

GUIDE TO THE GENERA OF LIANAS AND CLIMBING PLANTS IN THE NEOTROPICS

POLYGALACEAE

By Pedro Acevedo-Rodríguez (Feb 2020)



Securidaca warmingiana Chodat, photo by P. Acevedo

A nearly cosmopolitan family of 29 genera and about 1,236 species of herbs, shrubs, trees, and lianas. Lianas and climbing shrubs in this family are restricted to three of the four tribes and have a pantropical distribution. In the Neotropics, there are 80 species of climbers (lianas and vines) out of 548 species of Polygalaceae known for this region. The species of climbing Polygalaceae in the Neotropics are endemic to this region representing six genera, also endemic or predominantly represented in the Neotropics. For the most part, they are found in moist to wet lowland forest with few species occurring in open savanna-like formations, such as *campos rupestres*, *cerrados*, or even the dry *caatinga* forest of northeastern Brazil.

Diagnosics: Predominantly lianas, scrambling shrubs or erect shrubs with climbing branches; many species with woody flattened stems, commonly with successive production of xylem and phloem rings or bands; leaves simple, entire, with pinnate venation, lacking stipules; flower and fruit are quite variable, in some genera flowers are papilionaceous with two large, wing-like sepals. General appearance like Icacinaceae but distinguished by the flowers.

General Characters

1. **STEMS.** Smooth except in *Moutabea* that is commonly armed with inconspicuous thorns (fig. 2c). Stems are woody with substantial secondary growth, developing cylindrical initially, but in many species becoming flat, bilobed, or 5-lobed and known to reach up to 20 m in length and up to 12 cm in diam. Although few species have stems with regular vascular anatomy most of the genera have *successive cambia* that produce continuous concentric rings of xylem and phloem as in *Bredemeyera lucida* (fig. 1b); continuous unilateral (asymmetrical) arcs of xylem and phloem as in several species of *Securidaca* (fig. 1 c-f); or discontinuous concentric arcs or segments of xylem and phloem as seen in species of *Moutabea* (fig. 1 g & h) and in *Diclidanthera elliptica*.
2. **EXUDATES.** No visible exudate.
3. **CLIMBING MECHANISMS.** **Twiners** are known in *Diclidanthera* (fig. 2a), *Moutabea*, and several species of *Securidaca*; short lateral **prehensile branches** are known in many species of *Securidaca* (fig. 2b), and in *Bredemeyera lucida* which sometimes climbs by **scrambling** over other plants.
4. **LEAVES.** Alternate, exstipulate, coriaceous to membranaceous in species of *Securidaca*, commonly short-petioled, with gland-less blades and entire margins.
5. **INFLORESCENCE.** Axillary or terminal, short, few- to many-flowered, erect to pendant racemes. Many genera with nectaries basal to the bracts.
6. **PEDICELS.** Of variable lengths but usually short.
7. **FLOWERS.** Bisexual, zygomorphic (papilionaceous) in most genera, actinomorphic in *Diclidanthera* and *Barnhartia*; calyx of 5 distinct sepals, unequal in papilionaceous flowers, the inner two petaloid; corolla of 3 or 5 distinct petals; stamens 8(10), the filaments free or connate into a staminal sheath that is adnate to the base of petals, the anthers opening by terminal pores or along longitudinal slits; ovary superior, 1-5-locular, with a single, axial, pendulous ovule per locule, the style 1 with a terminal stigma.
8. **FRUIT.** Quite variable, in *Securidaca*, 1-seeded samaras (fig. 5a); in *Bredemeyera*, dehiscent capsules (fig. 5 d); in *Barnhartia*, *Diclidanthera* and *Moutabea*, indehiscent, fleshy to coriaceous, 4-5-seeded (fig. 5 b & c; fig. 6 a & b) berries.

