Flora of Nepal
नेपालका वनस्पति

Polygalaceae

Polygalaceae: Webedition 1 (2016)

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

Authors
Colin Pendry

Genera in this account

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Appendices
1: Illustration plates
2: Format, abbreviations and categories used in Flora of Nepal

See printed volumes of the Flora of Nepal (www.rbge.org.uk/publications/floraofnepal) and the project website (www.floraofnepal.org) for further information on the Flora of Nepal and acknowledgement of the institutes and people involved with this international collaborative project.

Royal Botanic Garden Edinburgh

Polygalaceae

Colin Pendry

Herbs, shrubs and woody climbers. Nodal glands occasionally present. Leaves simple, alternate, exstipulate, petiolate or subsessile, pinnate- or palmate-veined. Inflorescences axillary supra-axillary or terminal spikes, racemes or panicles; bracts solitary, bracteoles 2 or absent. Flowers bisexual, zygomorphic. Sepals 5, sometimes markedly unequal, then with the 2 inner sepals (alae) large and petaloid. Petals 3, unequal, partially connate; the 2 upper petals free on the upper side, and connate with the staminal sheath on the lower side; the lower petal (keel) clawed, with the claw adnate to the staminal sheath, keel hooded in the distal part and enclosing the anthers and stigma, sometimes with a distal appendage. Stamens 4–8, connate in a staminal sheath open on the upper side; anthers basifixed, 2-locular, opening by an apical pore. Ovary superior,1- or 2-locular; ovules apical, 1 per cell. Fruit a capsule or samara. Seeds with or without an aril.

A cosmopolitan family of about 19 genera and 1000 species. Three genera and 12 species in Nepal.

The traditional view of the Polygalaceae is that it consists of about 19 genera, with over 500 species in *Polygala*. However, recent molecular studies strongly support a narrower circumscription of *Polygala* in both the Old and New Worlds and the recognition of smaller genera with much more restricted ranges (see Abbott, J. Bot. Res. Inst. Texas 5: 125, 2011). The studies to date have concentrated on the New World, so it is premature to ascribe the Asian species currently in *Polygala* to new genera. This account therefore follows the traditional circumscription of *Polygala*, but it is acknowledged that changes will need to be made in the near future.

Key to Genera

1a Woody climbers. Ovary1-locular. Fruit a single-seeded samara with a prominent wing.....**3. *Securidaca***
b Herbs or shrubs. Ovary 2-locular. Fruit a two-seeded capsule.....2

2a Sepals markedly unequal, the two inner sepals more or less petaloid and about as long as the petals .....**1. *Polygala***
b Sepals almost equal, none petaloid, and all shorter than the petals ..... **2. *Salomonia***

1. *Polygala* L., Sp. Pl. 2:701 (1753)

Annual or perennial herbs or shrubs. Roots often (always?) aromatic. Stems terete, without nodal glands. Leaves alternate or rarely subopposite, often longer and relatively narrower in upper part of stem, pinnate-veined. Inflorescence an axillary, supra-axillary or terminal raceme; bracteoles present. Sepals markedly unequal, the 3 outer sepaloid and the 2 inner (alae) larger, more or less petaloid. Petals unequal, partially connate, the 2 upper petals free on the upper side, and connate with the staminal sheath on the lower side. Claw of lower petal (keel) adnate to the staminal sheath, keel hooded in the distal part and enclosing the anthers and stigma, the apex of the keel usually with a lobed or finely divided and brush-like appendage. Stamens 8, connate in a staminal sheath open on the upper side. Ovary symmetric, 2-locular. Style terminal, with two, more or less distinct stigmatic lobes. Fruit a 2-locular, laterally compressed, dehiscent capsule, often winged and sometimes with the partially persistent calyx. Seeds with a more or less prominent aril.

About 500 species worldwide. Nine species in Nepal.

Key to Species

1a Flowers 14–19 mm. Large shrubs to 1–3 m .....**1. *P. arillata***
b Flowers less than 10 mm. Herbs to 1 m sometimes woody at the base.....2.

2a Capsule without persistent alae .....3.
b Capsule with persistent alae .....4.

3a Flowers purple, pink or white with a purple tip. Capsule with a notched apical point ..... **2. *P. tatarinowii***
b Flowers yellow or orange. Capsule emarginate ..... **3. *P. furcata***

4a Alae strongly asymmetric with a markedly pointed apex, the margin often inrolled at apex.....**4. *P. triflora***
b Alae more or less symmetric with a rounded or scarcely pointed apex and a flat margin .....5.

5a Herbs or shrubs to 30 cm, stems arising from a perennial rootstock.....6.
b Annual herbs to 100 cm .....7.

