

Flora of Nepal

नेपालका वनस्पति

Sapindaceae

Sapindaceae: Webedition 1 (2018)

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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
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Edinburgh



Sapindaceae Juss. nom cons.

Peter C. van Welzen, Vidya Manandhar & Colin A. Pendry

Trees, shrubs or lianas, rarely herbaceous climbers, deciduous or evergreen. Indumentum usually simple hairs, rarely two-branched hairs. Stipules absent except in climbers, sometimes pseudo-stipules present. Leaves alternate or opposite, unlobed or palmately lobed, simple or paripinnate, sometimes imparipinnate or biternate. Leaflets alternate to opposite, symmetric to asymmetric, usually pinnately veined. Inflorescences axillary, pseudoterminal, terminal or ramiflorous, cymes or generally thyrses; bracts and bracteoles present. Flowers usually functionally unisexual, rarely bisexual, actinomorphic or zygomorphic. Sepals 4 or 5, rarely more, free to almost totally connate, equal to distinctly unequal, and then the outer 1 or 2 much smaller than the inner three, herbaceous to petaloid. Petals absent or 2–6, free, sometimes clawed, often with 1 or 2 scales or auricles (= inrolled margins), scales crested or not. Disc ring-like, complete or interrupted, rarely with appendages or an erect (tubular) rim. Stamens 5–18, usually 8, nearly always inserted within the disc; anthers basifixed, opening introrsely or latero-introrsely with lengthwise slits; in pistillate flowers present as staminodes with non-opening anthers. Ovary superior, 1–3(or 4)-locular, lobed or not; style usually apical, rarely inserted between the lobes, stigma entire with (1)2 or 3 lines or grooves, or (1)2 or 3-lobed; rudimentary in staminate flowers; ovules 1 or 2 per locule. Fruits drupaceous or more usually capsular, then usually opening along locules, sometimes along the septa or breaking apart. Seeds globose to obovoid, sometimes compressed, often with a fleshy arillode or a sarcotesta.

About 140 genera and 1,500 species, most genera pantropical and subtropical, with a few genera expanding into northern temperate regions or to drier areas. Seven genera and 19 species in Nepal.

Lychee (*Litchi sinensis*) is widely cultivated in Nepal, and probably originated from the northern part of the Indo-Chinese Peninsula or from SE China. The arillode around the seed is a popular dessert.

Key to Genera

- | | | |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| 1a | Herbaceous or woody climbers. Leaves biternate. Inflorescences with basal tendrils | 6. <i>Cardiospermum</i> |
| b | Trees or shrubs. Leaves simple or pinnate. Inflorescences without tendrils..... | 2 |
| 2a | Leaves opposite | 3 |
| b | Leaves alternate..... | 4 |
| 3a | Leaves simple, unlobed or palmately lobed. Fruits winged | 1. <i>Acer</i> |
| b | Leaves palmate. Fruits unwinged..... | 2. <i>Aesculus</i> |
| 4a | Flowers present..... | 5 |
| b | Fruits present | 8 |
| 5a | Petals present | 6 |
| b | Petals absent | 7 |
| 6a | Deciduous. Hairs simple, but in young parts also with glandular hairs and then more or less sticky resinous. Sepals united for up to a quarter of their length. Leaflets green beneath | 5. <i>Schleichera</i> |
| b | Evergreen. Hairs simple or 2-branched. Sepals united for at least half their length. Leaflets greyish beneath | <i>Litchi</i> |
| 7a | Leaves paripinnate, glabrous. Leaflets mostly slightly oblique and falcate. Petiole often marginate or winged. Petals with a rim or two auricles inside, margin entire..... | 3. <i>Sapindus</i> |
| b | Leaves mainly paripinnate, sometimes simple or with a terminal leaflet, hairy or glabrous. Petiole unwinged. Leaflets mainly symmetric. Petals usually with a scale (sometimes deeply lobed and splitting) or sometimes a rim inside, margin somewhat erose..... | 4. <i>Lepisanthes</i> |
| 8a | Fruits indehiscent capsules, spiny to scaly. Seeds with edible aril..... | <i>Litchi</i> |
| b | Fruits indehiscent berries or drupes, smooth or with a few patent, simple or branched, strong thorns. Seeds naked | 9 |
| 9a | Fruits with every lobe a drupe, lobes breaking off (soap containing)..... | 3. <i>Sapindus</i> |
| b | Complete fruit a drupe, lobes persistent..... | 10 |
| 10a | Fruits distinctly lobed, smooth | 4. <i>Lepisanthes</i> |
| b | Fruits unlobed, smooth or with a few patent, simple or branched, strong thorns..... | 5. <i>Schleichera</i> |

1. *Acer* L.

Vidya Manandhar & Colin A. Pendry

Deciduous or evergreen trees. Hairs simple. Monoecious or dioecious. Leaves petiolate, opposite, simple, exstipulate, unlobed or palmately lobed, palmately veined, margin entire, dentate or serrate. Inflorescences corymbs, racemes or panicles, glabrous, pubescent, or villous. Flowers bisexual or unisexual, actinomorphic. Sepals 4 or 5, free, equal. Petals 4 or 5, equal or shorter than the sepals, not clawed. Stamens 4–12, equal in size, filaments free, arising from the nectary disc. Ovary 2-locular. Fruit a schizocarp (double samara) with divergent membranous wings, samaras 1-seeded. Seeds without fleshy appendage.

About 130 species in temperate and tropical regions of Asia, Europe, N Africa, and C and N America. Twelve species in Nepal.

Key to Species

- 1a Leaves unlobed (sometimes slightly 3-lobed in *A. stachyophyllum* and *A. thomsonii*)2.
 b Leaves 3- to 7(–9)-lobed6.
- 2a Leaves unlobed or slightly 3-lobed, inflorescence racemose3.
 b Leaves always unlobed, inflorescence paniculate or racemose4.
- 3a Leaf margin serrate, inflorescence glabrous, flowers 4-merous8. ***A. stachyophyllum***
 b Leaf margin sub-entire or repand, inflorescence villous, flowers 5-merous 11. ***A. thomsonii***
- 4a Leaves ovate, inflorescence racemose5. ***A. sikkimense***
 b Leaves oblong ovate, inflorescence broadly paniculate5.
- 5a Leaf margin sub-entire, often serrulate near apex, inflorescence glabrous 3. ***A. laevigatum***
 b Leaf margin entire, inflorescence pubescent4. ***A. oblongum***
- 6a Leaves 7-lobed, inflorescence paniculate or corymbose, glabrous7.
 b Leaves 3–5-lobed, inflorescence racemose, paniculate, or corymbose, glabrous or pubescent8.
- 7a Leaf margin entire, inflorescence corymbose 1. ***A. cappadocicum***
 b Leaf margin serrate or serrulate, inflorescence paniculate2. ***A. campbellii***
- 8a Inflorescence broadly paniculate9.
 b Inflorescence racemose 10.
- 9a Leaves mostly 3-lobed, margin double serrate, serration acute, flowers 4-merous7. ***A. acuminatum***
 b Leaves 5-lobed, margin serrate, serration obtuse, flowers 5-merous9. ***A. caesium***
- 10a Leaf margin entire or repand, inflorescence villous 11. ***A. thomsonii***
 b Leaf margin serrate, inflorescence glabrous, pubescent, or villous11.
- 11a Inflorescence pubescent or villous 12.
 b Inflorescence glabrous 13.
- 12a Leaf margin double serrate, inflorescence paniculate raceme, pubescent, samara glabrous, wings diverging at a 40–55° angle 10. ***A. caudatum***
 b Leaf margin distantly serrate, inflorescence simple raceme, villous, samara villous, wings diverging at a 10–25° angle 12. ***A. sterculiaceum***
- 13a Leaf margin setosely serrate, flowers 5-merous, samara wings diverging at a 80–90° angle 6. ***A. pectinatum***
 b Leaf margin serrate or double serrate, flowers 4-merous, samara wings diverging at a 20–55° angle8. ***A. stachyophyllum***

1. ***Acer cappadocicum*** Gled., Schriften Berlin. Ges. Naturf. Freunde 6:116 (1785).
Acer lobelii Pax

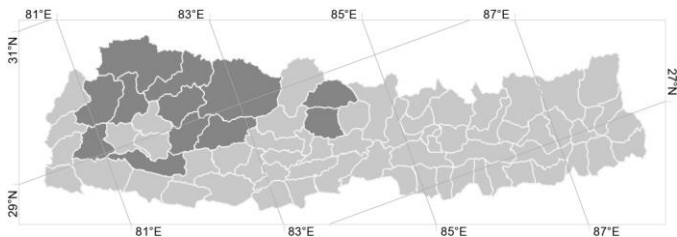
Deciduous tree, 8–25 m. Monoecious. Branchlets reddish brown, glabrous. Petioles red, 4–8 cm, glabrous. Leaves (5–)7-

Sapindaceae

lobed, outer 2 lobes smaller or obscure, 5–12 × 4–22 cm, base 7-veined, truncate to cordate, apices acuminate, margin entire, papery, glabrous on both surfaces, white hairy in the axils of veins beneath. Bud scales 7-paired, brownish red. Inflorescence erect, corymbose, glabrous, 4–6 cm. Pedicels 4–8 mm. Flowers pale green, 5-merous, ca. 6 mm in diameter. Sepals oblong, 4–5 mm, glabrous. Petals obovate, 4–5 mm, glabrous. Stamens 8, included, filaments 2–2.5 mm. Disc 2–2.5 mm in diameter. Ovary glabrous. Samaras 3–5 cm, wings red when young, maturing greenish brown, glabrous, slightly constricted towards base, diverging at 70–95°, nutlets rounded, compressed.

Fig. 1a-b

Distribution: W Himalaya, E Himalaya, E Asia and C Asia.



Altitudinal range: 1500–3100 m.

Ecology: Mixed broadleaved forests with *Quercus*, *Aesculus*, *Abies pindrow* and *Tsuga*.

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

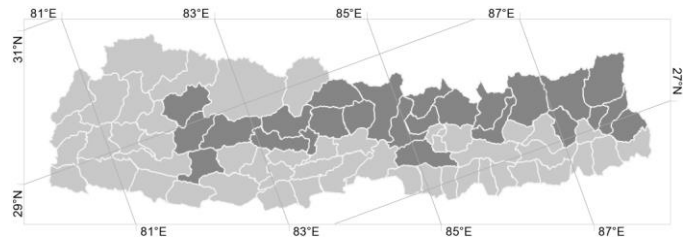
2. *Acer campbellii* Hook.f. & Thomson ex Hiern, Fl. Brit. India 1[3]:696 (1875).