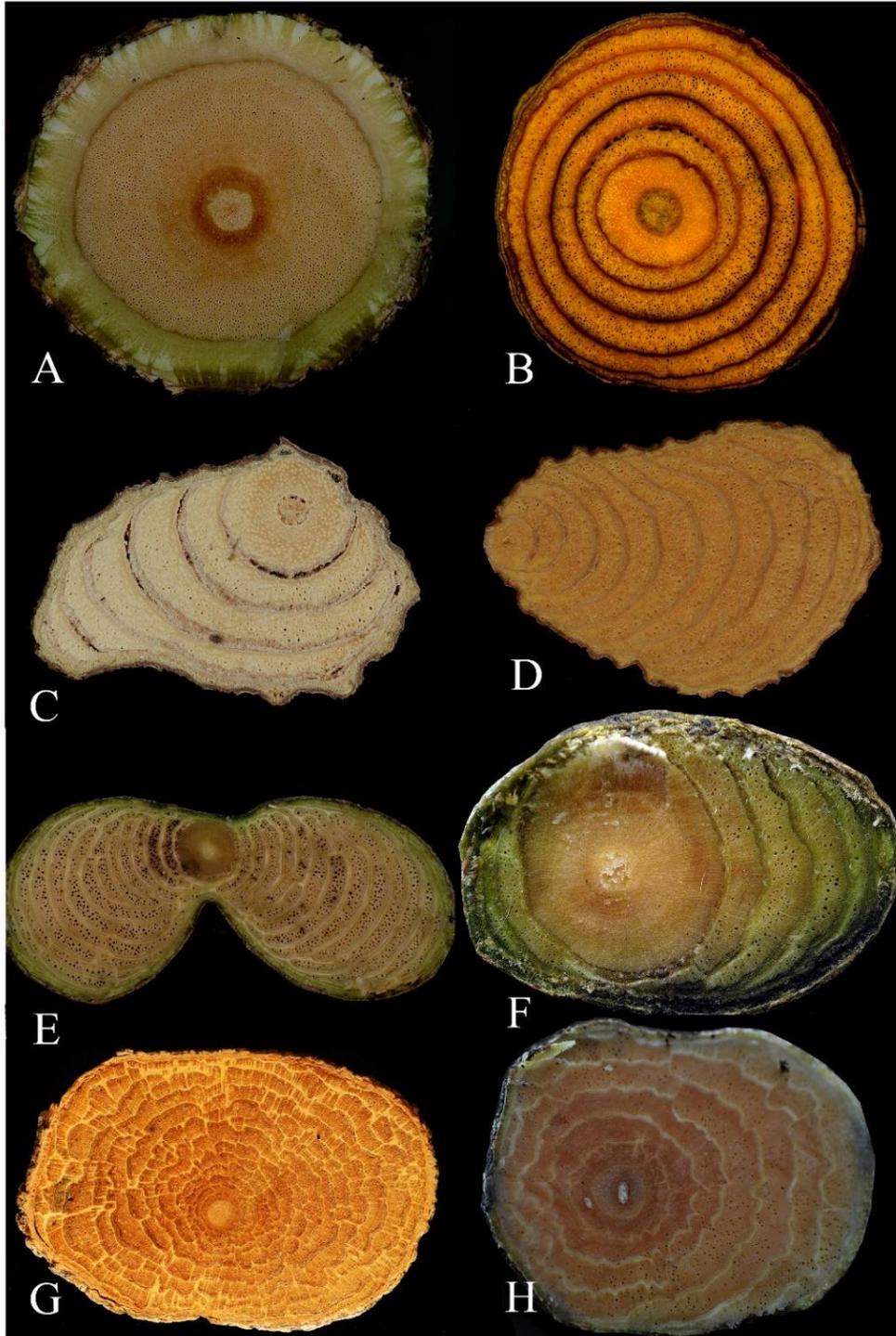


Figure 1. Cross sections of stems in Polygalaceae. **A.** Simple stem of *Securidaca diversifolia*. **B.** Symmetrical successive bands of xylem and phloem of *Bredemeyera lucida*. **C. & D.** Acentric successive bands of xylem and phloem of *Securidaca virgata*. **E.** Asymmetrical, successive bands of xylem and phloem producing a bilobed stem. **F.** Acentric successive bands of xylem and phloem of *Securidaca virgata*. **G.** Discontinuous concentric wavy arcs of xylem and phloem of *Moutabea aculeata*. **H.** Discontinuous concentric wavy arcs of xylem and phloem of *Moutabea* sp. Photos by P. Acevedo.



