

Oxygraphis kumaonensis sp. nov. (Ranunculaceae) from Western Himalaya, India

ISHWARI DATT RAI* & GOPAL SINGH RAWAT

Wildlife Institute of India, P.O. Box # 18, Chandrabani, Dehradun, Uttarakhand, 248001, India

*email address of the corresponding author: ishwari.raai@gmail.com

Abstract

Oxygraphis kumaonensis I. D. Rai and G. S. Rawat, a new species from the alpine region of Western Himalaya is described and illustrated. Diagnostic features for identification, brief notes on the ecology and description of Type locality are given. The species is named after place of its occurrence, i.e., Kumaon, a well-known floristic sub-region in the state of Uttarakhand, India. Information on the distribution and conservation status of the new species is provided.

Key words: Floral diversity, Kumaon Himalaya, new species, taxonomy, Uttarakhand, Western Himalaya

Introduction

Ranunculaceae Jussieu (1789: 231) is regarded as one of the most primitive families of flowering plants and placed in Clade-Eudicots according to APG-III classification (Haston *et al.* 2009). The family is represented by about 60 genera and 2500 species worldwide, mainly distributed in the temperate regions, particularly in East Asia (Wang *et al.* 2001). Genus *Oxygraphis* Bunge (1836: 46) in this family is of much interest because of its peculiar habit, i.e., dwarf, scapose and glabrous perennial having single flowered scape. Petals are 10–15, with a nectariferous pit on the claw. It differs from the genus *Ranunculus* Linnaeus (1753: 548) in having persistent sepals (Hooker 1875). *Oxygraphis* is represented by five species in the world, viz., *O. delavayi* Franchet (1886: 374), *O. glacialis* (Fischer ex de Candolle 1817: 305) Bunge (1836: 47), *O. polypetala* (Rafinesque) Hooker & Thomson (1855: 27), *O. shaftoanus* Aitchison & Hemsley (1882: 149) and *O. tenuifolia* Evans (1921: 172). All the species are confined to the northern hemisphere, primarily distributed in the Hindu Kush-Himalayan (HKH) region covering Bhutan, India, Nepal, Pakistan, Afghanistan and China while one species (*O. glacialis*) is reported from Mongolia, Kazakhstan, Russia and North America as well. *Oxygraphis tenuifolia* is endemic to China. The genus is represented by three species in the Indian Himalaya viz., *Oxygraphis polypetala*, *O. glacialis* and *O. delavayi*. Of these, first two are distributed in the Western Himalaya (Hooker 1875), and the latter is known to occur in Arunachal Pradesh.

During a recent botanical exploration in the alpine zone of Kumaon region (Western Himalaya) we recorded an interesting species of *Oxygraphis* growing on the steep rocky slopes among the mosses. Close scrutiny of literature and detailed study of allied taxa reveals that this taxon does not match with any of the species described so far and turns out to be new to science. Hence, it is being described for the first time under the name *Oxygraphis kumaonensis* sp. nov. with photo plates and illustrations to aid identification.

Material and Method

Specimens were collected from the Najurikot area of the Pithoragarh district. The Type locality lies just outside of the boundary of the Askot Wildlife Sanctuary in the state of Uttarakhand, India. Characteristic features of the species were noted down and measurements of the different plant parts were taken with the help of digital callipers and ruler in the field. Habitat characteristics and various ecological parameters were noted. Specimens of *Oxygraphis* at regional herbaria, viz., Wildlife Institute of India (WII), Botanical Survey of India, Dehradun (BSD) and Forest research Institute, Dehradun (DD) were examined and collections at Kew were also studied. The specimens are deposited in WII and BSD. Morphology and distribution of all species were compared in the relevant literature, viz., Hooker (1875), Hara and Williams (1979), Naithani (1984), Wang *et al.* (2001) and Uniyal *et al.* (2007).

