 2: Inflorescence; 3: Flower; 4: Prophyll; 5: Outer sepal; 6: Inner sepal; 7: Petal; 8: Stamen; 9: Immature fruit. 10. Longitudinal section (L.S.) of fruit; 11. Glands on petals. UKT-935 (Holotype) (WII). Scale bars are 5 × 2 mm for fig 1:10 and 0.5 mm for fig. 1.11.

(30°00'30.5"N, 080°10'45.4"E, 2343 m a.s.l., southwest-facing aspect, 34° slope), Pithoragarh, 9 May 2010, Umeshkumar Tiwari UKT-2053 (WII); Shaheed Trilok Singh Pangtey Gov. Intermediate College, Munsiyari, (30°03.704'N, 080°14.448'E, 2282 m a.s.l., northeast-

facing aspect, 20° slope) Pithoragarh, 22 May 2010, Umeshkumar Tiwari UKT-2521 (WII).

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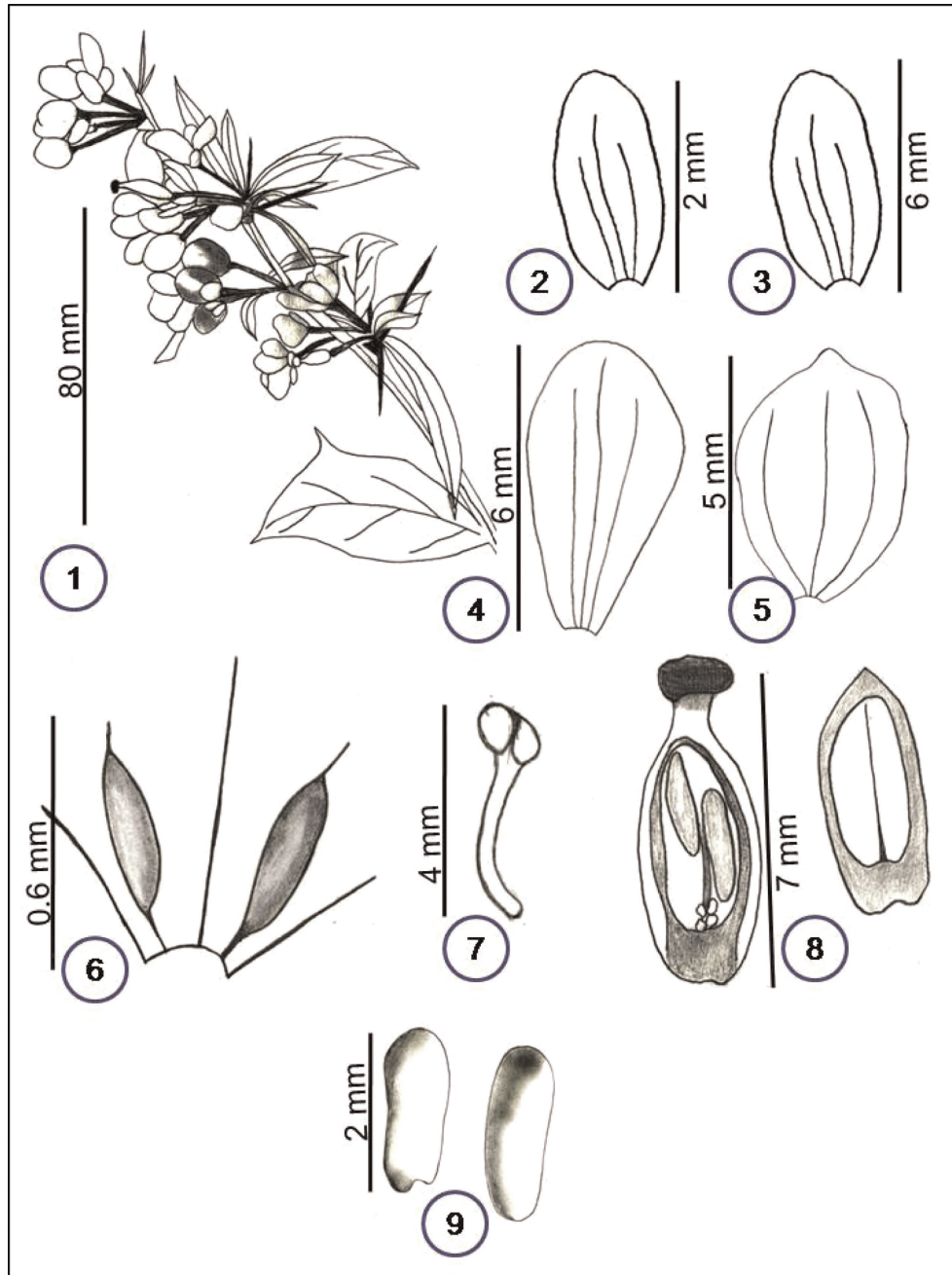


Figure 2. Illustration of *Berberis rawatii* sp. nov.: 1. Twig; 2. Prophyll; 3. Outer sepal; 4. Inner sepal; 5. Petal; 6. Glands; 7. Stamen; 8. L.S. of fruit. 9. Seeds. UKT-935 (Holotype) (WII). Drawn by- Umeshkumar L. Tiwari.

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