Acer campbellii var. *serratifolia* M.L.Banerji

Deciduous trees, 6–30 m. Monoecious. Branchlets reddish brown, glabrous. Petioles greenish or reddish brown, 3–10 cm, glabrous. Leaves 7(–9)-lobed, 5–14 × 9–16 cm, base truncate or cordate, apices acuminate, margin serrulate or serrate, serrations acute, papery, glabrous above, yellowish pubescent beneath, denser along veins. Bud scales 4-paired, yellowish, pubescent, inner surface glabrous. Inflorescence erect, paniculate, ca. 6 cm, glabrous. Pedicels 8–10 mm. Flowers greenish white, pink, or red, 5-merous, 6 mm in diameter. Sepals ovate, 4–5 mm, sparsely hairy. Petals obovate, 4–5 mm, glabrous. Stamens 8, included, filaments ca. 1 mm. Disc 1–1.2 mm in diameter. Ovary densely pilose. Samaras 1.5–3 cm, wings greenish brown, glabrous, attenuate at base, diverging at 60–90°, nutlets ovoid.

Fig. 1c-d

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



Altitudinal range: 1100–4000 m.

Ecology: Temperate forests with *Betula*, *Quercus*, *Rhododendron*, *Abies* and *Tsuga*

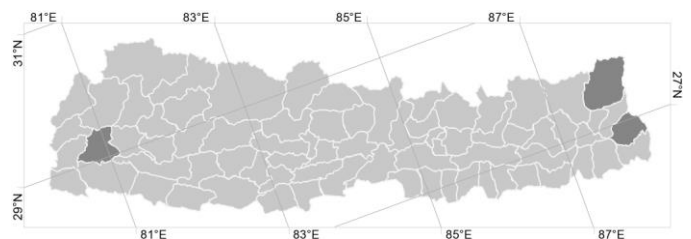
Flowering: April–July. **Fruiting:** June–October.

3. *Acer laevigatum* Wall., Pl. Asiat. Rar. 2[5]:3 (1830).

Evergreen tree, 10–15 m. Monoecious. Branchlets greenish brown, glabrous. Petioles reddish brown, 1–1.5 cm, reddish brown, glabrous. Leaves unlobed, oblong-lanceolate, 7–11 × 2.5–3 cm, base 3-veined rounded or cuneate, apex acute, margin entire, serrulate towards apex, leathery, glabrous on both sides, with tufts of hair in the axils of veins beneath. Bud scales 4-paired, red. Inflorescence erect, paniculate, sometimes corymbose, glabrous, 3–5 cm. Pedicels 5–10 mm. Flowers yellowish white, 5-merous, 3–3.5 mm in diameter. Sepals oblong ovate, 2–2.5 mm, glabrous. Petals obovate, 2–2.5 mm, glabrous. Stamens 8, included, glabrous, filaments 1–2.5 mm. Disc 1.5–2 mm in diameter, glabrous. Ovary pubescent with white hairs. Samaras 2.5–4.5 cm, wings pale brown, glabrous, constricted at base, diverging at 30–45°, nutlets ovoid.

Fig. 1e-f

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



Altitudinal range: 700–2000 m.

Ecology: Mixed broadleaved forests.

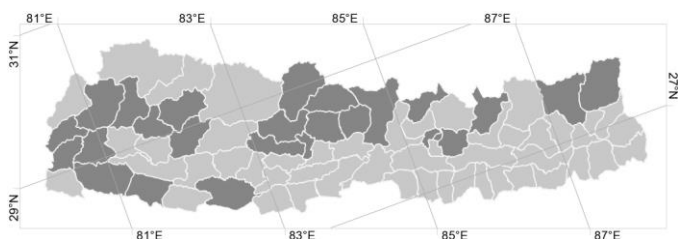
Flowering: May. **Fruiting:** June.

Very poorly collected in Nepal and known from only 4 specimens.

4. *Acer oblongum* Wall. ex DC., Prodr. (DC.) 1:593 (1824). *Acer buzimpala* Buch.-Ham. ex D.Don; *A. laurifolium* D.Don

Evergreen tree, 8–30 m. Monoecious. Branchlets dark brown, glabrous. Petioles red, 1.5–4 cm, glabrous, pubescent near apex. Leaves unlobed, oblong–ovate, 7–2 × 2–5 cm, base 3-veined, rounded, apex acuminate, margin entire, slightly undulate, leathery, glabrous on both surfaces, glaucous white or green below. Bud scales 7-paired, pale yellow, glabrous. Inflorescence erect, paniculate, sometimes corymbose, pubescent, 3–5 cm. Pedicels 3–10 mm. Flowers white or yellow, 5-merous, 4–5 mm in diameter. Sepals oblong, 2–3 mm, slightly pubescent. Petals obovate, as long as or slightly shorter than the sepals. Stamens 8, exserted, glabrous; filaments ca. 5 mm. Disc 2–2.5 mm in diameter, glabrous. Ovary densely pubescent with silky white hairs. Samaras 2.5–3 cm, wings green or brownish yellow, red when young, glabrous, constricted at base, diverging at 30–55°, nutlets ovoid.

Fig. 1g-h



Altitudinal range: 900–2500 m.

Ecology: Mixed broadleaf and *Pinus* forest; often along streamsides.

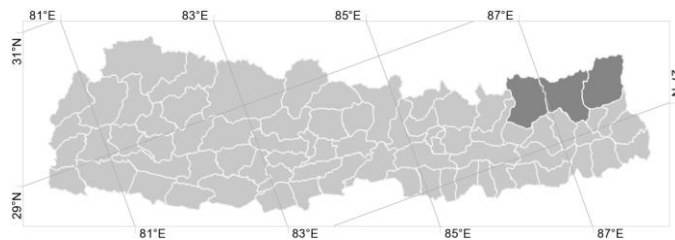
Flowering: February–June. **Fruiting:** April–November.

5. *Acer sikkimense* Miq., Arch. Neerl. Sci. Exact. Nat. 2:471 (1867).

Acer hookeri Miq.

Deciduous tree to 20 m. Dioecious. Branchlets reddish brown, glabrous. Petioles reddish, 2–4 cm, glabrous. Leaves unlobed, ovate, 6–17.5 × 4–10 cm, base 5-veined, subcordate to cordate, apex acuminate, margin subentire, serrulate, or serrate, subleathery or papery, glabrous on both surfaces with tufts of brown hairs in the axils of veins beneath. Bud scales 2-paired, reddish brown. Inflorescence pendulous, racemose, 4–10 cm, glabrous or finely pubescent. Pedicels 2–6 mm. Flowers yellowish green, 5-merous, ca. 4 mm in diameter. Sepals oblong, 1.5–2 mm glabrous. Petals obovate, 1.5–2 mm, glabrous. Stamens 8, exserted filaments 1–3 mm, occasionally flattened towards base. Disc ca. 2 mm in diameter, glabrous. Ovary glabrous. Samaras 1.5–2 cm, wings green, glabrous, constricted at the base, diverging at 45°, nutlets globose to ovoid.

Fig. 1i-j



Altitudinal range: 1600–3400 m.

Ecology: Mixed broadleaved and *Pinus wallichiana* forest.

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

Acer sikkimense and *A. hookeri* were treated as distinct species by Miquel (1867), Hooker (1875), Hara (EFPN, 1979), Griesson & Long (Fl. of Bhutan, 1991) and Press et al. (Ann. Ch. List of Nepal, 2000). The species were distinguished by the subentire or serrate leaf margin, subleathery or papery lamina, persistent or deciduous bud scales, finely pubescent or glabrous inflorescence and sessile or pedicellate flowers. However de Jong (Maples of the World, 1994) considered these characters inconsistent and merged the two species. I have also found these characters to be overlapping, so I follow de Jong and treat *A. hookeri* as a synonym of *A. sikkimense*.

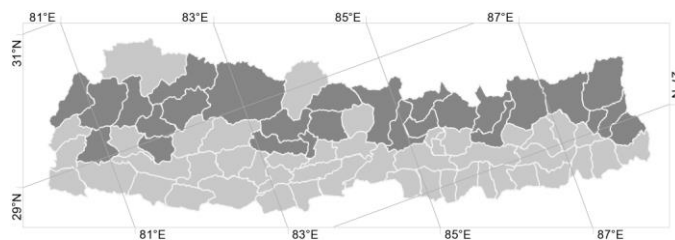
6. *Acer pectinatum* Wall. ex Brandis, Forest Fl. N.W.

India:112 (1874).

Acer pectinatum Wall. ex G.Nicholson; *A. pectinatum* Wall.; *A. pectinatum* Wall. ex Pax

Deciduous trees, 5–18 m. Monoecious. Branchlets glaucous, red, glabrous. Petioles red brown, 3–10 cm, glabrous. Leaves 5-lobed, 5–16 × 4–15 cm, base 5-veined, cordate, apices caudate acuminate, margin setosely serrate, papery, glabrous above, rusty brown pubescent below, especially along veins and in their axils. Bud scales 2-paired, red, glabrous. Inflorescence pendulous, racemose, 7–9 cm, glabrous. Pedicels 5–7 mm. Flowers white or red, 5-merous, 5–7 mm in diameter. Sepals oblong, 3.5–5 mm, glabrous. Petals obovate, 3.5–4.5 mm, glabrous. Stamens 8, included, filaments 1–1.5 mm. Disc 2–2.5 mm in diameter, lobed. Ovary glabrous. Samaras 2.5–3 cm, wings brown or pale green, glabrous, constricted or not at the base, diverging at 80–90°, nutlets ovoid, compressed.

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



Altitudinal range: 2300–3600 m.

Sapindaceae

Ecology: Mixed broadleaved, *Quercus*, *Pinus*, *Rhododendron*, *Abies*, *Tsuga* and *Betula* forests.

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

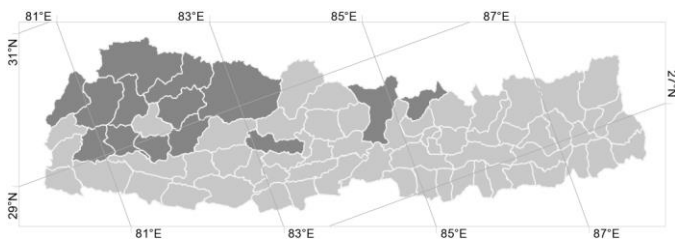
7. *Acer acuminatum* Wall. ex D. Don, Prodr. fl. Nepal.:249 (1825).

Acer caudatum Wall. nom. nud.

Deciduous tree, 5–15 m. Monoecious. Branchlets brown, glabrous. Petioles red, 3–10 cm, puberulous. Leaves 3- or 5-lobed, 6–13 × 3–15 cm, base 5-veined, truncate or subcordate, apex caudate acuminate, margin serrate or double serrate, papery, glabrous above, hairy along veins and in their axils below. Bud scales 1–2-paired, red, glabrous, apex pubescent. Inflorescence erect, broadly paniculate, sometimes corymbose, glabrous, ca. 2 cm. Pedicels 1.5–2 cm. Flowers greenish yellow, 4-merous, 5–7 mm in diameter. Sepals oblong, 3.5–4 mm glabrous. Petals oblanceolate, 3.5–4 mm, glabrous. Stamens 4, exserted, filaments 5–6 mm. Disc 2–2.5 mm in diameter, glabrous, lobed, ovary pubescent. Samaras 3–5 cm, wings green brown, glabrous, constricted at the base, diverging at 30–50°, nutlets, ovoid, compressed.