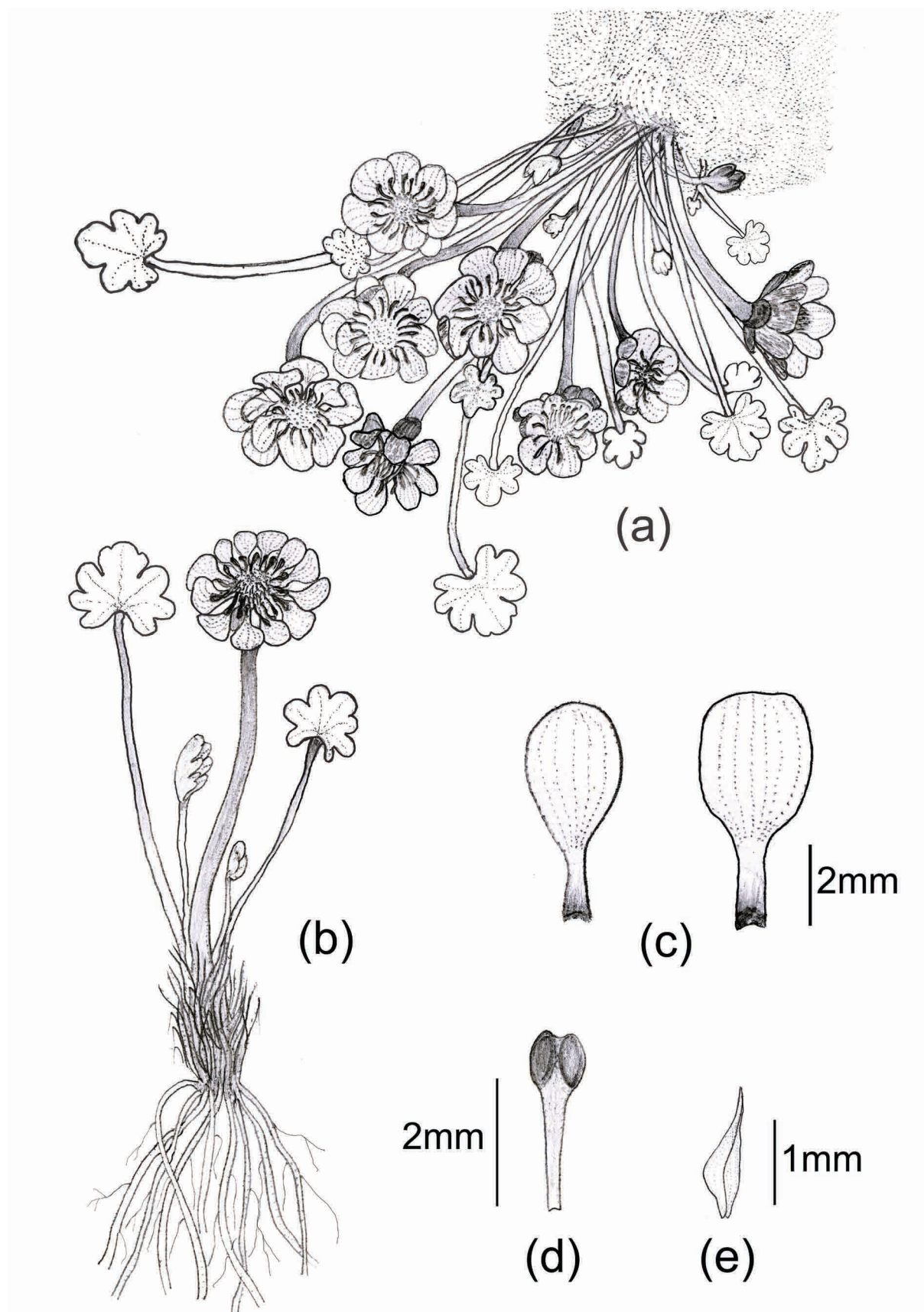


FIGURE 1. *Oxygraphis kumaonensis* I. D. Rai and G. S. Rawat *sp. nov.*: (a). Habit; (b). Single individual with flower, leaves and roots; (c). Petals; (d). Stamen with anthers; (e). Achene.

