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Hydrangeaceae

Hydrangeaceae: Webedition 1 (2012)

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Editors
Mark F. Watson, Shinobu Akiyama, Hiroshi Ikeda, Colin A. Pendry,
Keshab R. Rajbhandari, Krishna K. Shrestha

Authors
Sirjana Shrestha, Krishna K. Shrestha & Colin A. Pendry

Genera in this account

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Appendices

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Hydrangeaceae

Sirjana Shrestha, Krishna K. Shrestha & Colin A. Pendry

Small trees, shrubs, subshrubs or climbing shrubs. Leaves simple, opposite (rarely subopposite), subsessile to petiolate, exstipulate, margins more or less serrate, glabrous or with indumentum of simple or stellate hairs, pinnately veined or 3- or 5-veined at base. Inflorescence a cyme, corymb or raceme, sometimes with larger, sterile flowers on margins. Bracts and bracteoles present. Fertile flowers bisexual, small or medium sized, actinomorphic. Sepals 4 or 5, connate into a tube more or less adnate to ovary, lobes distinct, sepaloid or tooth-like. Petals 4 or 5, free. Stamens 10–30, diplostemonous, filaments linear, subulate or dilated, sometimes 2-dentate at apex. Ovary 3–5-lobed, inferior to partially superior, styles 2–6, free to partially connate. Fruit a many-seeded, loculicidal capsule or berry.
Worldwide about 17 genera and 250 species, particularly in temperate and subtropical regions of the N hemisphere. Four genera and eight species in Nepal.

Key to Genera

1a Sterile flowers present..... **1. *Hydrangea***
b Sterile flowers absent.....2

2a Inflorescence a terminal panicle. Fruit a berry..... **2. *Dichroa***
b Inflorescence cymose corymbs or racemes borne on leafy lateral branchlets. Fruit a capsule.....3

3a Flowers in cymose corymbs. Petals 5. Leaves with stellate hairs. Stamens 10, with 2-dentate filaments ..... **3. *Deutzia***
b Flowers in racemes. Petals 4. Leaves with simple hairs. Stamens 20–30, with simple filaments ..... **4. *Philadelphus***

1. *Hydrangea* L., Sp. Pl. 1: 397 (1753).

Shrubs, subshrubs or small trees, erect or climbing. Leaves opposite, petiolate, pinnately veined. Indumentum glabrous to variously hairy, hairs simple. Leaves pinnately veined. Inflorescence a terminal, occasionally axillary, corymbose cyme. Sterile flowers present, more numerous in cultivated taxa, occasionally absent in wild plants, borne at the margin of inflorescence on long pedicels, sepals 4 or 5, petaloid. Fertile flowers usually numerous, bisexual, smaller than sterile flowers. Pedicels short. Calyx tube adnate to ovary, 4- or 5-toothed. Petals 4 or 5, free, rarely connate and forming a calyptra, ovate, valvate. Stamens 10–14, inserted on disk, filaments linear, anthers oblong. Ovary inferior with flat apex to semi-superior with the apex projecting beyond the calyx tube, 2–4(or 5)-locular, placentation axile or parietal, ovules numerous. Styles 2–4, free or basally connate, stigma terminal or decurrent. Fruit a loculicidal capsule.

Worldwide about 30 species, from the Himalaya to E Asia, SE Asia, N and S America. Four species in Nepal with a further three cultivated.

Hydrangea macrophylla (Thunb.) Ser. (syn. *Viburnum macrophyllum* Thunb.), *H. paniculata* Siebold and *H. stylosa* Hook.f. & Thomson (syn. *H. macrophylla* subsp. *stylosa* (Hook.f. & Thomson) E.M.McClintock) are cultivated in the Kathmandu Valley and may be found more widely in the rest of Nepal. All are included in the key. *Hydrangea macrophylla*, native to Japan, is the most commonly grown species throughout the world and includes numerous cultivars. It is notable for the range of colours in its flowers which respond to soil pH, with blue flowers in acid soils and pink flowers in base-rich soils. *Hydrangea paniculata* from China, Japan and the far east of Russia has white flowers in elongate, pyramidal panicles which are quite distinct from all other species in Nepal. *Hydrangea stylosa* from Bhutan, Sikkim, Burma and Yunnan may yet be found growing wild in E Nepal. It is has blue flowers and is easily separable from the other species by the key characters.

Key to Species

1a Leaves pubescent along veins and in vein axils only, otherwise glabrous.....2
b Leaves more or less pubescent on both surfaces.....3

2a Climbing shrub. Petals connate to form a calyptra..... **1 *H. anomala***
b Erect shrub. Petals free..... ***H. stylosa***

3a Inflorescence a pyramidal, paniculate cyme. Leaves ovate ..... ***H. paniculata***
b Inflorescence a corymbose cyme. Leaves elliptic, oblong or broadly or narrowly ovate.....4

4a Ovary partially superior, apex conical.....5
b Ovary completely inferior, apex flat.....6

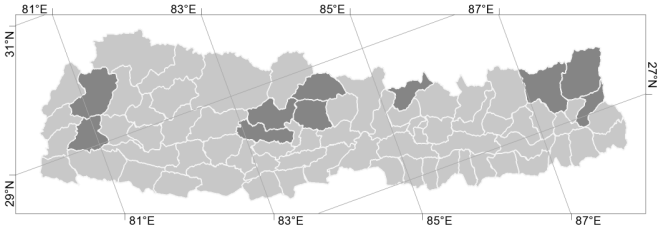
5a Sterile and fertile flowers white or yellowish.....**2 *H. heteromalla***
b Sterile and fertile flowers pink, blue or purple..... ***H. macrophylla***

6a Leaves narrowly ovate to elliptic or oblong, 1.5–9 cm wide. Inflorescence axis slender. Petals blue..... **3 *H. aspera***
b Leaves broadly ovate, 5–15 cm wide. Inflorescence axis stout. Petals purple.....**4 *H. robusta***

1. *Hydrangea anomala* D.Don, Prodr. Fl. Nepal.: 211 (1825).
Hydrangea altissima Wall.