Figure 2. Climbing mechanisms and stem features. **A.** *Diclidanthera elliptica*, a twiner. **B.** *Securidaca* sp. with short, lateral, prehensile branches. **C.** *Moutabea* sp. stem with inconspicuous thorns. Photos by P. Acevedo.



Figure 3. Leaves in Polygalaceae. **A.** *Securidaca diversifolia*. **B.** *Diclidanthera elliptica*. **C.** *Diclidanthera laurifolia*. Photo by P. Acevedo.

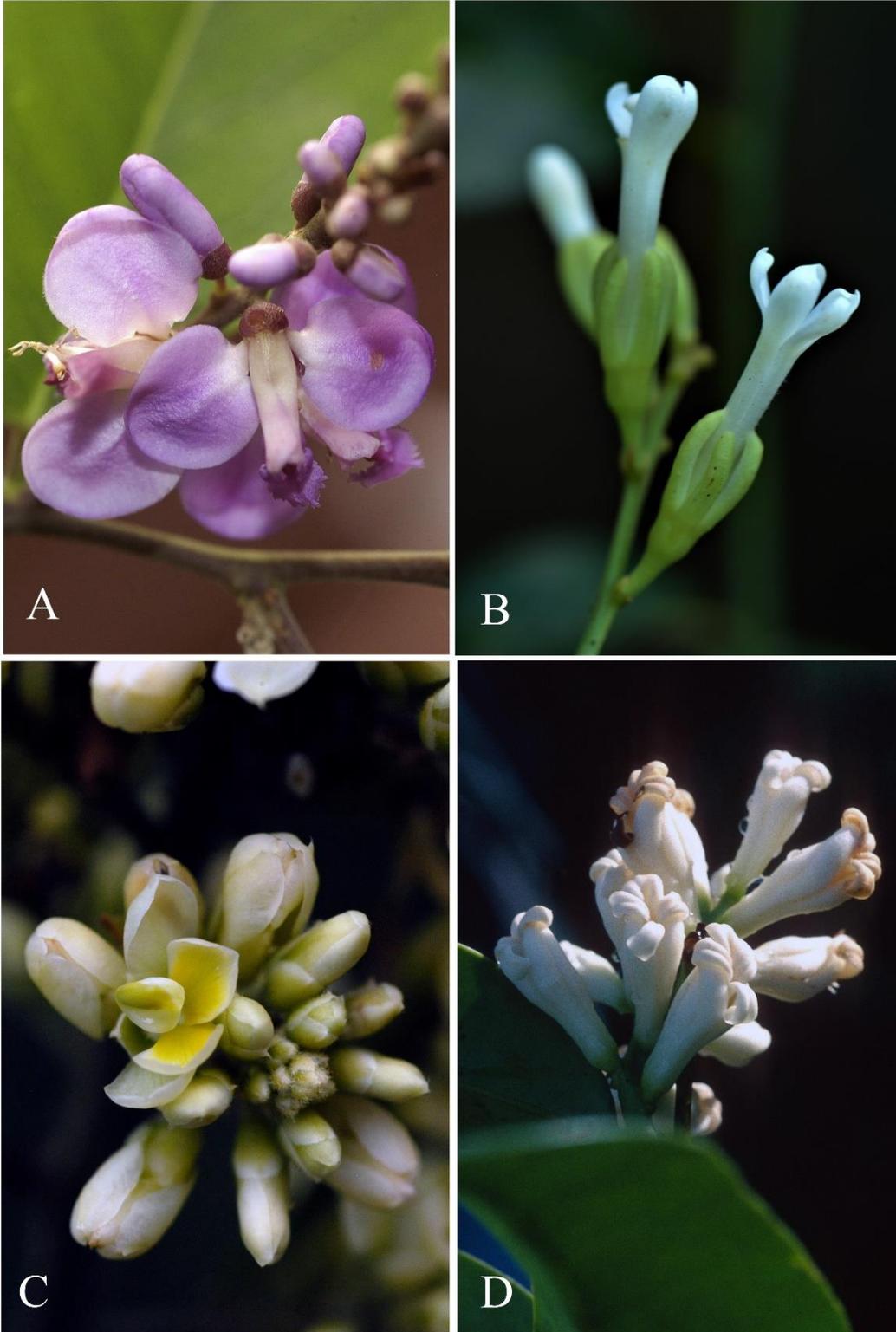


Figure 4. Flowers in Polygalaceae. **A.** *Securidaca paniculata* with papilionaceous flowers. **B.** *Diclidanthera* sp. with actinomorphic tubular corolla. **C.** *Bredemeyera brevifolia* with papilionaceous flowers. **D.** *Moutabea guianensis* with sub-zygomorphic flowers. Photos by P. Acevedo.