6a Leaves narrowly elliptic. Indumentum of short, curled hairs only .....**5. *P. sibirica***
b Leaves broadly obovate or elliptic. Indumentum of long, spreading hairs and short, curled hairs....**6. *P. crotalarioides***

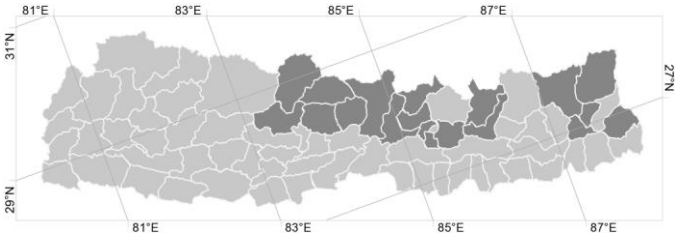
7a Bracts persistent. Upper leaves more than 0.5 cm wide .....**7. *P. persicariifolia***
b Bracts caducous. Upper leaves less than 0.5 cm wide .....8.

8a Flowers to 6 mm. Alae pale pink with a prominent network of green veins. Branching herbs to 30 cm **8. *P. abyssinica***
b Flowers to 3 mm. Alae pink with a green midvein only. Scarcely branching upright herbs to 100 cm..... **9. *P. longifolia***

1. *Polygala arillata* Buch.-Ham. ex D.Don, Prodr. fl. Nepal.:199 (1825)

Erect shrub, 1–3 m. Twigs shortly hairy, glabrescent. Leaves ovate to elliptic to slightly obovate, 5–15 (–20) × 1.5–8.5 cm, base cuneate to rounded, apex acuminate, margin flat, glabrous to sparsely appressed hairy, especially on midrib, veins and towards margin above and below. Petioles 5–10 mm. Inflorescence terminal or axillary, to 20 cm, lax, with 10–60 flowers. Bracts caducous, to 3 mm. Flowers yellow, 14–19 mm. Pedicel 4–7 mm. Outer sepals unequal, ciliate, the two lower oblong to ovate, 3.5–5 mm; the upper markedly saccate, 6–10 mm. Alae obovate, symmetric to falcate, 11–17 mm, the apex cucullate, ciliate. Upper petals glabrous. Keel 12–16 mm; appendage finely divided, 1.7–2.5 mm. Ovary glabrous or ciliate. Style hooked at apex, stigmatic lobes distinct. Capsule oblong, more or less winged, more or less two lobed, with prominent concentric ridges, 9–11 × 11–15 mm, glabrous or ciliate; calyx not persistent. Seeds spheroidal, 4.0–4.5 mm, glabrous; aril large, helmet-like.

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



Altitudinal range: 1200–3600 m.

Ecology: Understorey shrub in mid-elevation forests.

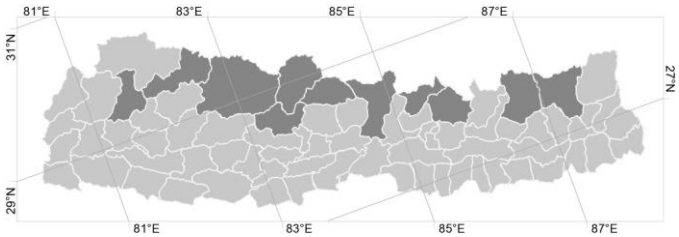
Flowering: May–September. **Fruiting:** July–November.

The only species of the shrubby section *Chamaebuxus* in Nepal, *Polygala arillata* is very much larger than the other Nepalese species, and is most unlikely to be confused with any of them.

2. *Polygala tatarinowii* Regel, Bull. Soc. Imp. Naturalistes Moscou 34(2):523 (1861)

Herb to 10 cm. Stems glabrous. Leaves orbicular to broadly ovate or obovate, 0.8–1.5 × 0.8–1.3 cm, base attenuate, apex rounded to apiculate, margin flat, sparsely hairy above, denser towards margin, the hairs flat, narrowly triangular and scale-like. Petioles 0.5–0.8 cm. Inflorescence terminal, to 3.5 cm, dense, with 15–40 flowers. Bracts caducous, 0.7 mm. Flowers pink, 2 mm. Pedicel 1 mm. Outer sepals unequal, glabrous, the two lower ovate, 1 mm; the upper larger and more boat-shaped, 1.2 mm. Alae orbicular, clawed, symmetric, 2.5 × 1.7 mm, apex rounded, glabrous. Upper petals glabrous. Keel 2.0 mm; appendage absent. Ovary glabrous. Style straight, without distinct stigmatic lobes. Capsule orbicular with a very short notched beak, scarcely winged, ca. 2.2 × 2.4 mm, glabrous, without persistent calyx. Seeds ellipsoidal, ca. 1.5 mm, shortly hairy; aril 3-lobed.