Fig. 2c-d

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



Ecology: Mixed broadleaved, *Quercus*, *Betula*, *Abies*, *Picea* and *Tsuga* forests.

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

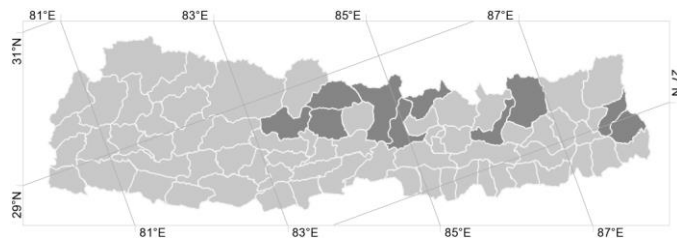
8. *Acer stachyophyllum* Hiern, Fl. Brit. India 1[3]:694 (1875).

Deciduous tree, 4–15 m. Dioecious. Branchlets brown, glabrous. Petioles red, 3–9 cm, glabrous, pubescent near apex. Leaves unlobed or 3-lobed, 6–15 × 3–10 cm, base 5-veined, rounded, subcordate or cordate, apex caudate acuminate, margin serrate or double serrate, papery, glabrous above, pubescent below, white tomentose when young, hairy along veins and in their axils. Bud scales 2-paired, brown, glabrous, inner surface pubescent. Inflorescence erect, racemose, ca. 2 cm, glabrous. Pedicels 8–18 mm. Flowers green, 4-merous, ca. 0.5 mm in diameter. Sepals oblong-ovate, ca. 4 mm, glabrous. Petals oblong, ca. 4 mm, glabrous. Stamens 4 or 6, exserted, filaments 5–6 mm. Disc ca. 1.5 mm in diameter, glabrous, lobed. Ovary glabrous. Samaras 2.5–4

cm, wings greenish brown, glabrous, scarcely constricted at base, diverging at 20–55°, nutlets ovoid.

Fig. 2e-f

Distribution: E Himalaya, Tibetan Plateau and E Asia.



Altitudinal range: 2200–3700 m.

Ecology: Mixed broadleaved, *Quercus* and *Tsuga* forest.

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

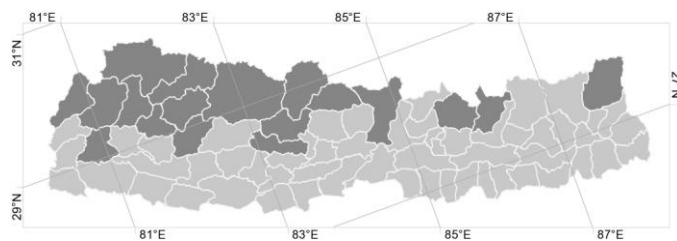
While both *Acer stachyophyllum* and *A. acuminatum* have 3-lobed leaves and 4-merous flowers, the former can be distinguished by its racemose inflorescence and the presence of occasional unlobed leaves.

9. *Acer caesium* Wall. ex Brandis, Forest Fl. N.W. India:111 (1874).

Deciduous tree to 40 m. Monoecious. Branchlets brown, glabrous. Petioles red, 8–12 cm, glabrous. Leaves 5-lobed, 8–20 × 10–24 cm, base 5-veined, cordate, apices acuminate, margin serrate, papery to subleathery, glabrous above, pubescent along the veins, tomentose beneath. Bud scales 5-paired, brown, glabrous, inner surface white hairy. Inflorescence erect, corymbose, glabrous, 2–4 cm. Pedicels red, ca. 3 cm. Flowers yellow green, 5-merous, 6 mm in diameter. Sepals obovate, ca. 4 × 2 mm, glabrous. Petals obovate, 3–3.5 mm, glabrous. Stamens 8, exserted, filaments 4–6 mm. Disc 2–2.5 mm in diameter, glabrous. Ovary pubescent. Samaras 2.5–5 cm, wings reddish brown, glabrous, sharply constricted at base, diverging at angle of 30–45°, nutlets dark red or brown, globoid.

Fig. 2g-h

Distribution: W Himalaya and Tibetan Plateau.



Altitudinal range: 1900–3900 m.

Ecology: Mixed broadleaved, *Quercus*, *Betula*, *Abies* and *Tsuga* forest

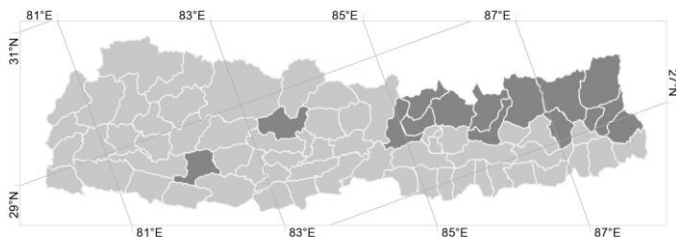
Flowering: April–May. **Fruiting:** May–September.

10. *Acer caudatum* Wall., Pl. Asiat. Rar. 2[5]:4 (1830).
Acer papilio King

Deciduous trees, 5–15 m. Monoecious. Branchlets brown, glabrous. Petioles red, 5–12 cm, glabrous, hairy near apex. Leaves 5-lobed, 7–12 × 5–18 cm, base 5-veined, cordate, apices caudate acuminate, margin double serrate, the serrations sharply incised with acuminate teeth, papery, glabrous above, pubescent beneath, especially along veins and in their axils. Bud scales 2–3 paired, brown, hairy. Inflorescence erect, racemose to paniculate, ca. 6–10 cm, pubescent. Pedicels 4–6 mm. Flowers white, green, or red, 5-merous, 4–6 mm in diameter. Sepals ovate, 3–3.5 mm, pubescent. Petals oblanceolate, ca. 5 mm, glabrous. Stamens 8, exserted, filaments 5–6 mm. Disc ca. 2.5 mm diameter. Ovary densely hairy. Samaras 2.5–3 cm, wings yellowish brown or red, glabrous, diverging at 40–55°, nutlets globose, compressed.

Fig. 2i-j

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



Altitudinal range: 2200–4000 m.

Ecology: Temperate forests with *Betula*, *Rhododendron*, *Abies*, *Tsuga* and *Juniper*.

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

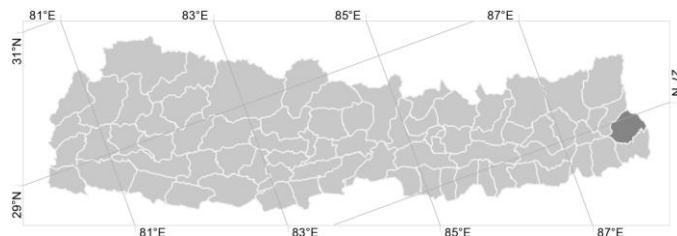
11. *Acer thomsonii* Miq., Arch. Neerl. Sci. Exact. Nat. 2:470 (1867).
Acer sterculiaceum subsp. *thomsonii* (Miq.) Murray; *A. villosum* var. *thomsonii* (Miq.) Hiern

Deciduous tree to 15 m. Dioecious. Branchlets brown, villous, glabrescent. Petioles reddish brown, 7–20 cm, pubescent. Leaves broadly ovate, unlobed or slightly 3-lobed, 8–15 × 10–28 cm, base 5-veined, subcordate or cordate, apex acute, margin entire or repand, leathery, glabrescent above, puberulous below. Bud scales 5–6-paired, pale yellow, villous. Inflorescence erect, racemose, 6–18 cm, villous. Pedicels 6–7 mm. Flowers greenish white, 5-merous, 3–4 mm in diameter. Sepals obovate, ca. 3.5 mm, ciliate. Petals oblanceolate, ca. 4 mm, glabrous. Stamens 8, exserted, filaments 5.5–6 mm. Disc ca. 2.5 mm in diameter, glabrous; ovary glabrous. Samaras 6–

10 cm, wings brown, red when young, glabrous, constricted at base, diverging at 20°, nutlets ovoid.

Fig. 3a-b

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



Altitudinal range: 900–2500 m.

Ecology: Broadleaved forest.

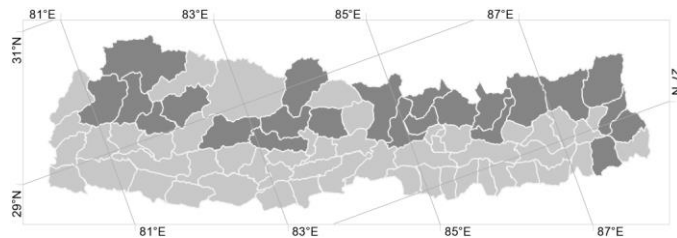
Flowering: October–November. **Fruiting:** March–May.

12. *Acer sterculiaceum* Wall., Pl. Asiat. Rar. 2[5]:3 (1830).
Acer villosum Wall.

Deciduous tree, 6–15 m. Dioecious. Branchlets brown or grey, villous to sparsely pubescent or glabrescent. Petioles red, 5–15 cm, pubescent, villous near apex. Leaves 5-lobed, the 2 outer lobes smaller, 8–21 × 7–25 cm, base 5-veined, subcordate or cordate, apices acuminate, margin subentire to remotely dentate, papery, pubescent along veins above, glabrous to pubescent below, silky brown pilose when young. Bud scales 5–6-paired, brown, glabrous. Inflorescence erect, racemose to paniculate, ca. 8 cm, villous. Pedicels ca. 10 mm. Flowers green, 5-merous, ca. 5 mm in diameter. Sepals oblong, ca. 3 mm, ciliate. Petals oblanceolate, ca. 3 mm, ciliate. Stamens 6–12, exserted, filaments 5–6 mm. Disc 2 mm in diameter. Ovary pubescent. Samaras 3.5–7.5 cm, wings rusty brown, villous, constricted at base, diverging at 10–25°, nutlets ovoid.

Fig. 3c-d

Distribution: W Himalaya, E Himalaya and E Asia.



Altitudinal range: 1600–3700 m.

Ecology: Temperate forests with *Betula*, *Quercus*, *Rhododendron*, *Abies*, *Tsuga* and *Juniper*

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

Acer sterculiaceum has the longest flowering season of any

Sapindaceae

Nepalese species, and its fruits are very persistent on the tree

so they may be found throughout the year.

2. *Aesculus* L., Sp. Pl. 1:344 (1753).

Colin A. Pendry

Large trees. Hairs simple. Leaves opposite, palmate, exstipulate. Leaflets serrate, venation reticulate. Inflorescences panicles. Flowers bisexual, zygomorphic. Calyx 5-merous, densely appressed short-hairy outside, tube cylindrical or campanulate, the lobes subequal. Petals 4, unequal, without a scale, clawed, lateral petals broader, slightly shorter. Disc U-shaped, lobed, on the upper side of receptacle. Stamens usually 7, subequal. Ovary clavate, 3-angled, 3-locular, with 2 ovules per locule style short, stigma unlobed. Fruit a spheroidal leathery capsule, usually 1-seeded. Seeds with a circular hilum, without fleshy appendage.