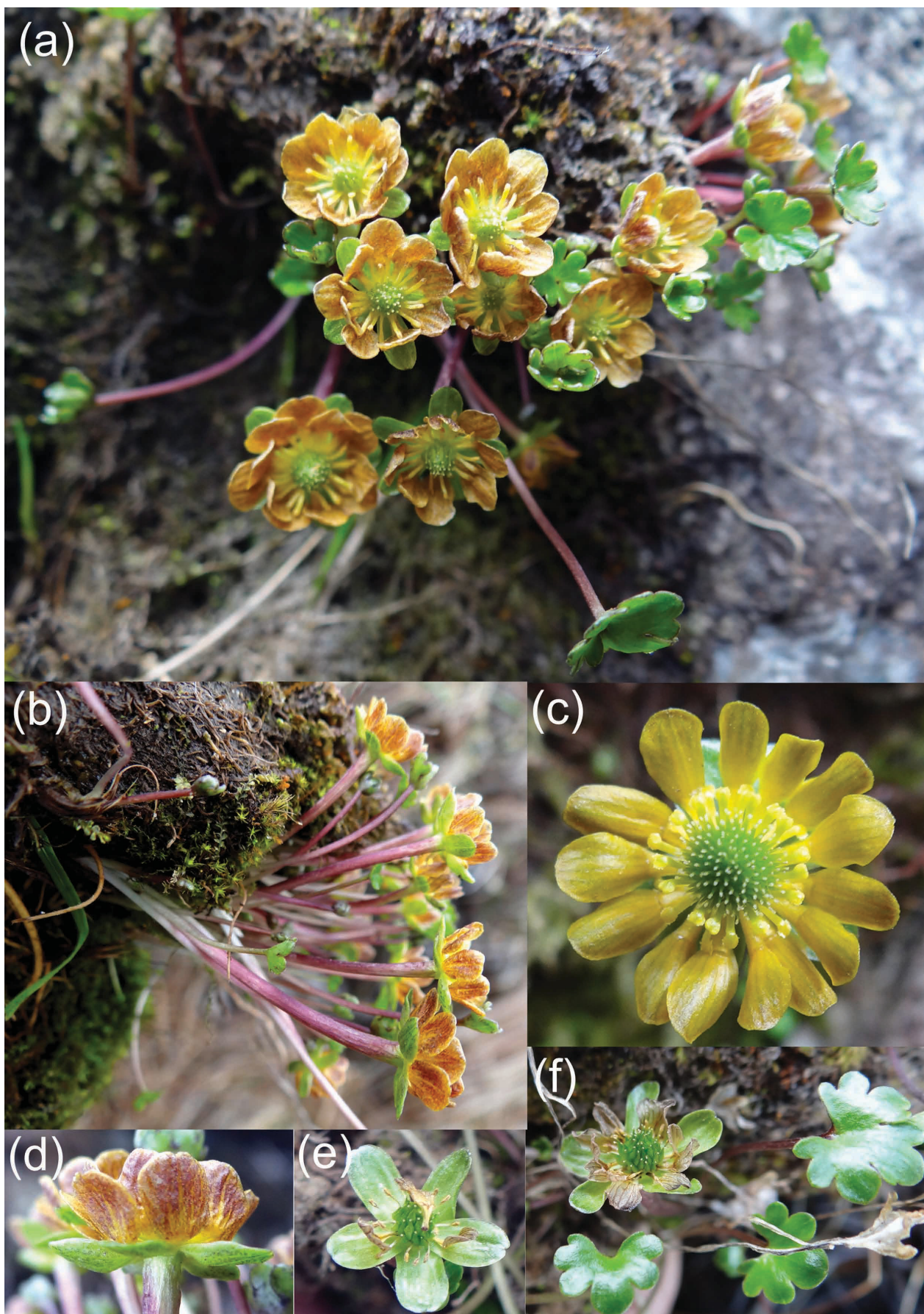


FIGURE 2. *Oxygraphis kumaonensis* I. D. Rai and G. S. Rawat *sp. nov.* : (a) and (b). Habit; (c). Flower with different floral parts; (d) Flowers showing purple-brown coating on the petal; (e). Mature flower with persistent calyx, carpels and dried stamen & petals; (f). Mature flower and leaves.