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



Altitudinal range: 1400–2900 m.

Ecology: Grassland, open places.

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

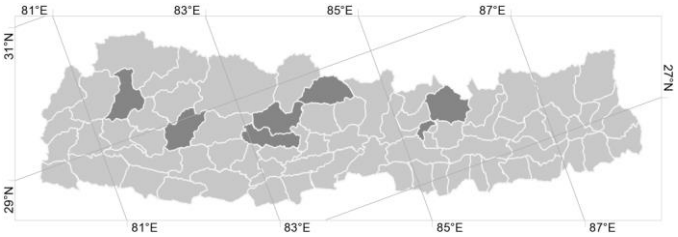
Polygala tatarinowii could only potentially be confused with *P. furcata*, but is distinguished from it by its pink flowers, and the short, notched beak on the apex of the capsule.

3. *Polygala furcata* Royle, Ill. Bot. Himal. Mts. [3]:76 (1834)
Polygala triphylla Buch.-Ham. ex D.Don

Herb to 15 cm. Stems glabrous. Leaves elliptic to somewhat ovate or obovate, 1.5–4 × 0.6–1.6, base attenuate, apex acute, mucronate, margin flat, glabrous or minutely hairy towards margin above, the hairs flat, narrowly triangular and scale-like. Petioles 0.5–1 mm. Inflorescence axillary or terminal, to 2.5 cm, dense, with 20–30 flowers. Bracts caducous, 1 mm. Flowers pale orange, 3 mm. Pedicel 1 mm. Outer sepals subequal, glabrous, the two lower ovate, 1.2 mm; the upper more boat-shaped, 1.6 mm. Alae symmetric, obovate, ca. 2.5 × 1.5 mm, glabrous, base attenuate, apex rounded. Upper petals glabrous. Keel 3 mm; appendage 4-lobed, 0.8 mm. Ovary glabrous. Style curved, inflated about the middle, stigmatic lobes not distinct. Capsule orbicular, emarginate, slightly winged, 2 × 2.2 mm, glabrous; only the upper sepal persistent.

Seeds ovoid, 1.1 mm, minutely tuberculate, almost completely glabrous; aril unequally 3-lobed.

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



Altitudinal range: 600–1700 m.

Ecology: Open, grassy areas.

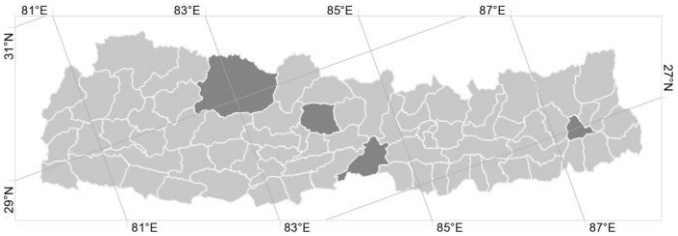
Flowering: August–October. **Fruiting:** August–October.

Polygala furcata is only likely to be confused with *P. tatarinowii*, but is distinguished from it by its orange flowers, and the presence of the persistent upper sepal at the base of the capsule.

4. *Polygala triflora* L., Sp. Pl. 2:705 (1753)

Erect herb, sometimes woody at base, to 30 cm. Stems with a sparse indumentum of minute curved hairs. Leaves narrowly elliptic, oblong or linear, 1–5 × 0.2–0.5 cm, base cuneate to attenuate, apex acute to obtuse, margin usually inrolled, sparsely hairy above, glaucous below. Petioles 1–1.5 mm. Inflorescence axillary or supra-axillary, to 2 (–3) cm, dense or rather lax, with 3–15 flowers. Bracts persistent, 0.8 mm. Flowers yellow-green, occasionally reddish, 3–5 mm; pedicel, 1–2.5 mm. Outer sepals ovate, subequal, 1.5–2 mm, ciliate. Alae markedly asymmetric, elliptic to semicircular, 3.5 mm, apex pointed, glabrous or sparsely ciliate. Upper petals slightly hairy at base. Keel 3–4 mm; appendage of two finely-divided bundles, 0.5–1.5 mm. Ovary ciliate. Style straight or coiled, apically strongly reflexed, stigmatic lobes not distinct. Capsule elliptic, emarginate, one lobe frequently slightly longer, winged, 3.5–4.8 × 2.7–3.8 mm, ciliate; calyx persistent, alae to 5 mm. Seeds ovoid, 3 mm, with long, stiff, white hairs; aril equally or unequally 3-lobed.

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



Altitudinal range: 150–2400 m.