Climbing shrub to 2–6 m. Branchlets brown, glabrous. Petioles 2–8 cm. Leaves ovate, elliptic, oblong or oblong-ovate, 4–17 × 2.5–12 cm, base rounded to cuneate, apex acuminate, margin serrate, glabrous above, pubescent below along the veins and in their axils, secondary veins 6–8 pairs. Inflorescence 10–30 cm, loose, spreading, about 25 cm across. Sterile flowers white, sometimes absent, sepals 4, obovate to suborbicular, base cuneate to rounded, apex obtuse to slightly obcordate, 7–9 × 7–10 mm, margin entire. Fertile flowers creamy white, calyx tube campanulate, 1.5–2 mm in diameter, teeth triangular, ca. 0.5 mm. Petals 5, connate apically, forming a 2–2.5 × 1–1.5 mm calyptra. Stamens 10 or 12, subequal, filaments 2–3 mm, anthers subglobose ca. 0.5 × 0.5 mm. Ovary inferior, placentation axile, styles 2 or 3, free, recurved, ca.1.5 mm in fruit. Capsule urceolate, 3–3.5 mm in diameter.

Distribution: Nepal, W Himalaya, E Himalaya, Tibetan Plateau, Assam-Burma and E Asia.



Altitudinal range: 1700–2900 m.

Ecology: Broad-leaved forests, stream-sides and rocky mountain slopes.

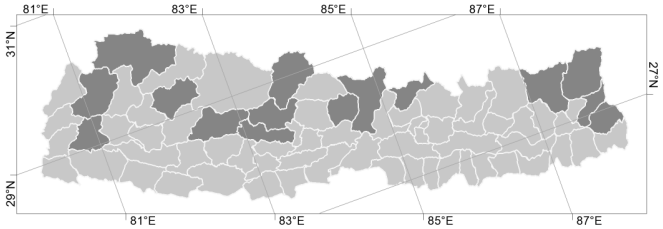
Flowering: April–July. **Fruiting:** August–October.

2. *Hydrangea heteromalla* D.Don, Prodr. Fl. Nepal.: 211 (1825).
Hydrangea vestita Wall.

फुस्रे काठ Phusre kath (Nepali).

Shrub to 3–10 m. Branchlets red-brown, with a few elliptical lenticels, pubescent with simple hairs. Petioles 2–5 cm, with pilose hairs. Leaves obovate to elliptic or oblong-ovate, 10–25 × 4–11 cm, base cuneate, obtuse or truncate, apex acuminate, margin serrulate or doubly serrate, the teeth acuminate, sparsely pubescent above, densely strigose-pubescent below, secondary veins 8–11 pairs. Inflorescence 12–20 × 12–20 cm, ca. 27 cm wide in fruit. Sterile flowers white or yellowish. Sepals 4 or 5, obovate, ovate or orbicular, 0.5–2 × 0.5–2 cm, base cuneate to rounded, apex acute to acuminate, margin entire, sparsely ciliate. Fertile flowers white or yellowish, ca. 6 mm across. Pedicels 2–3 mm, pubescent. Calyx tube funneliform to campanulate, ca. 1 mm in diameter, teeth triangular. Petals 5, oblong, 2.2–3 × 1–1.5 mm, apex acute to shortly acuminate. Stamens 10, unequal, longer stamens opposite petals and shorter stamens alternate with petals, 2–4 mm, filaments broad at the base. Ovary up to half superior, placentation axile, styles 3 or 4, erect, subulate, 1.5–2 mm, stigma thickened. Capsule subglobose, 3–5 × 2–3 mm.

Distribution: Nepal, E Himalaya, Tibetan Plateau, Assam-Burma and E Asia.



Altitudinal range: 1600–3200 m.

Ecology: Mountain forests, especially with *Tsuga* and *Picea*.

Flowering: June–August. **Fruiting:** September–October.

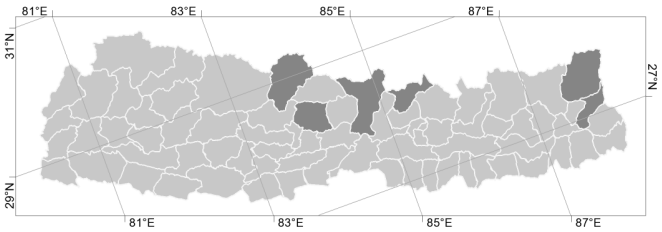
Hara (Fauna Fl. Nepal Himalaya: 142. 1955) misspelt this species as '*heterophylla*'.
Juice of the bark is used to treat coughs and colds.