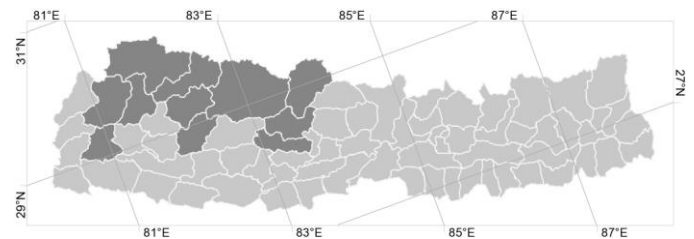
Thirteen species from Europe to E Asia. One species in Nepal.

1. *Aesculus indica* (Wall. ex Cambess.) Hook.f., Bot. Mag. 85 (1859).

Pavia indica Wall. ex Cambess. Voy. Inde 4(3):31 (1844);
Aesculus indica Colebr. ex Wall. *nom. nud.*

Trees to 26 m. Petioles 8–16 cm, swollen at the base, petiolules 0.5–2 cm. Leaflets 5–7, narrowly ovate to narrowly obovate, 10–30 × 3–9 cm, base cuneate to oblique, apex acute to acuminate, margin serrate, glabrous. Inflorescences erect, 25–40 cm, minutely pubescent. Flowers 2.5–3 mm, shortly pedicellate, white, sometimes flushed pink. Calyx pinkish green, 9–10 mm, velutinous without, teeth 1.0–3 mm. Petals clawed, velutinous on outer surface, dimorphic, lateral petals white, orbicular, ca. 2.2 × 1 cm, upper petals white with yellow base, spathulate ca. 2.5 × 0.5. Disc glabrous. Filaments sigmoidally curving upwards, 2.5–3.5 cm, glabrous, anthers yellow, elliptic, ca. 2 mm. Ovary 9–10 mm, pubescent with dark brown hairs, style as long as the filaments or ca. 1 mm long (in functionally male flowers?), pubescent. Capsules lenticellate, green ripening brown, 3–4.5(–5) cm long, smooth. Seeds 2.7–3.5 cm broad, dark brown and shiny.

Distribution: W Himalaya and SW Asia.



Altitudinal range: 1700–3100 m.

Ecology: Temperate forests with *Abies pindrow*, *Quercus* and Lauraceae, often along rivers. Sometimes planted as an ornamental.

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

The styles may be as long as the filaments or only about 1 mm long. It is unclear whether the flowers with short styles are functionally male.

3. *Sapindus* L., Gen. Pl., ed. 5:171 (1754).

Peter C. van Welzen

Trees. Hairs simple, solitary. Leaves alternate, paripinnate, up to 13-jugate, petiole and/or rachis winged or not. Leaflets with entire margin, venation densely reticulate. Inflorescences terminal, widely branched thyrses. Flowers unisexual, actinomorphic to zygomorphic. Sepals 5, free, outer 2 smaller than inner 3, (hardly) petaloid, variably hairy. Petals 4 or 5, as long as to slightly longer than the calyx, short-clawed, with inside a large scale, a transverse ridge, or a pair of auricles. Disc annular or semi-annular, glabrous or hairy, without appendages. Stamens 8, not or hardly exerted. Ovary sessile, 3-locular; style terminal, slender, about as long as the ovary, straight or bent, with 3 stigmatic lines; ovules 1 per cell, on a thickened angular placenta. Fruits 1 or 2-lobed, with each lobe a drupe derived from a locule, broken-off lobes leaving a large basal scar, smooth, glabrous except hairy around placenta. Seeds smooth, glabrous, without a fleshy layer.

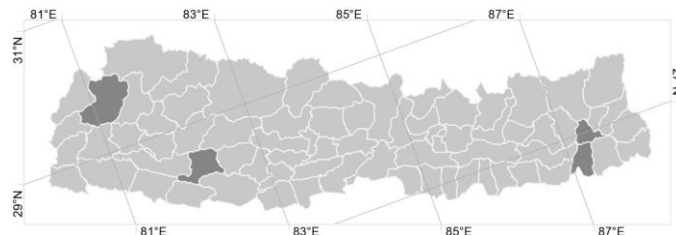
Ten species, 2 restricted to tropical central America, 1 in Hawaii, one in all tropical regions of the world, 6 species in continental S and SE Asia. One cultivated or introduced species in Nepal.

1. *Sapindus saponaria* L., Sp. Pl. 1:367 (1753).
Sapindus mukorossi Gaertn.

Trees to 25 m. Young branchlets glabrous to rather densely hairy. Indumentum fulvous. Petioles 1.5–5.5 cm, terete to 3-angular in cross section, marginate to winged towards the lower pair of leaflets or not, glabrous to somewhat hairy. Leaves up to 40 cm, 1–5-jugate. Leaflets elliptic, mostly slightly oblique and falcate, 6–16 × 3–6 cm, chartaceous, base more or less oblique, cuneate, apex emarginate or obtuse to acute, glabrous. Inflorescences to 25 cm, densely shortly fulvous-tomentose. Flowers cream. Sepals orbicular to broad-ovate, concave, mostly with a broad petaloid margin, ciliolate and with some appressed hairs near the base, outer sepals 1–1.2 mm in diameter, inner sepals ca. 2 × 1.5–2 mm. Petals 5, oblong-ovate to ovate, 1.5–2.5 × 1–1.2 mm, short-clawed, woolly-ciliate and outside at least at the base long hairy, inside above the claw either with a hairy ridge or with two involute, hairy auricles. Disc annular, glabrous. Stamens of equal length, filaments 0.5–1 mm, variably hairy; anthers 0.5–1 mm, glabrous. Ovary ca. 2 mm. Drupes dull yellow, subglobular, 0.8–2 cm, not carinate, smooth, glabrous. Seeds subglobular, smooth, black.

Fig. 4a-f

Distribution: S Asia, E Asia, SE Asia, N America and S America.



Altitudinal range: 200–1350 m.

Ecology: Cultivated and naturalized around settlements.

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

Ornamental. Fibres of inner bark used for ropes. Roots, bark, leaves, but especially fruits used as a substitute for soap because of the high levels of saponin; for the same reason the fruits are used as a fish poison. Seeds formerly used as buttons and beads.

4. *Lepisanthes* Blume, Bijdr. Fl. Ned. Ind. [5]:237 (1825).

Peter C. van Welzen

Trees or shrubs. Hairs simple. Leaves alternate, pari- or imparipinnate, sometimes simple, 1 to more than 40-jugate, petiole unwinged, with or without pseudo-stipules. Leaflets with entire margin, venation laxly reticulate. Inflorescences racemes or thyrses, terminal, axillary, ramiflorous or cauliflorous. Flowers unisexual, actinomorphic. Sepals 4 or 5 (rarely 3 or 6), free, outer 2 (or 1) mostly distinctly smaller, inner ones partly petaloid, entire or partly denticulate. Petals 4 or 5 (rarely 3, 6, or 7), shorter to longer than sepals, mostly distinctly clawed, scale mostly well developed, sometimes only represented by a hairy rim or a pair of small auricles, crested or not. Disc interrupted or not, mostly slightly lobed, without appendages. Stamens mostly ca. 8 (4–18), in staminate flowers distinctly exerted or not. Ovary sessile to short-stipitate, lobed or not, 2 or 3 (or 4)-locular; style apical, absent to about as long as the ovary; stigma globular or dome-shaped, slightly lobed; ovules 1 per cell. Fruit lobed or unlobed, drupaceous, smooth (or slightly warty), hairy to glabrous. Seeds with a basal small hilum, without fleshy appendage.

About 24 species in tropical Africa, Madagascar, S and SE Asia from Sri Lanka to Hainan throughout Malesia to NW Australia. Two species in Nepal.

Key to Species

- 1a Leaves hairy..... **1. *L. rubiginosa***
b Leaves glabrous..... **2. *L. senegalensis***

1. *Lepisanthes rubiginosa* (Roxb.) Leenh., Blumea 17:82 (1969).

Sapindus rubiginosa Roxb. Pl. Coromandel 1[3]:44 (1796).; *Erioglossum edule* Blume; *E. rubiginosum* (Roxb.) Blume

Shrubs or small trees to 16 m. Young branchlets densely short-hairy. Indumentum ferruginous to fulvous. Petioles 7.5–12(–20) cm, densely short-hairy, late glabrescent. Leaves paripinnate, (2–)3–6(–9)-jugate, often with a

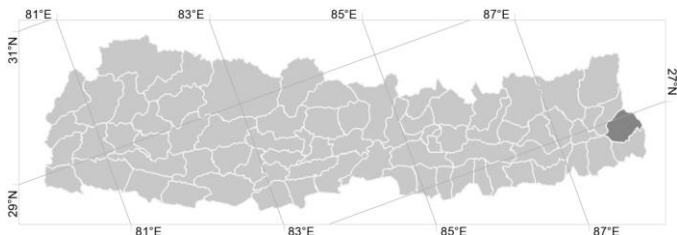
pseudoterminal leaflet. Petiolules up to 5(–10) mm. Leaflets elliptic, (4.5–)6.5–18(–25) × (2–)3.5–8.5(–11) cm, stiff chartaceous, base rounded to broadly cuneate, apex obtuse to acute or acuminate, often mucronulate, on both sides shortly and densely hairy. Inflorescences thyrses, 25–35(–50) cm, densely ferruginous tomentose; branched. Flowers white. Sepals orbicular-ovate, margin sometimes petaloid, ciliate, hairy outside, glabrous inside or with a few hairs, outer two 1.2–2.2 × 1.2–2 mm, acute, inner three 1.8–2.8 × 2–3

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mm, obtuse. Petals 4 (or 5), white to yellowish when fresh, longer than sepals, claw 0.5–1 mm, blade 2–4 × 1.5–2.2, crenulate in upper half, partly long ciliate, scale ca. 1.5–3 mm long, quadrangular to ± 2-lobed, the appendage deeply 2-lobed. Disc annular. Stamens longest abaxially; filaments flattened, long white hairy, in staminate flowers (1.5–)3–5 mm, in pistillate flowers ca. 1.5 mm, anthers oblong-ovate, ca. 0.8 mm, glabrous. Ovary 3-lobed, 1.2–1.8 × 2–2.2 mm, densely appressed-hairy, 3-locular, style cylindrical, ca. 2.2 mm, bent near the obscurely 3-lobed apex. Fruits dark purple to nearly black when ripe, 1–3-lobed, lobes spreading, 8–13 × 7–8 mm, subglabrous.

Fig. 5a-f

Distribution: S Asia, E Asia, SE Asia and Australasia.



Altitudinal range: 60–1200 m.

Ecology: Open tropical habitats on a variety of soils.

Flowering: January–December. **Fruiting:** January–December.

Wood probably valuable. The young leaves can be eaten as a vegetable, and the astringent but sweet fruits are relished as a titbit, mainly by children.

2. *Lepisanthes senegalensis* (Juss. ex Poir.) Leenh., Blumea 17:85 (1969).