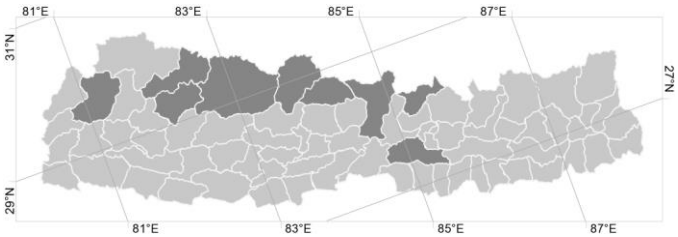
Ecology: Grassland, open areas.

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

Polygala triflora is unique among the Nepalese species of *Polygala* in having asymmetric capsules with one lobe longer than the other.

5. *Polygala sibirica* L., Sp. Pl. 1:702 (1753)
Polygala glaucescens Wall. ex Royle; *P. monopetala* Cambess.

Erect subshrub with numerous stems arising from a perennial rootstock. Stems with indumentum of short curved hairs. Leaves elliptic to slightly ovate or obovate, relatively narrower in upper part, base cuneate to rounded, apex acute, margin inrolled, sparsely hairy above, denser towards margin, glabrescent, glaucous and hairy on midrib below. Inflorescence supra-axillary or terminal, lax. Bracts usually caducous. Flowers blue, pink or magenta. Outer sepals equal or subequal, with the upper more curved, elliptic to ovate, hairy. Alae elliptic or obovate, almost symmetric to markedly falcate, apex rounded, apiculate, hairy on midvein, usually ciliate. Upper petals more or less hairy in lower half. Keel appendage finely divided. Ovary glabrous or ciliate. Style bent, the stigmatic lobes usually distinct. Capsule orbicular or quadrangular, winged, emarginate, glabrous or ciliate, calyx persistent. Seeds ovoid, with dense short white hairs; aril very unequally 3-lobed.



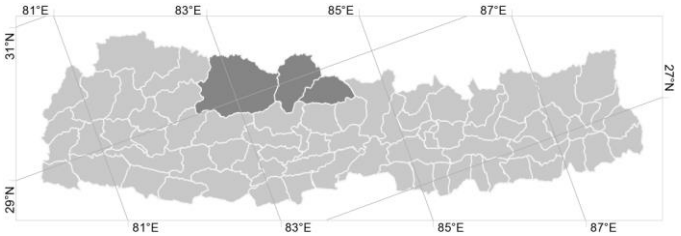
Polygala sibirica is a rather variable species in its leaves and flowers. Hara (1979) distinguished two varieties of *P. sibirica* in Nepal, var. *sibirica* and var. *elegans* which is based on Wallich 4186, the type of *P. elegans* Wall. ex Royle. He noted that the alae of var. *elegans* are almost symmetrical and not falcate, and further that the upper surfaces of the leaves of var. *elegans* possess raised reticulate venation in contrast with the smooth upper surfaces of var. *sibirica*. Kit Tan (1990) described *P. sibirica* ssp. *bhutanica*, and recombined *P. elegans* Wall. ex Royle as *P. sibirica* ssp *elegans* (Wall. ex Royle) Kit Tan. Although she distinguished ssp. *bhutanica* by the glabrous margins of the alae and capsules of the Bhutanese material, *Wallich 4186* possesses capsules with just such margins, and thus the only difference is in the presence of cilia on the margins of the alae. I do not consider this difference to be sufficient to maintain the distinction between ssp. *elegans* and ssp. *bhutanica*.

1a Flowers to 7 mm. Secondary venation of leaves indistinct ..... var. ***sibirica***
b Flowers 8–10 mm. Secondary venation of leaves clearly visible on at least one surface ..... var. ***elegans***

Polygala sibirica L.**var. *sibirica***

Stems to 25 cm. Leaves 0.5–2 × 0.2–0.4 cm, secondary venation not visible. Petioles 0.5 mm. Inflorescence with up to 10 flowers, to 6 cm. Bracts 1–1.5 mm. Flowers blue or purple, 5–7 mm. Pedicel 3–4 mm. Outer sepals 2.5–3 mm. Alae slightly asymmetric to falcate, 5–6 mm. Upper petals slightly hairy in lower half. Keel 5–7 mm; appendage finely divided, 1.5–2 mm. Ovary glabrous or ciliate; the stigmatic lobes not distinct or to 0.5 mm apart. Capsule orbicular to quadrangular, winged, emarginate, 4–4.5 × 4–4.5 mm, glabrous; alae to 7 mm. Seeds ca. 3 mm.

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



Altitudinal range: 2700–3700 m.