3. *Hydrangea aspera* Buch.-Ham. ex D.Don, Prodr. Fl. Nepal.: 211 (1825).
Hydrangea vestita var. *fimbriata* Wall. nom. nud.; *H. vestita* var. *fimbriata* Wall. ex DC.

Shrub or small trees to 3–5 m. Branchlets brown, terete or obscurely 4-angled, strigose or pubescent. Petioles 1–4.5 cm. Leaves narrowly ovate to elliptic or oblong, 4–28 × 1.5–9 cm, base rounded to cuneate, apex acuminate, margin serrate with teeth alternating in size, sparsely to densely strigose above, pubescent to villous below, secondary veins 6–10 pairs. Inflorescence 6–25 cm across. Sterile flowers greenish white, pinkish or red, sepals 4 or 5, ovate, obovate or orbicular, 1.5–2.5 × 0.8–2.5 cm, base cuneate, apex mucronulate, margin entire to serrate. Fertile flowers purple blue, calyx tube

campanulate to cupular, 1–1.5 mm in diameter, teeth triangular to ovate-triangular, 0.5–1 mm. Petals 5, free, ovate, 2–2.5 × 1–1.5 mm. Stamens 10, unequal, 2.5–4 mm, anther globose, ca. 1 × 1 mm. Ovary inferior, placentation axile, styles 2 or 3, free, recurved, ca. 1–2 mm in fruit. Capsule urceolate, 3–3.5 mm in diameter.
Fig. 1a

Distribution: Nepal, W Himalaya, E Himalaya, Tibetan Plateau, Assam-Burma and E Asia.



Altitudinal range: 1200–2700 m.

Ecology: Dense forests or thickets in valleys or on mountain slopes.

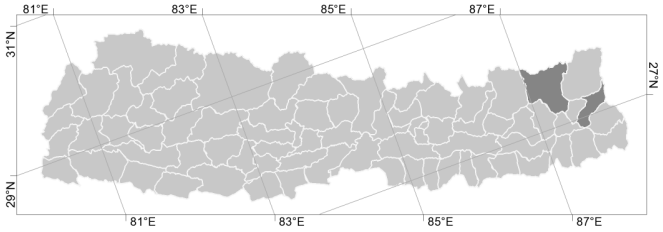
Flowering: July–September. **Fruiting:** October–November.

4. *Hydrangea robusta* Hook.f. & Thomson, J. Proc. Linn. Soc., Bot. 2: 76 (1857).
Hydrangea aspera subsp. *robusta* (Hook.f. & Thomson) E.M.McClint.

फिरफिरे घाँस Phirphire ghans (Nepali).

Shrubs to 4 m. Branchlets terete, pubescent to hispid. Petioles 3–8 cm. Leaves broadly ovate to slightly obovate, 9–22 × 5–15 cm, base rounded, obtuse or truncate, apex acuminate, margin doubly serrate with teeth alternating in size, acuminate, sparsely pubescent above, densely pubescent to strigose below, secondary veins 8–13 pairs. Inflorescence 10–12 × 10–30 cm. Sterile flowers white, sepals 4, ovate to orbicular, 1.5–2 × 1–2 cm, base rounded to cuneate, apex acute to obtuse, margin serrate to dentate in the upper half. Fertile flowers purple, calyx tube cupular, 1.5–2 mm in diameter, teeth ovate to triangular, 0.5–1 mm. Petals 5, free, ovate to lanceolate, 2–3 × 1.5 mm. Stamens 10–14, unequal, 6–10 mm. Ovary inferior, placentation axile, styles 2, spreading to recurved, 1–2 mm in fruit. Capsule cupular, 3–4 × 3–5 mm.

Distribution: Nepal, E Himalaya, Tibetan Plateau, Assam-Burma, S Asia and E Asia.



Altitudinal range: 1900–2500 m.

Ecology: Forests or thickets in valleys, along stream banks or on mountain slopes.

Flowering: July–August. **Fruiting:** September–February.

2. *Dichroa* Lour., Fl. Cochinch. 1: 301 (1790).
Adamia Wall.

Shrubs or subshrubs. Indumentum of simple hairs. Leaves opposite or rarely subopposite, petiolate, opposite, rarely alternate, pinnately veined. Inflorescence a terminal panicle. Flowers all fertile. Calyx tube adnate to ovary, obconical, 5(or 6)-toothed. Petals 5 or 6, free, induplicate-valvate. Stamens 10–20, filaments filiform to subulate, anthers ellipsoid to ovoid. Ovary inferior, incompletely 3–5 locular, placentation parietal, ovules numerous, styles 4(–6), connate only at base, divergent, stigma oblong to subglobose. Fruit a fleshy berry; seeds ovoid, minute.

Worldwide twelve species from the Himalaya to E Asia and SE Asia. One species in Nepal.

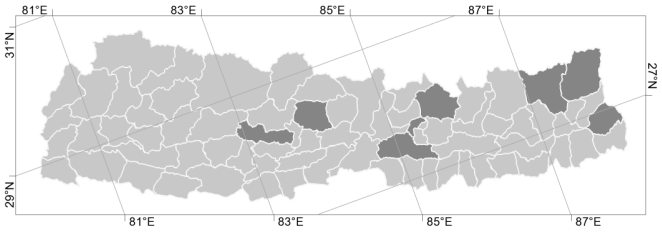
1. *Dichroa febrifuga* Lour., Fl. Cochinch. 1: 301 (1790).
Adamia cyanea Wall.