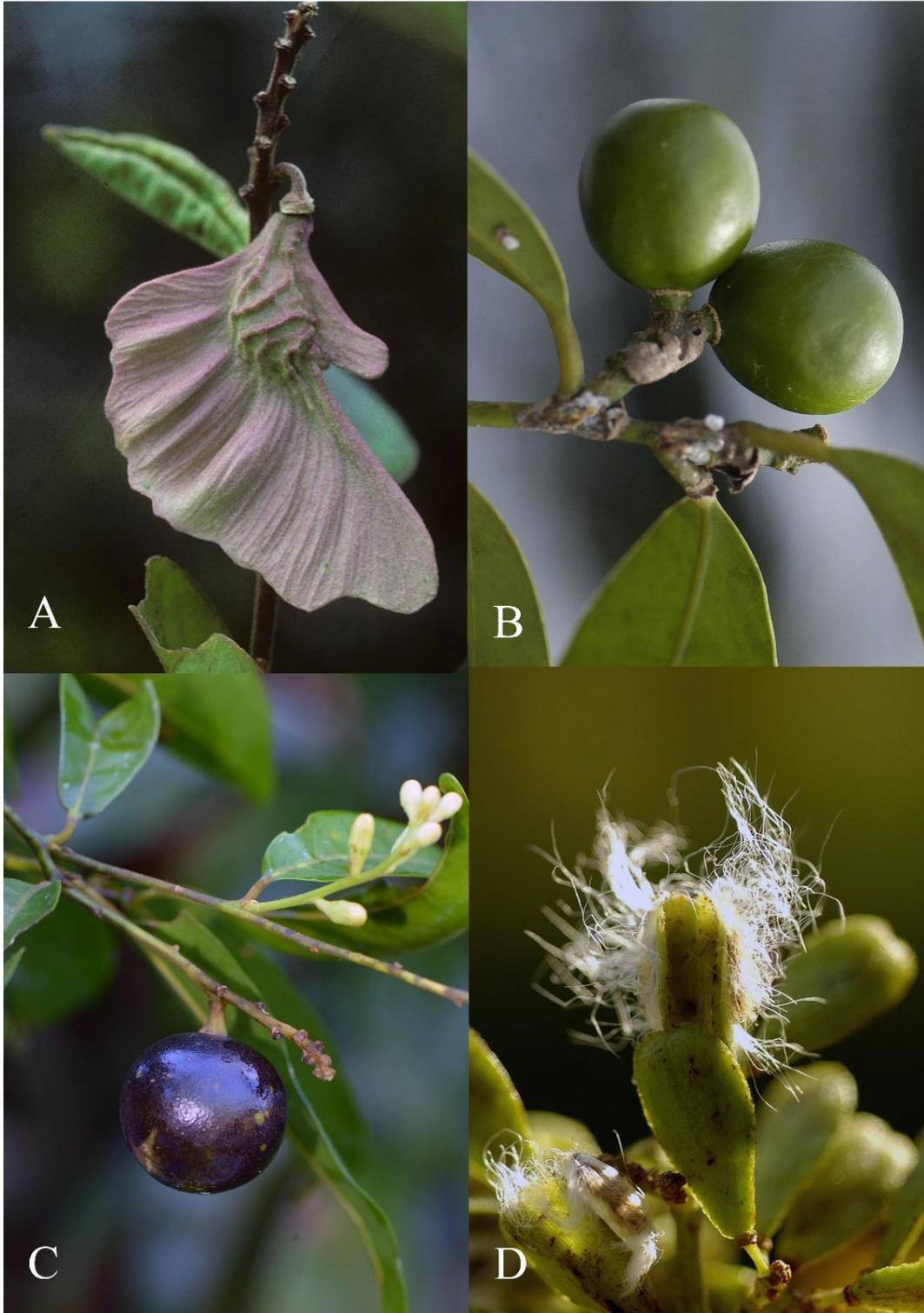


Figure 5. Fruits in Polygalaceae. **A.** Samara in *Securidaca longifolia*. **B.** Berries in *Moutabea guianensis*. **C.** Berry in *Diclidanthera* sp. **D.** Capsule in *Bredemeyera myrtifolia*, seeds with long hairs. Photos by P. Acevedo.



Figure 6. Indehiscent fruits in Polygalaceae. **A.** *Diclidanthera* sp. **B.** *Moutabea longifolia*. Photos by P. Acevedo.

USES

There are a few reports on the utility of Polygalaceae lianas. These include the usage of a decoction of *Securidaca diversifolia* as a treatment for venereal diseases in Panama and Venezuela (Persson, 2004). Similarly, a decoction of the bark from the African species *Securidaca longipedunculata* is reported as useful in the treatment of various ailments (Nkoana et al. 2015). The fleshy mesocarp of various species of *Moutabea* (e.g., *M. aculeata*, *M. angustifolia*, and *M. chodatiana*) are reported as edible (Martin et al. 1987).

KEY TO THE GENERA

1. Plants climbing by short prehensile lateral branches2
1. Plants twiners or scramblers3
2. Flowers pink, purple, violet *Securidaca*
2. Flowers white or cream with yellow centers *Bredemeyera*
3. Plants twiners4
3. Plants leaning or scramblers6
4. Flowers pink, purple or violet, zygomorphic; corolla papilionaceous, 3-merous; fruit a samara
..... *Securidaca*
4. Flowers white, actinomorphic or slightly zygomorphic; corolla not papilionaceous, 5-merous;
fruits indehiscent berries5
5. Stems not armed; petioles commonly with a pair of inconspicuous, circular glands on distal