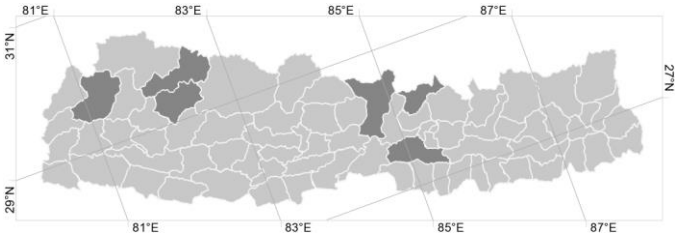
Ecology: Open, grassy areas. Able to resprout after burning.

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

Polygala sibirica* var. *elegans (Wall. ex Royle) H.Hara, J. Jap. Bot. 47:272 (1972)
Polygala elegans Wall. ex Royle Ill. Bot. Himal. Mts. [3]:76 (1834).

Stems to 30 cm. Leaves 0.5–2.7 × 0.2–0.8 cm, secondary venation visible. Petioles 0.5–1.0 mm. Inflorescence with up to 15 flowers, to 8 cm. Bracts 2–3.5 mm. Flowers pink or magenta, 8–10 mm. Pedicel 3–4 mm. Outer sepals 4–6 mm. Alae symmetric to slightly asymmetric, 8–10 mm. Upper petals densely hairy in lower half. Keel 8–10 mm; appendage finely divided, 3–4 mm. Ovary glabrous. Style bent, the stigmatic lobes 1 mm apart. Capsule orbicular, ca. 6 × 6 mm, glabrous; alae to 10 mm. Seeds ca. 3.5 mm.

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



Altitudinal range: 1500–3100 m.

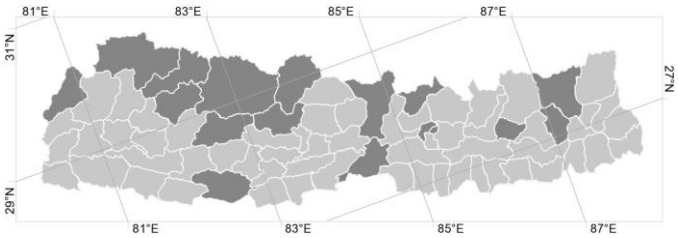
Ecology: Open, grassy areas. Able to resprout after burning.

Flowering: March–June. **Fruiting:** April–July.

6. *Polygala crotalarioides* Buch.-Ham. ex DC., Prodr. 1:327 (1824)

Erect subshrub to 20 cm, stems arising from a woody rootstock. Stems with an indumentum of short, curved hairs and long, erect hairs. Leaves elliptic to obovate, 1.5–7.5 × 1.0–2.5 cm, base cuneate, apex rounded or acute to apiculate, occasionally emarginate, margin flat, usually with at least a few stiff, white hairs, glaucescent below. Petioles 1–2 mm. Inflorescence supra-axillary or terminal, to 3 cm, dense, with 15–40 flowers. Bracts persistent, 1.5 mm. Flowers greenish purple, 5–7 mm. Pedicel 1.5–3 mm. Outer sepals ovate, subequal, 2–4 mm, ciliate. Alae orbicular to obovate, almost symmetrical, 4.5–7 × 3–5 mm, apex rounded. Upper petals hairy at base. Keel 3.5–7 mm; appendage brush-like, 1.5–3 mm. Ovary ciliate. Style bent, stigmatic lobes minute, but distinct. Capsule orbicular, emarginate, 3.3–4 × 3.3–4 mm, ciliate; calyx persistent, alae to 7 mm. Seeds oblong or ovoid, 2.5–3.5 mm, with short white hairs; aril almost equally 3-lobed. or ovoid, 2.5--3.5 mm, with short white hairs; aril almost equally 3-lobed.

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



Altitudinal range: 250–3000 m.

Ecology: Open, grassy areas. Able to resprout after burning.

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

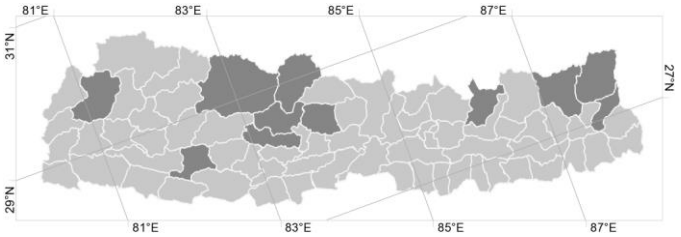
Polygala crotalarioides is a very distinctive species with its short inflorescences and obovate leaves which are usually rather densely hairy with stiff, erect hairs. Some lowland collections (eg *Troth 823* and *Wesche 1140* from Chitwan) lack these hairs though are otherwise indistinguishable from normal specimens.