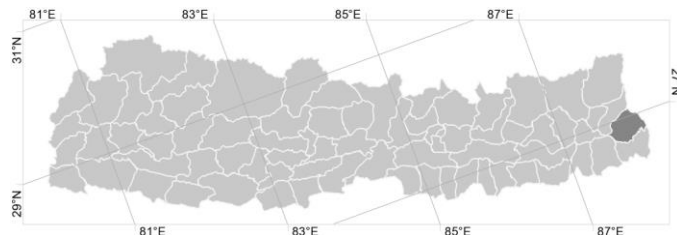
Sapindus senegalensis Juss. ex Poir. Encycl. 6(2):666 (1805).;
Sapindus attenuatus Wall. ex Hiern *nom. superfl.*; *Scytalia rubia* Roxb.

Shrubs or trees to 24 m. Young branchlets sparsely, appressed hairy. Indumentum whitish to yellowish. Petioles 0–14 cm, often pulvinate, glabrous. Leaves paripinnate, mainly 1–2-jugate, sometimes simple or with a pseudoterminal leaflet. Petiolules 2–15 mm. Leaflets elliptic,

7–35 × 2–15 cm (simple leaves up to 60 × 18 cm), chartaceous to subcoriaceous, base acute to obtuse, more or less attenuate, apex obtuse to acuminate, mucronulate, glabrous on both sides. Inflorescences up to 40 cm, racemes or narrow thyrses, or sometimes a single, widely though sparsely branched thyrses to 60 cm. Flowers red. Sepals concave, margin petaloid, crenulate, ciliolate, otherwise glabrous, outer 2 oblong-ovate to orbicular, rounded at apex, 1–3 × 0.8–1.2 mm, inner 3 up to 4 × 3 mm. Petals 5 (rarely 4), about same size as inner sepals, shortly clawed to sessile, blade elliptic to oblong, 2.5–4.5 × 1–2 mm, entire, rounded, ciliate at least near the base, sometimes more or less sericeous outside; scale minute to 2/5 of the length of the blade, simple to deeply 2-lobed (rarely divided into two minute auricles), without appendage. Disc annular, or occasionally interrupted. Stamens more or less equal, filaments flattened or terete, woolly in the lower 2/3, rarely subglabrous, 1–3.5 mm, anthers ovate to elliptic, 1–1.8 mm, glabrous. Ovary 2- (or 3-)lobed, 1.5–3 mm in diameter, sessile to 1.5 mm stipitate, style 1–2 mm, straight to slightly curved; stigma sometimes decurrent halfway down the style. Fruits 2-lobed (often only 1 part developed), dark red to black, lobes red, shortly ellipsoid to globular, 8–15 × 5–15 mm, glabrous. Seeds ovoid to globular, ± attenuate towards the hilum, 7–8 × 6–7 mm, smooth, glabrous.

Fig. 6a-f

Distribution: S Asia, E Asia, SE Asia and Africa.



Altitudinal range: 60–200 m.

Ecology: Tropical, periodically dry to everwet, more open habitats.

Flowering: March–November. **Fruiting:** January–April.

Wood hard, heavy, and durable.

5. *Schleichera* Willd., Sp. Pl., ed. 4 4(2):1096 (1806).

Peter C. van Welzen

Trees. Hairs simple, solitary; young parts with sticky, glandular hairs. Leaves alternate, paripinnate, 2–4-jugate, petiole and/or rachis not winged. Leaflets with margin entire to repand, venation laxly reticulate. Inflorescences thyrses, mainly ramiflorous below leaves, sometimes axillary, simple (pistillate) to sparsely branched (staminate). Flowers unisexual, actinomorphic. Sepals 4 or 5 (or 6), connate in basal quarter, lobes all equal, not petaloid, somewhat hairy. Petals absent. Disc annular, more or less patelliform, sinuate, glabrous or sparsely hairy, without appendages. Stamens (5 or) 6–8 (or 9), long exerted in staminate flowers. Ovary sessile, (2 or) 3 (or 4)-locular, sparsely to densely pilose and glandular; style terminal, subglabrous, with recurved stigmatic lobes;

ovules 1 per cell. Fruits hard-crustaceous, dry berries, of which 1 or 2 locules developed, smooth or with patent, simple or branched, strong thorns, glabrescent. Seeds smooth, glabrous, completely enveloped by a thin arillode, hilum orbicular.

One species in tropical Asia from Sri Lanka to Indochina and Malesia. One species in Nepal.

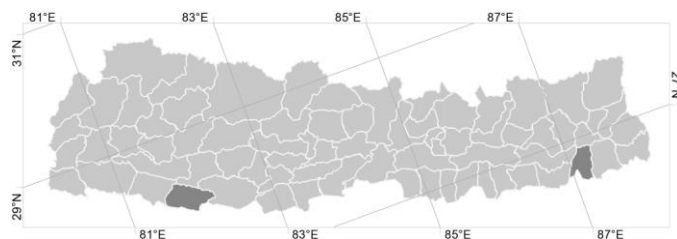
1. ***Schleichera oleosa*** (Lour.) Oken, Allg. Naturgesch. 3(2):1342 (1841).

Pistacia oleosa Lour. Fl. Cochinch. 2:615 (1790).; *Schleichera trijuga* Willd.

Trees to 40 m. Young branchlets with sparse, short, sericeous hairs and sessile glands. Indumentum fulvous. Petioles 2–6(–8) cm, terete to flattened, basally pulvinate, not winged, glabrous to somewhat hairy. Petiolules 1–3 mm, swollen. Leaflets elliptic to obovate, 4.5–18.5(–25) × 2.5–9 cm, chartaceous to coriaceous, base subacute to cuneate, often oblique, apex obtuse or emarginate (to shortly acuminate), (sub)glabrous. Inflorescences 6–15 cm, sparsely hairy. Flowers pale yellow or pale green. Sepal lobes ovate to deltoid, ca. 1.5 mm, obtuse to acute, thinly hairy on both sides, margin ciliate and glandular. Stamens equal, filaments filiform, ca. 2 mm, sparsely hairy, anthers broadly elliptic, ca. 0.75 mm, glabrous. Ovary ovoid, slightly 3-angular and indistinctly 3-sulcate, ca. 1.2 mm; style rather thick, 1.2–1.5 mm. Fruit yellow, broad-ovoid to subglobular, ca. 15 by 13 mm when 1-seeded, or transversely ellipsoid, slightly flattened, somewhat 2-lobed, 17–20 × ca. 18 × 14 mm when 2-seeded, narrowed at base, pointed at apex. Seeds yellow, subglobular, ca. 12 × 10 × 8 mm, smooth, glabrous.

Fig. 7a-b

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



Altitudinal range: 80–900(–1200) m.

Ecology: Forest and more open habitats, often along rivers.

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

Wood used for timber and high quality charcoal. Bark used medicinally and for dyeing. Young leaves eaten as a vegetable. Fruits (arillode) edible. The seed yields an oil which is used medicinally and as a constituent of Makassar oil.

6. *Cardiospermum* L., Sp. Pl. 1:366 (1753).

Peter C. van Welzen

Suffruticose or herbaceous climbers. Hairs simple. Leaves alternate, biternate with minute stipules at the base of the petiole. Leaflets with lobed margin, venation indistinctly laxly reticulate. Inflorescences cymes, axillary, with a pair of tendrils. Flowers unisexual, zygomorphic, in a helicoid cyme, the first flower to develop usually pistillate, all others staminate. Sepals 4 (2 united) or 5, free, outer 2 smaller than inner 2 or 3. Petals 4, inner surface with a large scale with its apex hooded, bearded or crested. Disc glandular, at base of every petal. Stamens 8, unequal in size. Ovary 3-angled, 3-locular; style short; stigma 3-lobed; ovules 1 per cell. Fruit a 3-lobed, papery, inflated, septical capsule. Seeds with heart-shaped hilum, without fleshy appendage.

About 12 species, mainly in tropical and subtropical America, one extending to Africa, one worldwide. One species in Nepal.

1. ***Cardiospermum halicacabum*** L., Sp. Pl. 1:366 (1753).

Annual or perennial climbing herbs or subshrubs, glabrous to sparsely hairy. Stipules elliptic, caducous. Petiole 1.5–3 cm, slender, grooved. Leaves alternate, ca. 5–8 × 5–8 cm, sparsely appressed-short-hairy to subglabrous. Lateral petiolules ca. 0.5 cm, terminal petiolule ca. 1 cm, all narrowly winged. Leaflets pinnately lobed, lobes and apex mucronate. Inflorescences patent, sparsely short-hairy, 5–14 cm; peduncle 7–10 cm, slender, slightly above the tendrils terminated by a single pseudo-whorl of 3 spreading, long-stalked, few-flowered helicoid cymes. Flowers white,

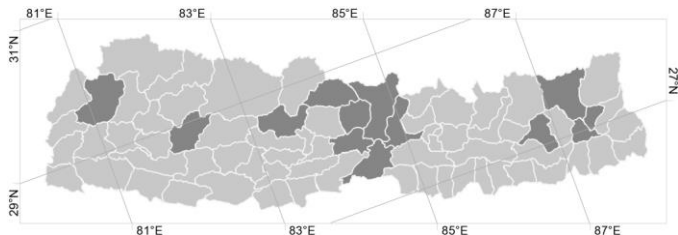
2–3.5 mm long on slender pedicels. Sepals 4, with white margins, concave, thin, subglabrous, green, tinged red, outer pair broadly ovate to suborbicular, 1–1.5 × ca. 1.2 mm, inner pair suborbicular to broad-elliptic, 2–2.5 × 1.5–2 mm. Petals white to creamy with yellowish margin, obovate-cuneate to orbicular, 1.5–2.5 × 1–2 mm, at the base with some woolly hairs at the margin, otherwise glabrous, apex rounded and slightly emarginate, scales glabrous but for the bearded apical part, 1.2–2 by ca. 1 mm, rounded at apex, slightly thicker than the petal blade. Disc glands glabrous. Filaments flattened, 0.8–2.5 mm, slightly hairy, anthers elliptic, ca. 0.5 mm, yellow. Ovary obovoid, 2–3 mm, nearly

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glabrous to densely pubescent. Fruits 3-lobed, globular, 1.5–4 cm in diameter, mostly sparsely short-hairy, green, reddish at base or with reddish veins. Seeds dull-black, subglobular, ca. 4 mm across, smooth, glabrous.

Fig. 8a-h

Distribution: Cosmopolitan.



Altitudinal range: 150–1500 m.

Ecology: Mainly in disturbed, open places.

Flowering: January–December. **Fruiting:** January–December.

Probably of American origin, now worldwide in the tropics and subtropics.

Used as a vegetable and medicinally. Baskets are made from the stems, and the seeds are used as beads.