Results and discussion

Oxygraphis kumaonensis I. D. Rai & G. S. Rawat, *sp. nov.* (Figs. 1, 2)

Type:—INDIA, Uttarakhand, Kumaon, Pithoragarh district, Najurikot, South-West facing broken-rocky slope, 29°57'35.05"N, 80°24'16.40"E, 4050 m, 6 June 2015, *I. D. Rai & G. S. Rawat 11463* (holotype WII!, isotype BSD).

Diagnosis:—*Oxygraphis kumaonensis* differs from its nearest ally *O. polypetala* in the presence of lobate leaf margins, clawed petals with broad to round apex, calyx and corolla abaxial surfaces with thin purple to brown coating and typical habitat on the rocks.

Etymology:—The epithet recognises the name of the Type region 'Kumaon', a biodiversity rich area in the Western Himalaya.

Description:—Perennial scapose herbs, 3–6 cm tall. Roots fibrous, base covered by remains of old leaves. Leaves all radical, 2–5, glabrous; petiole 1.5–6.5 cm long, light to dark purple, narrowly sheathing at base; leaf blade round to reniform, 0.5–0.8×0.6–1.1 cm, base cordate, lobes 7 or sometimes less in the young leaves, middle lobe largest and slightly 3 partite at apex, apex rounded to broadly pointed. Scapes 1, 2–6 cm long, glabrous, white to light purple at sprouting, dark purple at maturity. Flowers solitary, yellowish-brown, 1–1.3 cm in diam., ebracteate; sepals 5, green, oblong to ovate-oblong, 0.4–0.8 cm long, glabrous, leathery, persistent, abaxial surface with purple colour spots/coating; petals 8–14, 4.5–6.5×2.5–4.0 mm, distinctly clawed, apex rounded to broadly flat, yellow to brown with thin layer purplish-brown irregular spots or coating on the abaxial surface, adaxial surface with 4–6 prominent green to purple veins; stamens 15–26, spirally arranged, 1.8–3.2 mm long, smooth; filaments yellow, 1.2–2.5 mm; anthers oblong; 0.5–0.7 mm long, yellow to brown. Carpels on a sub-globose receptacle, yellow, turning green with maturity, compressed, glabrous, with an elongate subulate beak. Aggregate fruit broadly ovoid, ca. 4 mm in diam.; achenes 1.2–2.2 mm long, obliquely obovate or narrowly obliquely ovate, glabrous.

Phenology:—Flowering: May–June; Fruiting: July–August.

Distribution and Ecology:—The species was found growing on the ledges of moist rocks in the alpine zone. As in case of other species of *Oxygraphis*, this taxon was found in bloom during early summer just after the snowmelt. The individuals appear to form bunches among cushions of mosses in the crevices of rocks and boulders. Leaf blade is minute and unfolded during the initiation/opening of flower bud and inconspicuous at early flowering individuals whereas it expands after flowering. The area remains under snow from November to May. The slope was dominated by *Kobresia hookeri* Boeckeler (1875: 4), *K. nepalensis* (Nees) Kük. (1909: 40) and *K. duthiei* C.B. Clarke (1894: 697) whereas in the microhabitat of the species only a few mosses were present packed in the rock crevices and soil along the edges of the rocks.

Conservation status:—The species is restricted to a single locality at Najurikot with an ideal habitat of less than 1 hectare. A total of 40 individuals were found in this area in two small populations of 25 and 15 individuals. This area is under high anthropogenic pressures due to the collection of caterpillar fungus (*Ophiocordyceps sinensis* (Berk.) G.H. Sung, J.M. Sung, Hywel-Jones & Spatafora) and frequent fires on the mountain slopes. According to IUCN Red List Criteria and Categories (IUCN, 2014) the conservation status of the species is CR under the criteria B1, B2a,b(iii) and D.

Affinities with allied species:—The new species resembles with *O. polypetala* and *O. delavayi* in the round, orbicular to reniform leaves but differs in the presence of lobed leaf blade, clawed petals with broad to round margin, outer surface of calyx and corolla with thin purple to brown coating and typical habitat on the rocks. Scapes are one to several in *Oxygraphis polypetala* whereas only single scape is found in *O. kumaonensis*.