बँसुली Bansuli (Nepali).

Shrub, 1–2 m. Stems glabrous, flowering branchelets pubescent. Petioles 1–3.5 cm. Leaves elliptic, obovate, elliptic oblong 6–25 × 1.5–5.5 cm, base cuneate, apex acute to acuminate, margin serrate, glabrous above except on veins, slightly pubescent below, denser on veins, secondary veins 8–10 pairs, Inflorescence 3–15 cm, pubescent. Calyx tube adnate to ovary, 5 mm in diameter, teeth 0.5 × 1 mm. Petals blue, elliptic to oblong-lanceolate, 4–6 × 1.5–2.5 mm, reflexed at maturity. Stamens 5–6 mm, filaments 3–4 mm, anthers ca. 2 × 1 mm. Styles 2–3 mm, stigmas subglobose to oblong, ca. 1 × 1 mm. Berry intense metallic blue, subglobose, 3–8 mm in diameter.

Fig. 1b-c

Distribution: Nepal, E Himalaya, Assam-Burma, S Asia, E Asia and SE Asia.



Altitudinal range: 1100–2500 m.

Ecology: Mixed forests on mountain slopes or in valleys.

Flowering: February–May. **Fruiting:** June–August.

The plant is emetic and febrifuge. Roots are used in the treatment of malaria and coughs.

3. ***Deutzia*** Thunb., Nov. Gen. Pl. 1: 19 (1781).

Erect shrubs. Indumentum of stellate hairs. Leaves opposite, subsessile to shortly petiolate, pinnately veined. Inflorescence a cymose corymb, terminal on lateral branchlets from buds enclosed by imbricate scales persisting at base. Flowers all fertile. Calyx tube adnate to ovary, campanulate, 5-toothed. Petals 5, induplicate or imbricate. Stamens 10, 2-seriate, filaments flat, filaments of outer stamens 2-dentate at apex, filaments of inner stamens truncate to 2-dentate at apex, anthers shortly stalked, subglobose. Ovary inferior, 3–5-loculed, placentation axile, ovules numerous, styles 3–5, free, stigmas terminal or decurrent. Fruit a capsule, 3(–5)-valved, dehiscing loculicidally or between styles; seeds numerous, oblong, compressed.

Worldwide about 60 species in the warm temperate regions of the N hemisphere. Two species in Nepal.

Key to Species

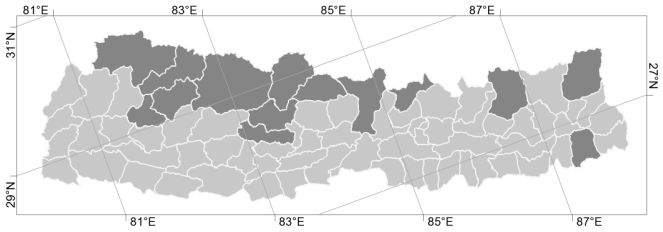
1a	Petals oblong to elliptic, induplicate. Leaves ovate	**1** ***D. staminea***
b	Petals obovate to ovate or orbicular, imbricate. Leaves elliptic to narrowly ovate	**2** ***D. compacta***

1. ***Deutzia staminea*** R.Br. ex Wall., Pl. Asiat. Rar. 2[8]: 82, pl. 191 (1831).
Deutzia bhutanensis Zaik.; *D. brunoniana* Wall. nom. nud.; *D. brunoniana* Wall. ex G.Don; *D. staminea* Wall. nom. nud.; *D. staminea* var. *brunoniana* (Wall. ex G.Don) Hook.f. & Thomson.

सुन्तले Suntale (Nepali).

Shrubs 2–4 m. Stems 9–14-rayed stellate hairy, soon glabrescent. Petioles 1–2.5(–5) mm. Leaves ovate, 2–5(–7.5) × 1–3.5 cm, base rounded or broadly cuneate, apex acute to acuminate, margin serrulate, regularly 4–8-rayed stellate hairy above, densely 9–14-rayed stellate hairy below, secondary veins 3–6 pairs. Inflorescences 2–5(–9) cm, 9–25-flowered, terminal or on 2–6-leaved flowering branchlets, axes stellate hairy. Pedicels 4–6 mm. Flowers ca. 1 cm across. Calyx tube cupular, densely yellowish stellate hairy, teeth triangular to narrowly ovate, 2 × 1 mm. Petals white, induplicate, oblong to elliptic, 6–10 mm × 3–6 mm, stellate hairy outside, glabrous within. Outer stamens 6–8 mm, inner stamens 4–6 mm, anthers globose, on 1–1.5 mm stalk. Styles 7–8 mm. Capsule hemispheric, 3–4 mm in diameter.

Distribution: Nepal, W Himalaya, E Himalaya, Tibetan Plateau and E Asia.



Altitudinal range: 1100–3500 m.

Ecology: In thickets on mountain slopes.

Flowering: April–July. **Fruiting:** August–November.

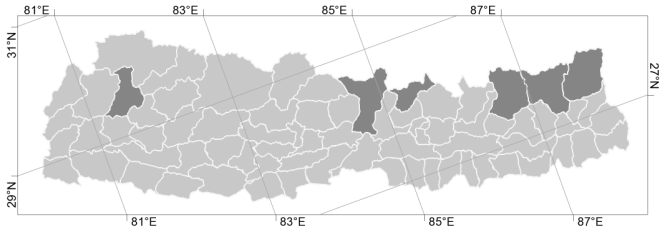
Juice of the plant is used to cure fever. The plant is used as fodder.