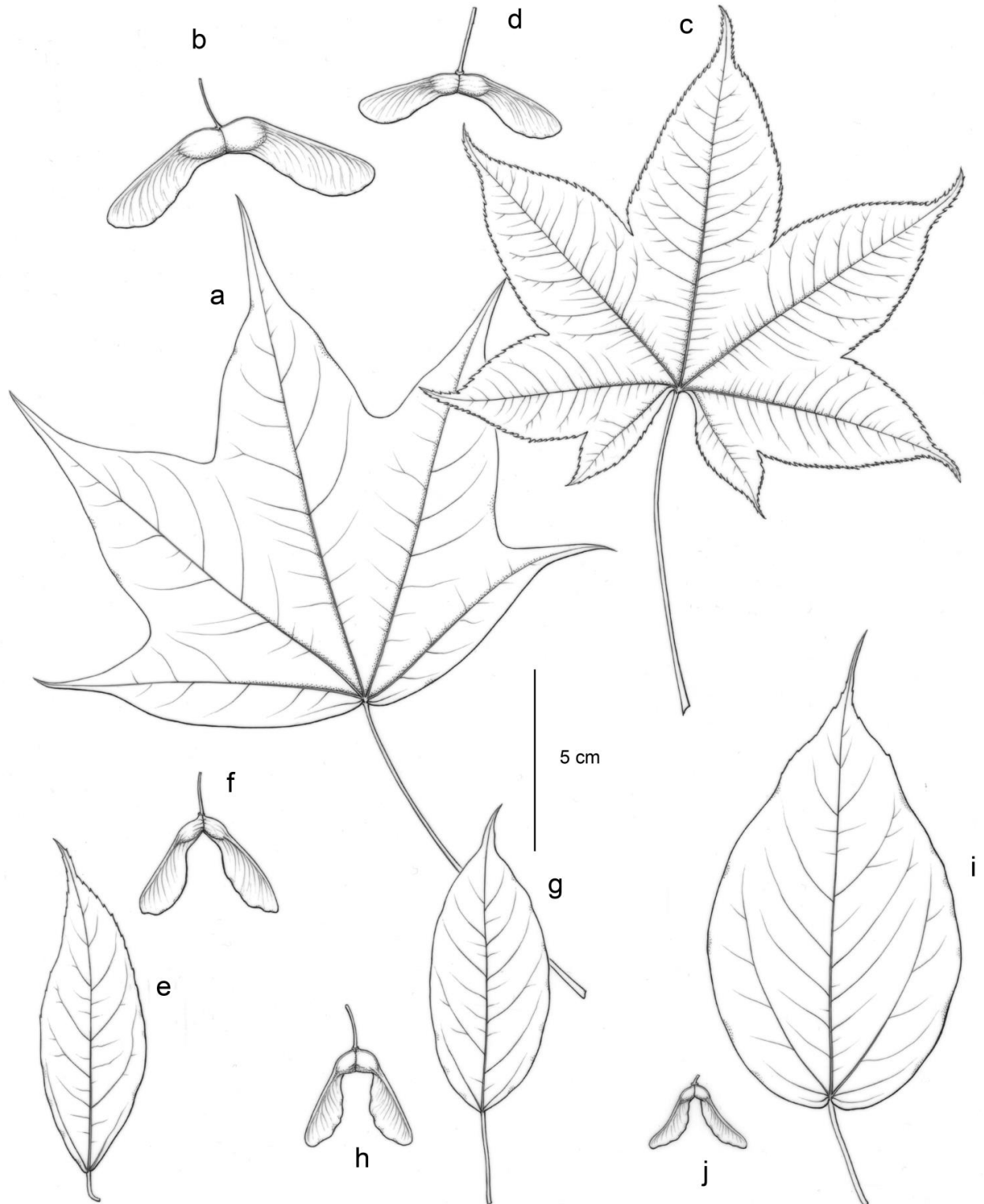


Fig. 1.
SAPINDACEAE. **Acer cappadocicum**: a, leaf; b, fruit. **Acer campbellii**: c, leaf; d, fruit. **Acer laevigatum**: e, leaf; f, fruit. **Acer oblongum**: g, leaf; h, fruit. **Acer sikkimense**: i, leaf; j, fruit.

Sapindaceae

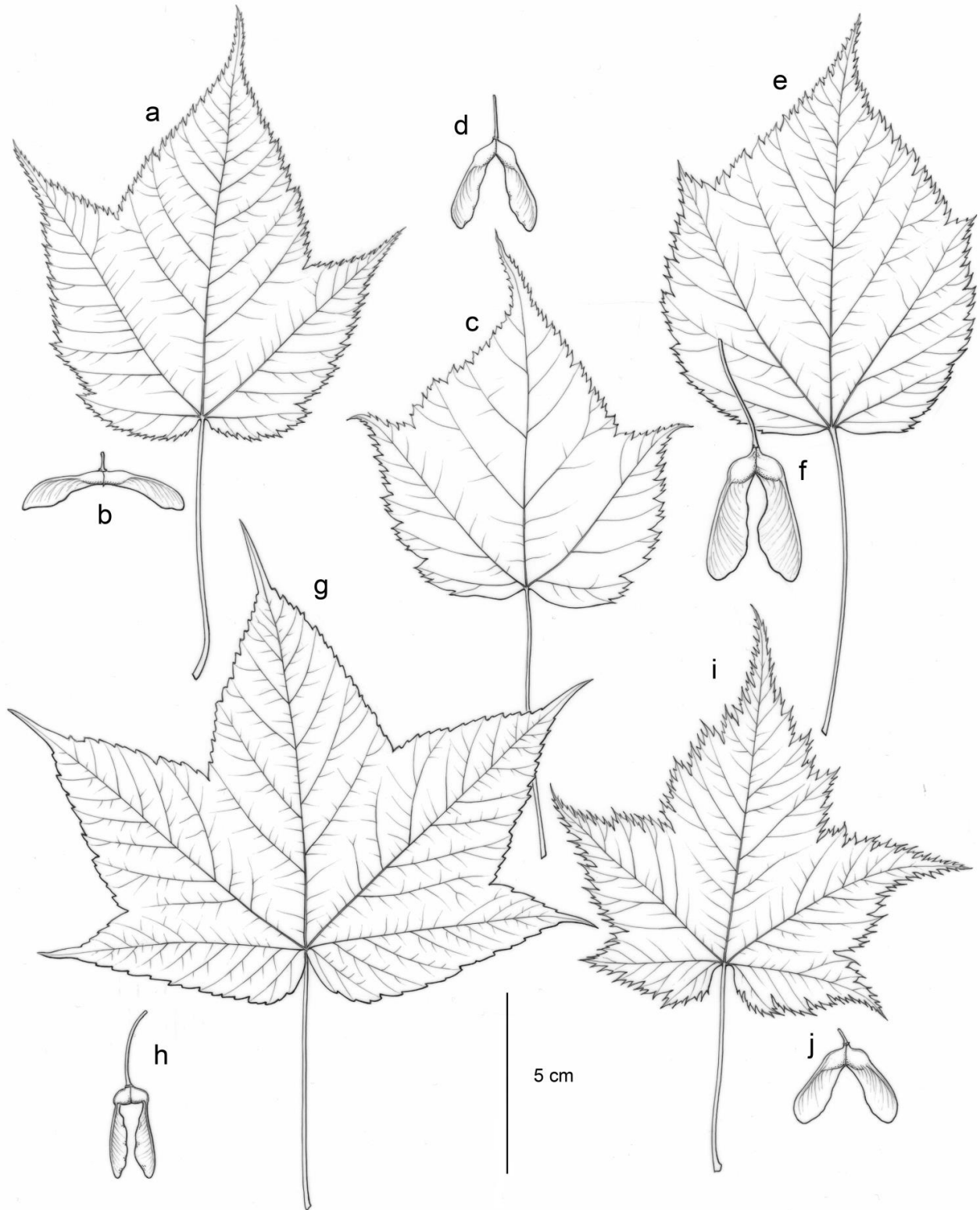


Fig. 2.
Acer pectinatum: a, leaf; b, fruit. **Acer acuminatum**: c, leaf; d, fruit. **Acer stachyophyllum**: e, leaf; f, fruit. **Acer caesium**: g, leaf; h, fruit. **Acer caudatum**: i, leaf; j, fruit.

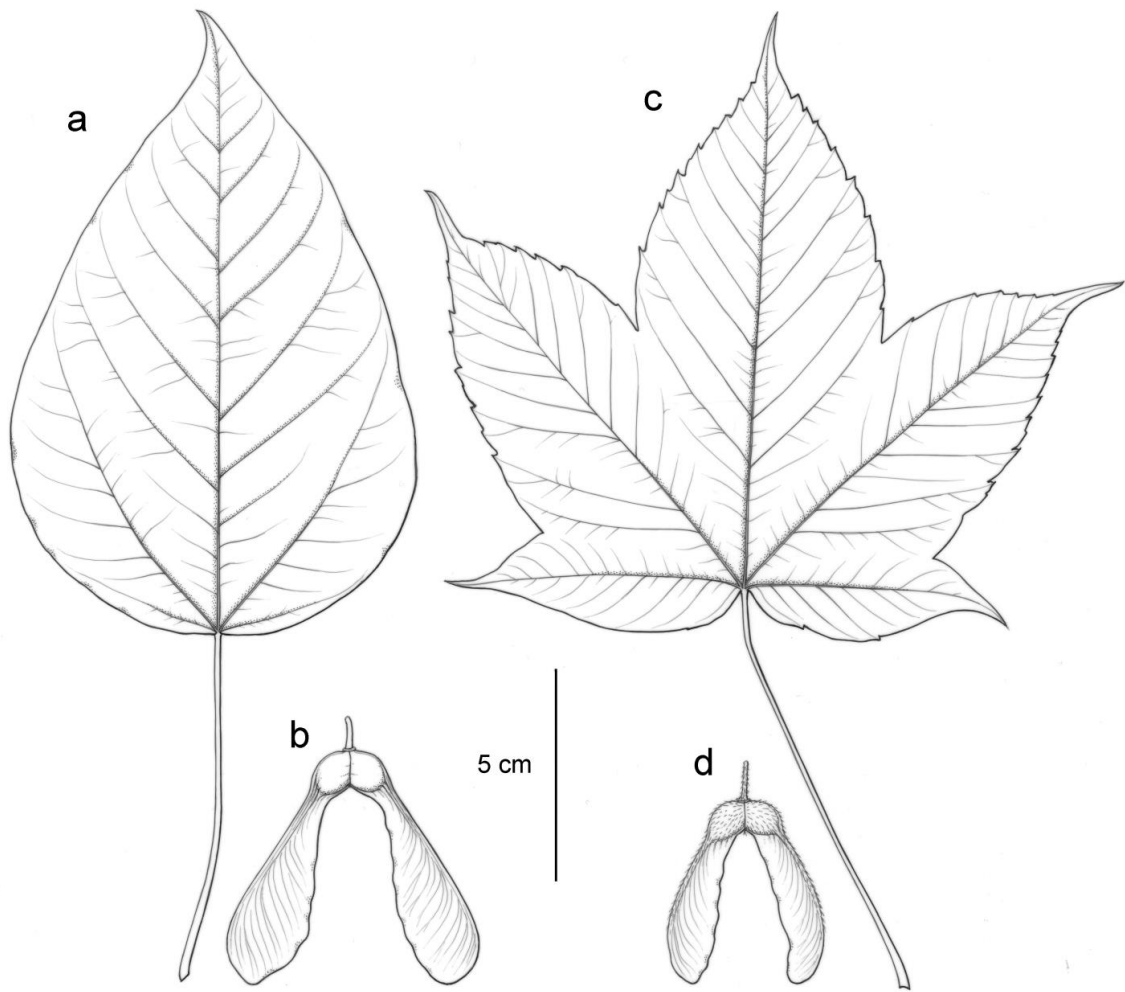


Fig. 3.
SAPINDACEAE. *Acer thomsonii*: a, leaf; b, fruit. *Acer sterculiaceum*: c, leaf; d, fruit.