Key for the identification of the *Oxygraphis* species of the world

- | | | |
|----|---|--------------------------------|
| 1. | Leaves trifoliate with obovate crenate or circular segments | <i>O. shaftoanus</i> |
| - | Leaves ovate, elliptic, reniform or orbicular | 2 |
| 2. | Scapes puberulent apically; flowers bracteate, sepals deciduous..... | <i>O. delavayi</i> |
| - | Scapes glabrous; flowers ebracteate, sepals persistent..... | 3 |
| 3. | Leaf blade ovate or elliptic, base broadly cuneate or attenuate..... | <i>O. glacialis</i> |
| - | Leaf blade reniform, orbicular or round in outline, base cordate to sub-cordate | 4 |
| 4. | Leaf margins crenate; petals linear to spatulate, apex acute..... | <i>O. polypetala</i> |
| 4. | Leaf margin lobed; petals ovate-oblong to obovate, apex round | <i>O. kumaonensis sp. nov.</i> |

Acknowledgements

Authors are thankful to the Director and Dean, Wildlife Institute of India for necessary support and encouragements. First author (IDR) is thankful to SERB-DST, Govt. of India for financial support.

References

- Aitchison, J.E.T. & Hemsley, W.B. (1882) On the flora of Kurrum Valley etc., Afghanistan, Part-II. *Journal of the Linnean Society, Botany* 19: 139–200.
<http://dx.doi.org/10.1111/j.1095-8339.1882.tb00357.x>
- Boeckeler, O. (1875) Die Cyperaceen. *Linnaea* 39: 1–158.
- Bunge, von A. (1836) *Verzeichniss der im Jahre 1832 im östlichen Theile des Altai-Gebirges gesammelten Pflanzen. Ein Supplement zur Flora Altaica*. St. Petersburg, Kaiserliche Acad, der Wissenschaften, 608 pp.
- Clarke, C.B. (1894) Cyperaceae. In: Hooker, J.D. (Aut.) *Flora of British India* 6. L. Reeve & Co. Ltd, London, 792 pp.
- Evans, W.E. (1921) Diagnoses specierum novarum. *Notes from the Royal Botanic Garden* 13: 149–187.
- Franchet, A. (1886) Plante Yunanenses. *Bulletin de la Société Botanique de France* 33: 374–375.
- Hara, H. & Williams, H.J. (1979) *An enumeration of the flowering plants of Nepal* 2. British Museum of Natural History, London, UK.
- Haston, E., Richardson, J.E., Stevens, P.F., Chase, M.W. & Harris, D.J. (2009) The Linear Angiosperm Phylogeny Group (LAPG) III: A linear sequence of the families in APG III. *Botanical Journal of the Linnean Society* 161: 128–131.
<http://dx.doi.org/10.1111/j.1095-8339.2009.01000.x>
- Hooker, J.D. & Thomson, T. (1855) *Flora Indica* 1. W. Pamplin, London, 285 pp.
- Hooker, J.D. (1875) *Flora of British India* 1. L. Reeve & Co., Ltd. NR. Ashford, Kent, 740 pp.
- IUCN Standards and Petitions Subcommittee (2014) *Guidelines for Using the IUCN Red List Categories and Criteria*, Version 11. Prepared by the Standards and Petitions Subcommittee, 87 pp.
- Jussieu, A.L. de (1789) *Genera plantarum*. Paris, 498 pp.
- Kukenthal, G. (1909) Cyperaceae-Caricoideae. *Das Pflanzenreich: Regni vegetabilis conspectus* 38.
- Linnaeus, C. (1753) *Species Plantarum* 1. Stockholm, 560 pp.
- Naithani, B.D. (1984) *Flora of Chamoli* 1. Botanical Survey of India, Howrah, 379 pp.
- Uniyal, B.P., Sharma, J.R., Choudhery, U. & Singh, D.K. (2007) *Flowering plants of Uttarakhand – A checklist*. BSMPS, Dehradun, 404 pp.
- Wang, W., Fu, D., Li, L., Bruce, B., Anthony, R.B., Bryan, E.D., Michael, G.G., Yuichi, K., Orbélia, R.R., Michio, T., Michael, J.W., Zhu G. & Svetlana, N.Z. (2001) Ranunculaceae. *Flora of China* 6: 133–438.