7. *Polygala persicariifolia* DC., Prodr. 1:326 (1824)
Polygala buchanani D. Don; *P. wallichiana* Wight

Erect herb, 20–80 cm. Stems with an indumentum of minute, curved hairs, glabrescent. Leaves elliptic, 2–6 × 0.4–1 cm, base attenuate, apex acuminate to mucronate, margin flat or inrolled, glabrous or sparsely hairy, glaucous below. Petiole 1–1.5 mm. Inflorescence axillary or terminal, to 10 cm, lax, with 15–20 flowers. Bracts persistent, 1–1.5 mm. Flowers pink to purple, 3–5 mm. Pedicel 2.5–4 mm. Outer sepals elliptic, more or less ciliate, unequal, the two lower 1.6–3.0 mm; the upper more boat-shaped. Alae broadly elliptic to suborbicular,

symmetric, 4–5 × 3–5 mm, apex rounded, glabrous to minutely ciliate. Upper petals hairy in lower half. Keel 3.5–6 mm; appendage finely divided, 1–1.5 mm. Ovary glabrous or ciliate. Style slightly bent to strongly curved, thickened in middle part, stigmatic lobes distinct. Capsule broadly elliptic, emarginate, slightly winged, 4–5 × 3.5–4.5 mm, glabrous or ciliate; calyx persistent, alae enlarging in fruit, to 7 mm. Seeds oblong, 3.5–4 mm, with a dense indumentum of long, stiff, white hairs; aril equally, minutely 3-lobed.

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



Altitudinal range: 700–2100 m.

Ecology: Open, grassy areas.

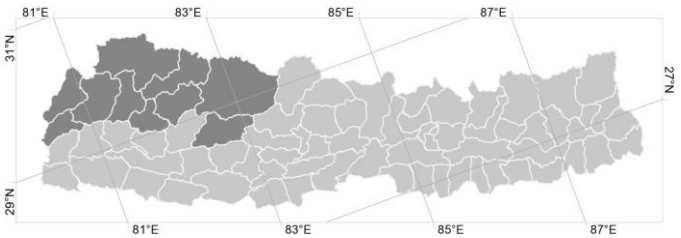
Flowering: July–September. **Fruiting:** July–October.

Polygala periscariifolia is most similar to *P. abyssinica* and *P. longifolia*, but has broader leaves and persistent bracts.

8. ***Polygala abyssinica*** R. Br. ex Fresen., Mus. Senckenberg. 51:273 (1837)

Erect herb to 30 cm. Stems with a sparse indumentum of wavy hairs, glabrescent. Leaves narrowly elliptic to linear, 1–2.5 × 0.1–0.15 cm, base cuneate, apex acute, margin inrolled, sparsely pubescent. Petiole 0.5–1 mm. Inflorescence terminal or axillary, to 9 cm, lax, with 15–30 flowers. Bracts soon caducous, 1–1.5 mm. Flowers pink, 6 mm. Pedicel 2 mm. Outer sepals equal, oblong or boat-shaped, 2–2.5 mm, glabrous. Alae obovate, sometimes asymmetric in lower half, 5–5.5 × 3–3.5 mm, apex rounded, glabrous. Upper petals more or less hairy at the base. Keel 4.5 mm; appendage of two finely divided bundles, 1.5–1.8 mm. Ovary glabrous. Style reflexed, stigmatic lobes distinct. Capsule more or less obovate, winged, 4–6 × 3–3.5 mm, glabrous; calyx persistent, alae to 6 mm. Seeds oblong to ovoid, 3.3–4 mm, with a dense indumentum of long, stiff, white hairs; aril almost equally 3-lobed.

Distribution: Nepal, W Himalaya, S Asia, SW Asia and Africa.



Altitudinal range: 1300–2800 m.

Ecology: In dry, rocky places.

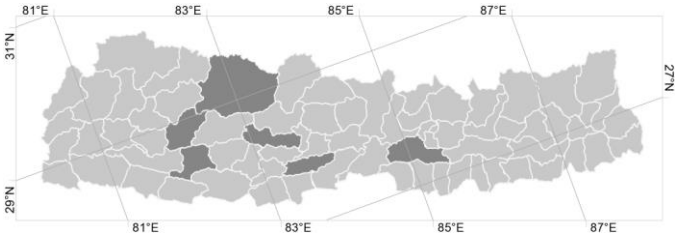
Flowering: May–August. **Fruiting:** June–September.

With its persistent rounded alae, *Polygala abyssinca* is most similar to *P. persicariifolia*, however the latter is a larger, and more robust plant and has larger leaves. Whilst it is vegetatively similar to *P. longifolia*, the latter has much smaller flowers and tends to be taller and less branched.

9. ***Polygala longifolia*** Poir., Encycl. 5:501 (1804)
Polygala discolor Buch.-Ham. ex D. Don; *P. leptalea* DC.; *P. oligophylla* DC.