2. ***Deutzia compacta*** Craib, Kew Bull. 1913: 264 (1913).
Deutzia corymbosa var. *hookeriana* C.K.Schneid.; *D. hookeriana* (C.K.Schneid.) Airy Shaw.

Shrubs 2–2.5 m. Stem 6–8-rayed stellate hairy, glabrescent. Petioles 2–3 mm. Leaves narrowly ovate to elliptic, 2–7.5 × 0.8–2.5 cm, base rounded to cuneate, apex acute to acuminate, margin serrulate, regularly 4–6-rayed stellate hairy above, hairs sometimes with erect central ray, more densely

stellate hairy below, secondary veins 3–4 pairs. Inflorescences 2–8 cm, 8–15 flowered, terminal or on 4–6-leaved flowering branchlets, axes rather sparsely stellate hairy. Pedicels 3–15 cm. Flowers ca. 1 cm across. Calyx tube cupular, stellate hairy, teeth broadly ovate, 1.5–2 × 1.5–2.5 mm. Petals white to pink or purplish, imbricate, obovate to ovate or suborbicular, 6–7 × 5–6 mm, stellate hairy outside, glabrous within. Outer stamens 4–7 mm, inner stamens 3–4 mm, anthers globose, on ca. 1 mm stalks. Styles 3 or 4(or 5), free, 4–5 mm. Capsule hemispheric, 3–4 mm in diameter.
Fig. 1d-f

Distribution: Nepal, E Himalaya, Tibetan Plateau, Assam-Burma and E Asia.



Altitudinal range: 2100–3900 m.

Ecology: Riversides and alpine scrubland.

Flowering: April–June. **Fruiting:** June–September.

Clarke (Fl. Brit. Ind. 2: 406. 1878) partially misapplied *Deutzia corymbosa* R.Br ex G.Don to this species.

Noshiro et al. 9840077 (TI, E), collected in fruit from Sankhuwasaba, was previously determined as *D. compacta*, but its flowers have 5 or 6 styles and it has larger leaves (to 9 × 4 cm) whose underside have an even indumentum of stellate hairs with long, erect central rays. It appears not to match any Himalayan species, but the material is not complete enough to be certain that it is a new species.

4. *Philadelphus* L., Sp. Pl. 1: 470 (1753).

Erect shrubs. Indumentum of simple hairs. Leaves opposite, petiolate, 3–5-veined above base. Inflorescence racemose, terminal on lateral branchlets from buds enclosed by imbricate scales persisting at base. Flowers all fertile. Calyx tube adnate to ovary, 4(or 5)-lobed. Petals 4, contorted. Stamens 20–30, filaments subulate, free, anthers ovoid or oblong. Ovary inferior to slightly superior, 4 (or 5)-locular, placentation axile, style solitary (3 or)4-lobed, stigmas clavate. Fruit a 4–5-valved loculicidal capsule.

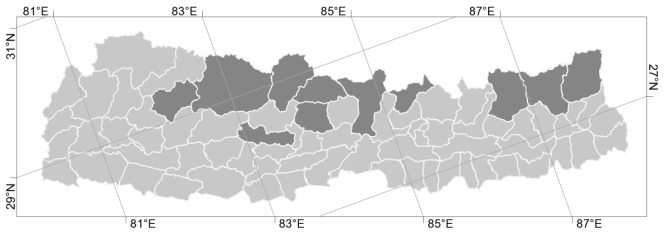
Worldwide about 80 species in temperate regions of N hemisphere. One species in Nepal.

1. *Philadelphus tomentosus* Wall. ex G.Don, Gen. Hist. 2: 807 (1832).
Philadelphus coronarius var. *tomentosus* (Wall. ex G.Don) Hook.f. & Thomson; *P. nepalensis* Wall. ex Loudon nom. nud.; *P. nepalensis* Koehne; *P. tomentosus* Wall. nom. nud.; *P. tomentosus* forma *nepalensis* (Koehne) H.Hara; *P. tomentosus* Wall. ex G.Don forma *tomentosus*; *P. triflorus* Wall. ex S.Y.Hu; *P. triflorus* Wall. nom. nud.

Shrubs to 2–3 m. Branchlets red-brown, glabrous or sparsely villous. Petioles 0.3–1 cm, villous. Leaves ovate, 2–10 × 0.5–5 cm, base rounded or cuneate, apex acuminate, margin minutely and distantly serrate, glabrous above, below pubescent along veins and margin or densely pubescent throughout. Inflorescence 5–7-flowered, 3–10 cm, on 2–6-leaved lateral branchlets, axes glabrous. Flowers 1.5–2 cm across. Pedicels 0.5–1.5 cm. Calyx tube adnate to ovary, 1–1.7 cm in diameter, sepals ovate, 5–6.5 × 2–4 mm, acuminate, glabrous or sparsely pubescent outside, pubescent within towards apex. Petals 4, white, obovate, 10–15 × 7–12 mm. Stamens 20–30, filaments 4–7 mm, anthers ca. 1 × 1 mm. Style 7–8 mm, apically divided for one third of its length. Capsule, ellipsoid, ca. 1 × 0.5 cm, sepals persistent, erect to reflexed; seeds flattened, ca. 2 mm.