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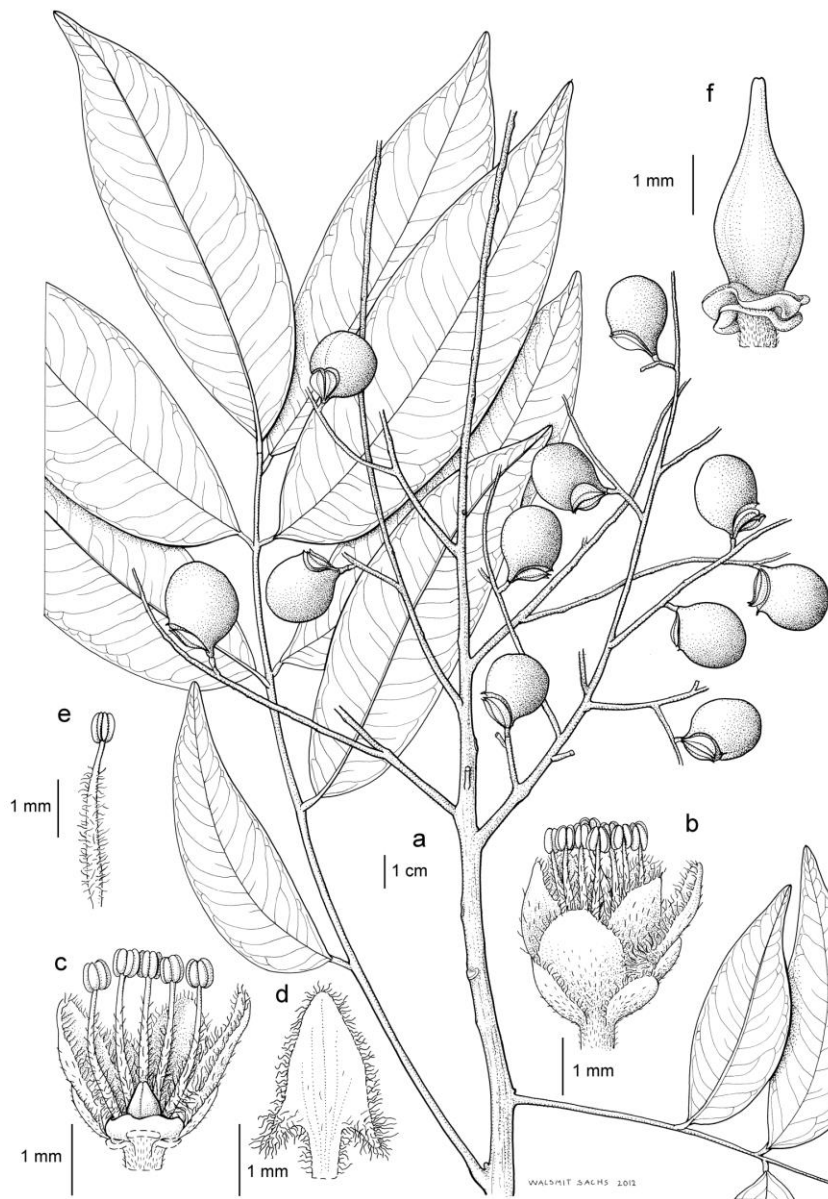


Fig. 4.
SAPINDACEAE. *Sapindus saponaria*: a, habit; b, staminate flower; c, staminate flower with part of sepals and petals removed; d, petal; e, stamen; f, pistillate flower.

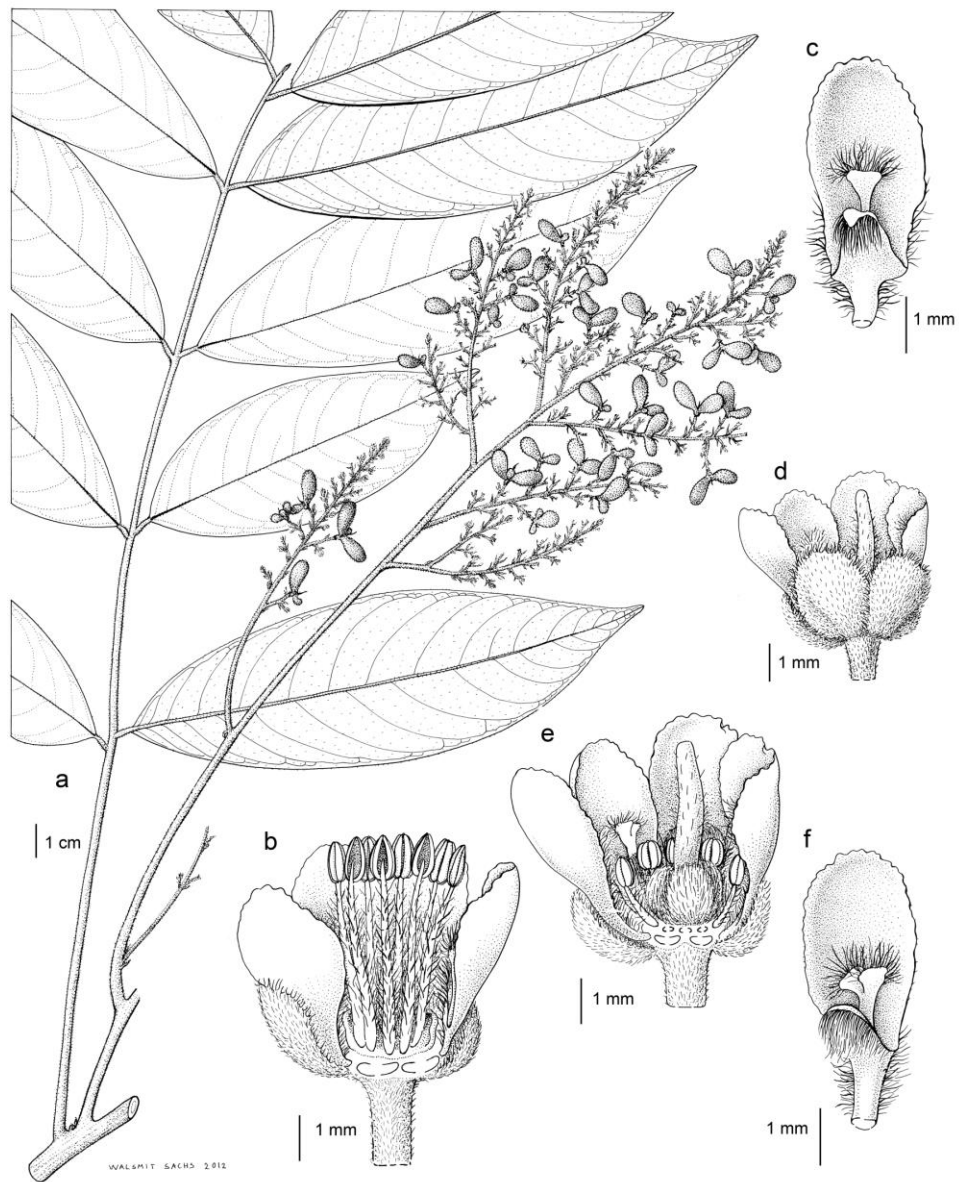


Fig. 5.
SAPINDACEAE. *Lepisanthes rubiginosa*: a, fruiting habit; b, staminate flower with part of sepals and petals removed; c, staminate petal with scale and appendage; d, pistillate flower; e, pistillate flower with part of sepals and petals removed; f. pistillate petal with scale and appendage.

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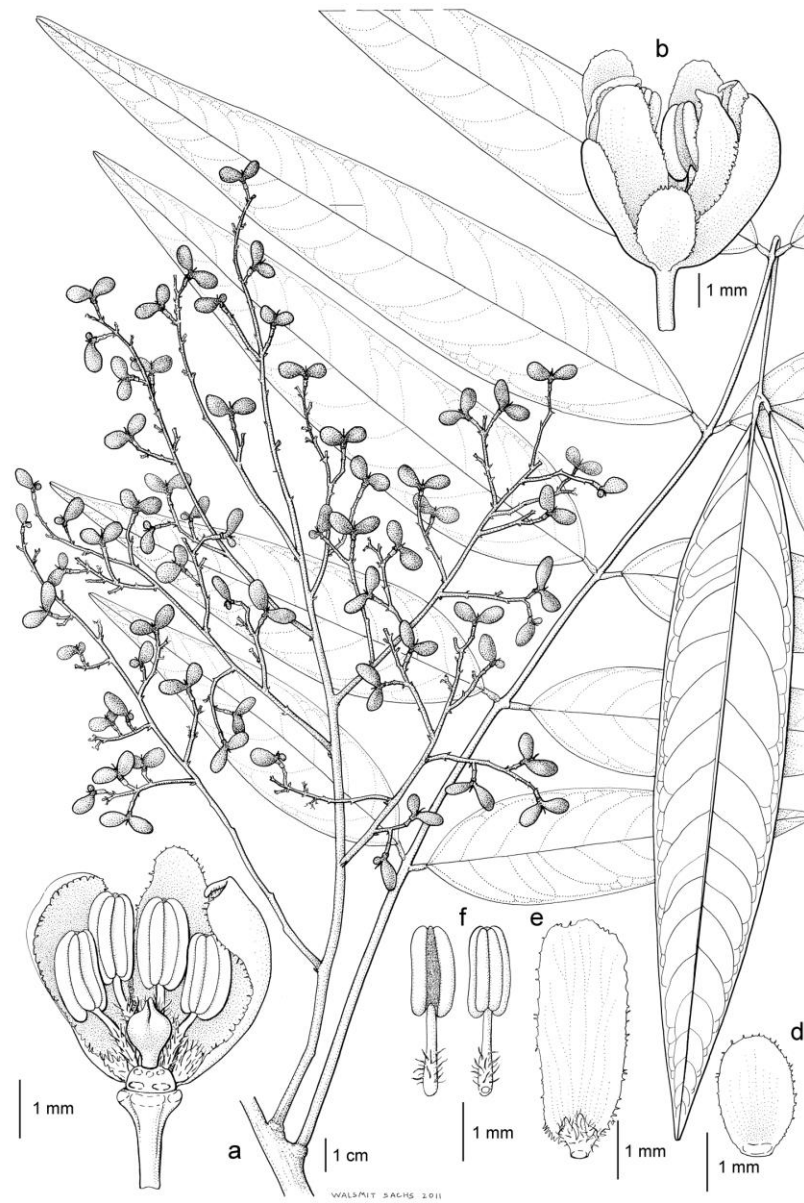


Fig. 6.
SAPINDACEAE. **Lepisanthes senegalensis**: a, fruiting habit; b, staminate flower; c, staminate flower with part of sepals and petals removed; d, inside of sepal; e, inside of petal with basal scales; f, stamens from both sides.