Erect herb 10–100 cm. Stem almost glabrous. Leaves very narrowly elliptic to linear, leaves longest and relatively narrower on upper part of stem, 1.2–3 × 0.1–0.3 cm, glabrous, glaucous below, base cuneate to attenuate, margin inrolled, apex acute to mucronate. Petiole 0.5–1.2 mm. Inflorescence terminal or axillary, dense, with 15–80 flowers, to 10 cm. Bracts soon caducous or very rarely persistent, 1.1–2 mm. Flowers violet to purple, 2.5–3 mm. Pedicel 0.6–1.2 mm; outer sepals unequal, ciliate, the two lower sepals ovate, 1.1–1.5 mm, upper boat-shaped, 1.6–3.2 mm. Alae obovate, 2–3 × 1.5 mm, glabrous or ciliate, apex obtuse. Upper petals glabrous. Keel 2–3 mm; appendage of 4–6 more or less connate lobes, 1–1.5 mm. Ovary glabrous, sometimes slightly winged. Style curved or hooked, stigmatic lobes not distinct. Capsule orbicular or obovate, emarginate, scarcely winged, 2–3 × 2–2.5 mm, glabrous, calyx persistent, alae up to 4 mm. Seeds oblong, 1.5–2 mm, sparse indumentum of stiff, white hairs; aril equally, minutely, 3-lobed.

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



Altitudinal range: 900–1500 m.

Ecology: Grassland, open places.

Flowering: March–October. **Fruiting:** March–November.

Polygala longifolia is similar to *P. abyssinica*, but is generally taller, more upright and has markedly smaller flowers.

2. *Salomonia* Lour.

Small, erect annual herbs. Roots aromatic. Stems angular or winged, without nodal glands. Leaves alternate, palmately veined. Inflorescence a terminal or axillary spike, without bracteoles. Sepals almost equal, none petaloid. The 2 upper petals free on the upper side, and connate with the staminal sheath on the lower side, claw of lower petal (keel) adnate to the staminal sheath. Keel hooded in the distal part and enclosing the anthers and stigma; without a terminal appendage. Stamens 4–6, connate in a staminal sheath open on the upper side. Ovary symmetric, 2-locular. Style terminal, with 2 stigmatic lobes. Fruit a 2-locular, reniform, laterally compressed, dehiscent capsule markedly broader than long, with a double row of spines along margin. Seeds without an aril.

Five species found from S India to Japan, throughout Malesia and N Australia. Two species in Nepal.

Key to Species

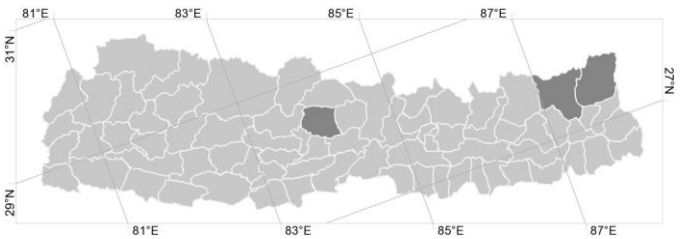
1a Face of capsule with protruding reticulated venation, margins with short spines to 0.2 mm. Bases of most leaves truncate or cordate ..... **1. *S. cantoniensis***

b Face of capsule smooth, lacking protruding reticulations, margins with prominent spines to 0.3-0.7 mm. Leaf bases rounded or cuneate, never truncate or cordate ..... **2. *S. ciliata***

1. *Salomonia cantoniensis* Lour., Fl. Cochinch. 1:14 (1790)
Salomonia edentula DC.; *S. petiolata* Buch.-Ham.

Herb to 30 cm, often much branched and spreading. Stem 3-winged, glabrous. Leaves broadly triangular to cordate, 3–24 × 3–16 mm, 3–5(–7)-veined, base truncate to cordate, somewhat decurrent along petiole, margin entire or slightly sinuate, apex acute and cuspidate. Petioles 1–3 mm. Inflorescence 1–11 cm. Bracts 0.6–1 mm, caducous. Flowers pink with a purple tip, occasionally yellow, 2–2.5 mm. Sepals narrowly triangular, ca. 0.5 mm, glabrous. Corolla 1.8–2.5 mm, glabrous. Ovary glabrous. Style almost straight. Capsule kidney shaped, 0.8–1.3 × 1.5–2.2 mm; faces with ± prominent reticulate venation and sometimes with minute hairs, marginal spines straight or slightly bent, to 0.2 mm, sometimes very reduced. Seeds black, ovoid, ca. 1 mm, glabrous.

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



Altitudinal range: 700–1700 m.

Ecology: Grassland, open places.

Flowering: June–November. **Fruiting:** July–November.