Fig. 1g-i

Distribution: Nepal, W Himalaya, E Himalaya, Tibetan Plateau and Assam-Burma.



Altitudinal range: 1800–3600 m.

Ecology: Open slopes, tracksides.

Flowering: April–July. **Fruiting:** August–October.

Schilling (J. Roy. Hort. Soc. 94: 227. 1969) misapplied the name *Philadelphus coronarius* L. to this species.

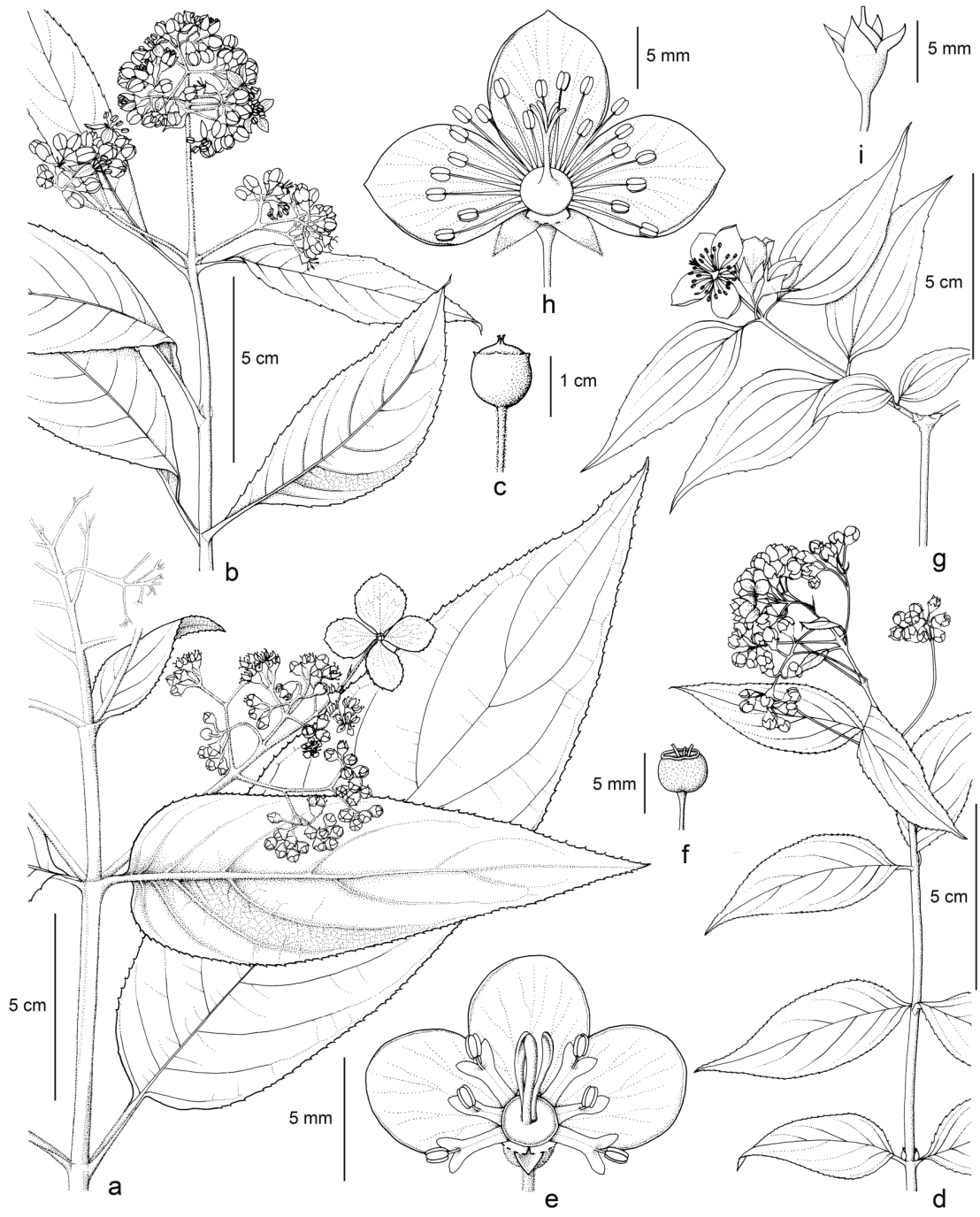


Fig. 1.
HYDRANGEACEAE. **Hydrangea aspera**: a, inflorescence and leaves. **Dichroa febrifuga**: b, inflorescence and leaves; c, fruit. **Deutzia compacta**: d, inflorescence and leaves; e, opened flower; f, fruit. **Philadelphus tomentosus**: g, flowering branch; h, opened flower, i, fruit.

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Fig. 1
Claire Banks

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This Web-edition pdf document forms part of a set of Flora accounts for families and genera that have been finalized, including those in volumes yet to be printed. These pdf documents are made accessible via the *Flora of Nepal* website (www.floraofnepal.org) and will be periodically updated in numbered versions, permanently available and citable.

Flora of Nepal takes an innovative approach to Flora writing, with an underlying data base system managing the *Flora of Nepal Knowledge Base* from which the printed volumes and the 'online Flora' (www.floraofnepal.org) are generated. The Internet-accessible dataset augments the printed Flora by presenting all herbarium specimen data, detailed taxonomic information (such as full nomenclatural references and typification), distribution maps with point occurrences and images used when preparing the Flora. Much of this information is accumulated as a normal part of taxonomic working practices when undertaking a floristic revision, but it is usually lost to a wider audience as it is rarely included in the traditional printed Flora.