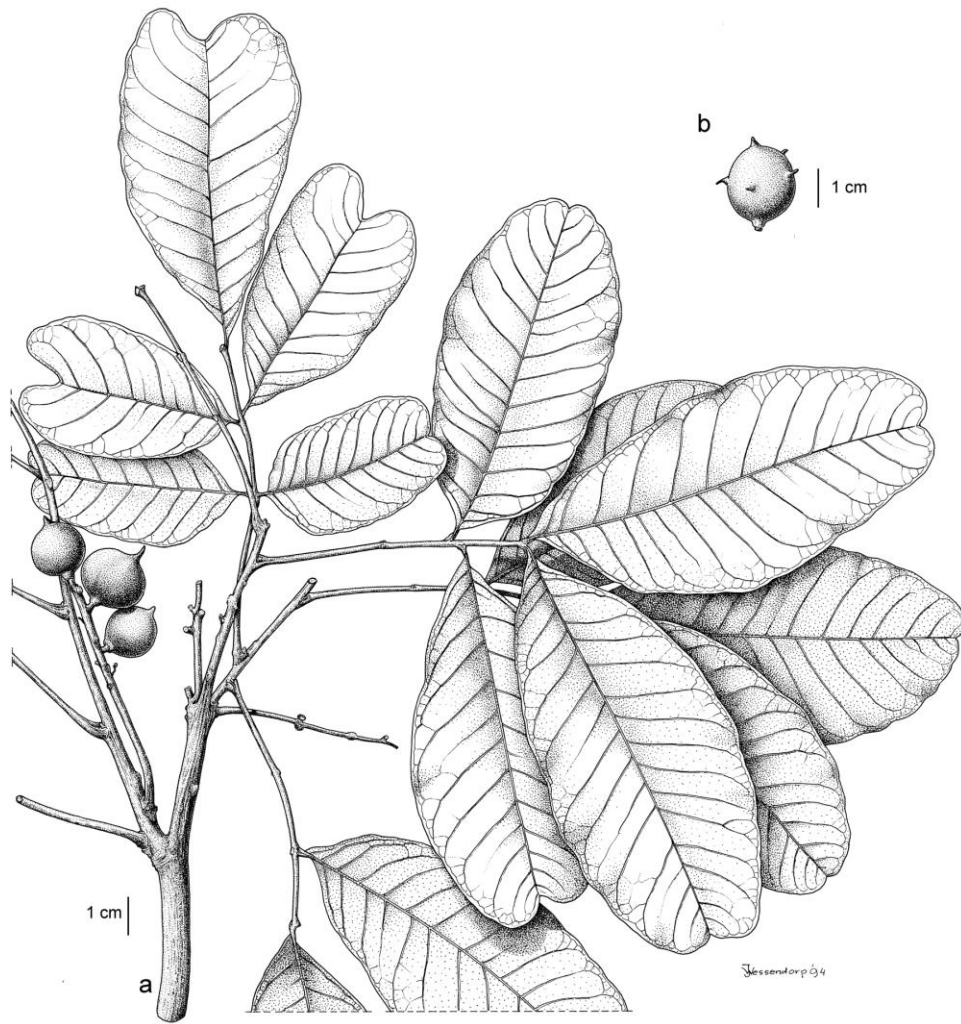


Fig. 7.
SAPINDACEAE. **Schleicheria oleosa**: a, habit; b, fruit with spines.

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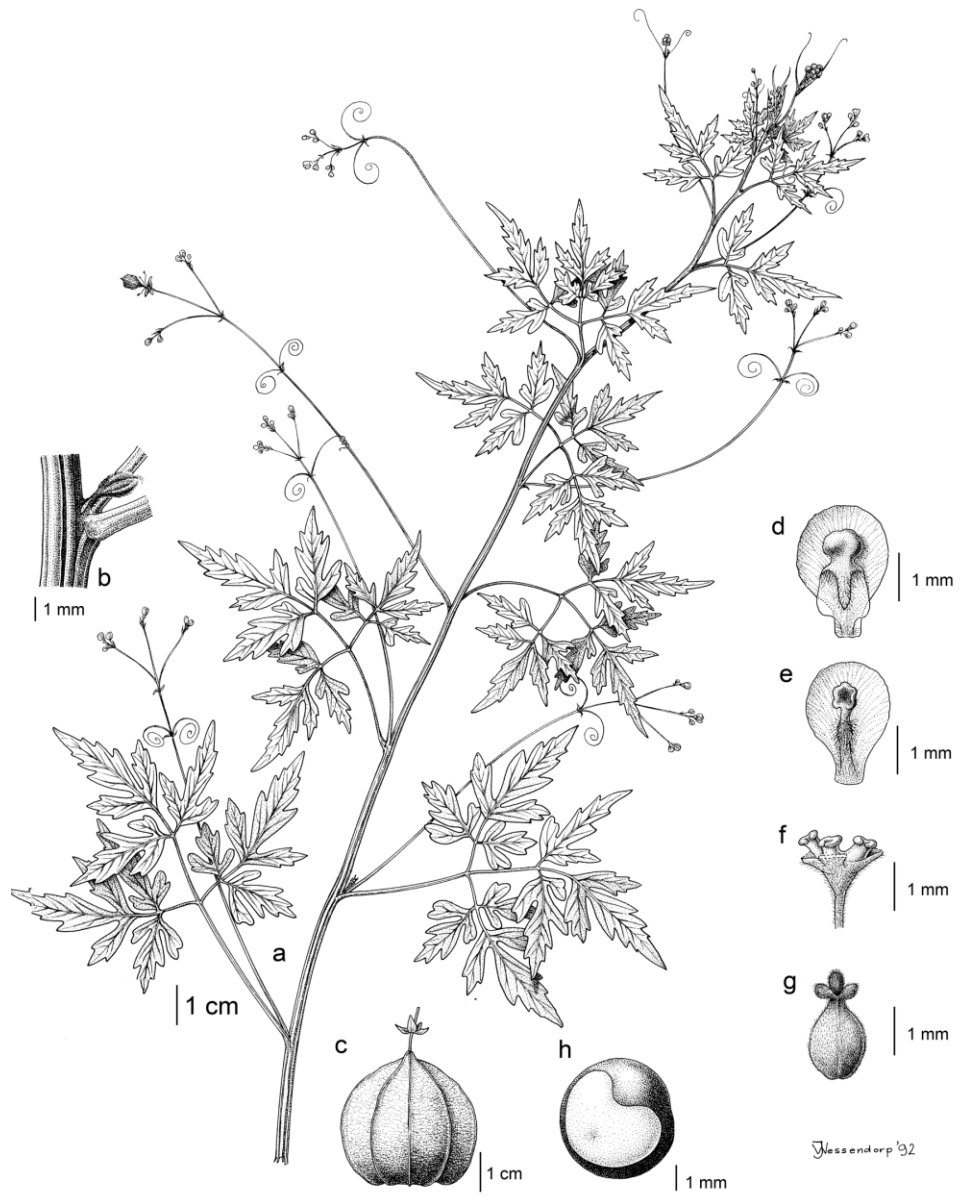


Fig. 8.
SAPINDACEAE. *Cardiospermum halicacabum*: a, habit; b, stipules; c, fruit; d, e, petals from inside with scales; f, disc glands; g, ovary; h, seed with hilum (white).

Illustration Accreditation

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Fig. 1

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Fig. 2

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Fig. 3

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Fig. 4

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Fig. 5

Anita Walsmit Sachs

Fig. 6

Anita Walsmit Sachs

Fig. 7

Joop Wessendorp

Fig. 8

Joop Wessendorp

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. Intraspecific 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 Devanagari 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

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online. Separate indexes to vernacular names in Devanagari, 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 ‘Nepalia’ 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:

<i>W Himalaya</i>	India (Jammu & Kashmir, Himachal Pradesh, Uttarakhand), northern Pakistan (Khyber Pakhtunkhwa, previously known as North West Frontier Province).
<i>E Himalaya</i>	Sikkim, Darjeeling, Bhutan, NE India (Arunachal Pradesh).
<i>Tibetan Plateau</i>	China (Xizang, Qinghai).
<i>Assam-Burma</i>	Assam, Nagaland, Manipur, Myanmar.

<i>S Asia</i>	Eastern Pakistan (Punjab, Sind, Islamabad), Peninsular India, Sri Lanka, Bangladesh, Maldives.
<i>E Asia</i>	China (excluding Xizang, Xinjiang, Qinghai), Korea, Japan, Taiwan.
<i>SE Asia</i>	Thailand, Laos, Cambodia, Vietnam, Malaysia, Indonesia, Philippines, New Guinea.
<i>N Asia</i>	China (Xinjiang), Russia, Mongolia.
<i>C Asia</i>	Kazakhstan, Uzbekistan, Turkmenistan, Tajikistan, Kyrgyzstan.
<i>SW Asia</i>	Afghanistan, western Pakistan (Baluchistan, Federally Administered Tribal Areas), Iran, Middle East, Arabian Peninsula, Turkey, Azerbaijan, Armenia, Georgia.
<i>Asia</i>	collective term for all above areas of Asia.
<i>Europe</i>	includes Ukraine, Belarus, Baltic republics.
<i>Africa</i>	includes Madagascar.
<i>N America</i>	includes C America south to Panama.
<i>S America</i>	south of Panama.
<i>Australasia</i>	Australia, New Zealand, Pacific Islands.
<i>Cosmopolitan</i>	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.	<i>circa</i> – about, approximately.
comb. nov.	<i>combinatio nova</i> – 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.	<i>et alia</i> – and others.
fig.	figure.
N	north, northern.
nom. cons.	<i>nomen conservandum</i> – name officially conserved in ICBN. ¹⁴
nom. illegit.	<i>nomen illegitimum</i> – illegitimate name, according to ICBN. ¹⁴
nom. inval.	<i>nomen invalidum</i> – invalid name, according to ICBN. ¹⁴
nom. nud.	<i>nomen nudum</i> – name lacking a description, or reference to an effectively published description, and so invalid according to ICBN. ¹⁴
nom. rej.	<i>nomen rejiciendum</i> – name officially rejected in ICBN. ¹⁴
nom. superfl.	<i>nomen superfluum</i> – name superfluous when published, and so illegitimate according to ICBN. ¹⁴
pl.	plate.
q.v.	<i>quod vide</i> – which see.
S	south, southern.
s.l.	<i>sensu lato</i> – for a taxon treated in a broad sense.
s.s.	<i>sensu stricto</i> – for a taxon treated in a narrow sense.

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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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