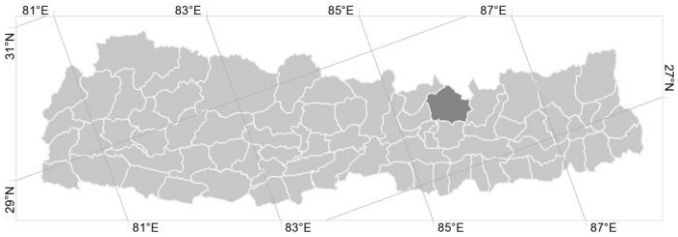
The broad, cordate leaves and reticulately-veined capsules of *Salmonia cantoniensis* readily distinguish it from *S.ciliata*.

2. *Salomonia ciliata* (L.) DC., Prodr. 1:334 (1824)

Polygala ciliata L. Sp. Pl. 1:705 (1753). *Salomonia oblongifolia* DC.; *S. obovata* Wight; *S. sessiliflora* D. Don

Upright herb to 30 cm, branched or unbranched. Stem angular, glabrous or with scattered hairs. Leaves elliptic to ovate or oblong, 3–9 × 2–3 mm narrower in proportion higher up the stem, 1–3-veined, base rounded to cuneate, margin entire or occasionally slightly ciliate, apex mucronate, acute to acuminate. Petioles to 0.5 mm. Inflorescence 1–8 cm. Bracts to 1.5 mm, caducous. Flowers pink or occasionally white, 2–2.5 mm. Sepals narrowly ovate, 0.8–1.4 mm. Corolla 1.8–2.3 mm. Capsule kidney shaped, 1.5–2 mm × 0.6–0.9 mm, faces without reticulate venation, glabrous or with minute erect hairs; marginal spines straight or slightly hooked, to 0.3–0.7 mm. Seeds black ovoid, ca. 1 mm, glabrous.

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



Altitudinal range: 900–1300 m.

Ecology: Grassland, open places. Sometimes in forests or swampy places.

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

Easily distinguished from *Salomonia cantoniensis* by its narrow, oblong leaves and smooth capsules.

3. *Securidaca* L.

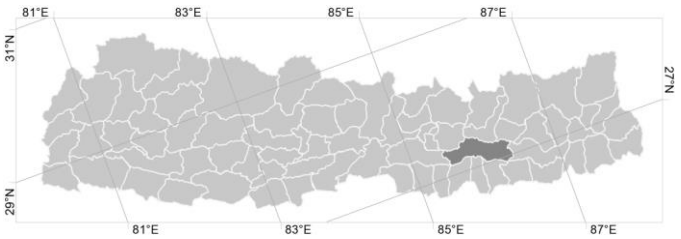
Large woody climbers. Roots not examined. Stems terete, with nodal glands. Inflorescence an axillary or terminal panicle, with nodal glands. Sepals unequal, the 3 outer sepaloid, the 2 inner (alae) larger, petaloid. The 2 upper petals free on the upper side, and connate with the staminal sheath on the lower side. Claw of lower petal (keel) adnate to the staminal sheath. Keel hooded in the distal part and enclosing the anthers and stigma, distal point of the keel with an appendage. Stamens 8, connate in a staminal sheath. Ovary asymmetric, 1-locular. Style subterminal; stigma 1-lobed. Fruit an indehiscent samara with an asymmetric coriaceous wing. Seeds without an aril.

A genus of about 80 species, mostly in S and C America. One species in Nepal.

1. *Securidaca inappendiculata* Hassk., Flora 25(2):32 (1842)
Securidaca scandens Buch.-Ham. ex Hassk.; *S. tavoyana* Wall. ex Benn.

Woody climber to 20 m. Nodal glands protruding to somewhat inconspicuous. Petiole ca. 1 mm; lamina oblong or elliptic to slightly ovate or obovate, 4–14 × 2–6 cm, base cuneate to rounded, apex shortly acuminate, margin occasionally slightly inrolled, minutely, sparsely pubescent on both surfaces, denser below, glaucous below. Inflorescence pubescent, 5–30 cm; bracts triangular, ca. 1 mm, pubescent, early caducous. Flowers pink to purple, 6–8 mm; pedicel 8–12 mm. Outer sepals ovate to orbicular, ca. 2 mm × 2 mm, ciliate, sparsely to densely pubescent; alae ovate to orbicular, 5–6 mm, glabrous or occasionally pubescent basally. Upper petal lobes triangular, keel to 8 mm with an apical appendage of 2 flattened lobes. Samara basally globose, wing to 8.5 × 2.5 cm, green or somewhat reddish. Seed ellipsoid.

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



Altitudinal range: 500–1000 m.

Ecology: In clearings and along streams in primary and secondary evergreen and deciduous forests.

Flowering: April–October. **Fruiting:** May–October.

How to use this pdf web edition

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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