Flora of Nepal includes all native and fully naturalized vascular plants recorded within the political borders of Nepal, including brief references to agricultural and horticultural plants as appropriate. For pragmatic reasons the arrangement of families in the printed *Flora of Nepal* follows a modified Englerian sequence, closely following that of the *Flora of China* and, to a lesser extent, the *Flora of Bhutan*.[1, 2] In recent years the world view on the arrangement of families has radically changed following overwhelming phylogenetic evidence. The emergent family-level classification, now in its third iteration as APG III, is reasonably stable and widely accepted.[3] It has not been possible to alter the family sequence in *Flora of Nepal* printed volumes midway through the project, but as the data are stored separately in a database, the families can be reorganized electronically at a later date to reflect alternative classifications. Circumscription of families and genera, however, generally does follow a contemporary understanding of their relationships, except where group experts advise otherwise. Genera and species are treated in taxonomic order, or if there is disagreement then morphologically similar species are usually grouped together or occasionally listed alphabetically. Infraspecific taxa are always presented in alphabetical order. Intermediate ranks, such as subfamily, tribe, subgenus, section and series, are only used when they are useful in the treatment of large families or genera.

Information on nomenclature and classification is given for all accepted scientific names and synonyms pertaining to Nepal and nearby regions. Emphasis is given to those names listed in the primary checklists for Nepal: *Enumeration of the Flowering Plants of* Nepal,[4] *Annotated Checklist of the Flowering Plants of* Nepal,[5] and *Flowering Plants of Nepal (Phanerogams)*.[6] At the generic level, synonyms widely used in the Asian literature are included. Full bibliographic citation with authorship is given for all accepted names and their basionyms at the rank of genus and below. As far as possible, the bibliographic citations of all accepted names and their basionyms have been verified with the original literature. The basionym precedes all other synonyms, which are listed alphabetically. Misapplied names (misidentifications encountered in the literature) are not included in synonymy, but are discussed in the supporting information at the end of a taxon. Authors of plant names follow the standard forms given in *Authors of Plant Names* and its continuously updated online supplement (www.ipni.org).[7] Bibliographic references are given using the standard abbreviations in BPH-2 for serial publications (journals and periodicals) and in TL-2 (and its supplements) for books.[8, 9] In some cases books were published in several fascicles on different dates, sometimes over different years, but not indicated as such in the printed work. Date of publication is critical for establishing nomenclatural priority, and so it is important to be precise when citing names published in such works. The fascicle composition and publication dates of these often complex cases are clearly explained in TL-2, but the standard abbreviation does not differentiate between them. In these instances the TL-2 abbreviation has been amended with brackets to clearly indicate which fascicle is being referred to, for example Wallich, N., Pl. As. Rar. 2[8]. 1831. Books and periodicals not included in these two standard references have been abbreviated according to the recommendation in Appendix A of BPH-2.

Where a taxon has a widely recognized local name this is given in Devanagri script, followed by its transliteration into the Latin alphabet and the language of the vernacular name in parentheses '( )'. One local name is given in the printed Flora, whereas multiple alternative vernacular names in different languages may be included in the *Flora of Nepal Knowledge Base* and made available online. Separate indexes to vernacular names in Devanagri, their Latin transliterations and scientific names are included at the end of each volume.

Descriptions are given for all taxa (family, genus, species, infraspecies and occasionally intermediate ranks) and wherever possible are based on primary observations and measurements made on specimens from Nepal. If no such material was available to authors, descriptions are taken from specimens from adjacent countries or secondary sources, and annotated as such. Most descriptions are about 150 words long, but exceptionally they are shorter or longer depending on the complexity of the taxon being described. For species with more than one infraspecific taxon, a full description is given for the species and short diagnoses for the lower taxa. Descriptions aim to be consistent and parallel between taxa of the same rank within a higher taxon. Authors were asked to standardize descriptive terms using the definitions given in *Plant Identification Terminology*.[10] If a single measurement is given it refers to length, and if width is also given it is in the format length × width. Ranges are separated by an en-dash (–) and discontinuous states by the word 'or'. Exceptional measurements are given in parentheses '( )'. Taxon statistics and short statements on worldwide distribution are provided for families and genera, with summary statistics of lower taxa represented in Nepal.

Identification keys are dichotomous and presented in a bracketed format, with all elements strictly parallel between the two leads of each couplet. Keys are artificial and not intended to reflect any taxonomic classification. There is usually a single key to genera within a family, combining flowering, fruiting and vegetative characters, but where this is unwieldy separate keys are given for flowering and fruiting material (e.g. Cruciferae, Rosaceae). Keys are also given for species within a genus and taxa within a species. Figures are provided to aid identification by illustrating the diagnostic characters of each family and genus, and for large genera variation in major morphological features is represented.

The geographic distribution within Nepal is indicated for each species and infraspecific taxon at the political district level by a shaded distribution map. The distribution maps are evidence-based, produced from the *Flora of Nepal Knowledge Base* using locality information taken from authenticated herbarium specimens and records of plants *in situ* made by credible observers. Ideally all specimens identified by authors should be geo-referenced and databased when they are preparing *Flora of Nepal* accounts, but where this is not possible a minimum of one specimen per district is required. Sometimes the distribution of a species is greater than the sum of the distribution maps of its infraspecific taxa. This is a result of some herbarium specimens only being identifiable to species level. Occasionally species are known only from poorly localised collections, especially those from the early 19th century. For example, Wallich often only gave 'Napalia' as the locality for many of his 1820–1821 collections. These specimens are most likely to have come from the Kathmandu Valley, known as the 'Nepal Valley' or just 'Nepal' at that time, but they might also have been collected during his inward and outward journeys from India via Hetauda, or by pilgrims going north to 'Gossainthan' (Gossainkund). It is therefore impossible to be sure of the correct district and in such cases this is noted in the supporting information and the map omitted. The *Flora of Nepal* website gives access to the underlying distribution and specimen information through an interactive dot map plotting all geo-referenced occurrence records and a listing of all material recorded.

Distribution for species and infraspecific taxa occurring outside Nepal is indicated by a list of geographical regions, with the resolution becoming coarser with increasing distance from Nepal. In order to utilise information contained within other published Floras these areas are defined according to political borders, with countries or provinces grouped to form regions that have some underlying biogeographic basis. For example, although the Tibetan Plateau extends into parts of Sichuan and Yunnan, we limit it to Xizang and Qinghai. *Flora of Nepal* takes no stance on any politically disputed border areas and is following the current

international mapping convention of using the 'lines of control' to delineate its regions. The names used for the regions are intended to be descriptive and non-political. The regions are:

W Himalaya	India (Jammu & Kashmir, Himachal Pradesh, Uttarakhand), northern Pakistan (Khyber Pakhtunkhwa, previously known as North West Frontier Province).
E Himalaya	Sikkim, Darjeeling, Bhutan, NE India (Arunachal Pradesh).
Tibetan Plateau	China (Xizang, Qinghai).
Assam-Burma	Assam, Nagaland, Manipur, Myanmar.
S Asia	Eastern Pakistan (Punjab, Sind, Islamabad), Peninsular India, Sri Lanka, Bangladesh, Maldives.
E Asia	China (excluding Xizang, Xinjiang, Qinghai), Korea, Japan, Taiwan.
SE Asia	Thailand, Laos, Cambodia, Vietnam, Malaysia, Indonesia, Philippines, New Guinea.
N Asia	China (Xinjiang), Russia, Mongolia.
C Asia	Kazakhstan, Uzbekistan, Turkmenistan, Tajikistan, Kyrgyzstan.
SW Asia	Afghanistan, western Pakistan (Baluchistan, Federally Administered Tribal Areas), Iran, Middle East, Arabian Peninsula, Turkey, Azerbaijan, Armenia, Georgia.
Asia	collective term for all above areas of Asia.
Europe	includes Ukraine, Belarus, Baltic republics.
Africa	includes Madagascar.
N America	includes C America south to Panama.
S America	south of Panama.
Australasia	Australia, New Zealand, Pacific Islands.
Cosmopolitan	collective term for a generally worldwide distribution.

Altitudes (elevation above sea level) are based on herbarium specimen data or records from credible observers. They are given to the nearest 100 m rounded up or down, with exceptional altitudes given in parentheses '( )'. Likewise, flowering and fruiting times are based on specimens collected from Nepal, or on material from adjacent regions if these data are lacking and a note is provided to explain this. The short statement on the ecological preference of each species and infraspecific taxon is mostly taken from herbarium specimen data. Currently these often lack detail, a reflection of the shortcomings of poor-quality data recorded by the past collectors of herbarium material, but these will improve with more field studies.

Supplementary information is given at the end of a taxon account discussing taxonomic issues, highlighting spot characters useful for identification, noting similar species that could cause confusion, and detailing the misapplication of names. Summary information is provided for ethnobotanical and other uses, but this is not intended to be exhaustive and is derived from secondary sources, such as *Plants and People of Nepal* and *A Compendium of Medicinal Plants of* Nepal.[11, 12]

Abbreviations

Standard abbreviations for the International System of Units (SI) are used for measurements. Herbaria are cited using the standard abbreviation in *Index Herbariorum*.[13] Other abbreviations used in the text include:

C	central.
ca.	*circa* – about, approximately.
comb. nov.	*combinatio nova* – new combination of name and epithet.
dbh	diameter at breast height – measured on tree trunks at 1.3 m above the ground.
E	east, eastern.
et al.	*et alia* – and others.
fig.	figure.
N	north, northern.

nom. cons.	*nomen conservandum* – name officially conserved in ICBN.[14]
nom. illegit.	*nomen illegitimum* – illegitimate name, according to ICBN.[14]
nom. inval.	*nomen invalidum* – invalid name, according to ICBN.[14]
nom. nud.	*nomen nudum* – name lacking a description, or reference to an effectively published description, and so invalid according to ICBN.[14]
nom. rej.	*nomen rejiciendum* – name officially rejected in ICBN.[14]
nom. superfl.	*nomen superfluum* – name superfluous when published, and so illegitimate according to ICBN.[14]
pl.	plate.
q.v.	*quod vide* – which see.
S	south, southern.
s.l.	*sensu lato* – for a taxon treated in a broad sense.
s.s.	*sensu stricto* – for a taxon treated in a narrow sense.
sect.	section.
subfam.	subfamily.
subgen.	subgenus.
subsp.	subspecies.
subvar.	subvariety.
syn.	synonym
var.	variety.
W	west, western.
>	greater than
<	less than

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