portion; corolla tubular, actinomorphic *Diclidanthera*
5. Stems commonly with dispersed, inconspicuous thorns; petioles glandless; corolla of free
petals, slightly zygomorphic..... *Moutabea*
6. Plants woody, commonly > 5 m long; flowers actinomorphic, white, not papilionaceous
..... *Barnhartia*
6. Plants herbaceous, 2-3 m long; flowers papilionaceous, blue or purplish lavender7
7. Flowers blue or dark purple with yellow; sepals caducous in fruit; fruits fleshy *Monnina*
7. Flowers pink-purple; sepals persistent in fruit; fruits not fleshy *Polygala*

GENERIC DESCRIPTIONS

BARNHARTIA Gleason, Bull. Torrey Bot. Club 53: 297. 1926.



B. floribunda from Hook. Ic. Pl. pl. 3172

Fruit a globose berry, with 2 pubescent seeds.

Canopy liana, (sometimes reported as a tree), apparently scramblers. Stems cylindrical, with successive cambia that generate continuous concentric rings of xylem and phloem. Leaves alternate, subcoriaceous, simple, with entire margins; petioles 5-10 mm long, with a pair of distal, inconspicuous, circular glands. Inflorescences axillary or terminal, of simple or compound racemes, shorter than the subtending leaf. Flowers actinomorphic, subtended by a small bract and two bracteoles and sometimes by a pair of nectaries at the base of the bract; calyx shorter than the corolla, of 5, free, equal, imbricate, erect sepals; petals 5, free, narrowly spatulate, unguiculate, erect, white, cream to light yellow, adaxially sericeous; stamens 8, adnate to the petal's claw (3 petals with 2 stamens, 2 petals with 1 stamen); anthers oblong, dehiscent by longitudinal sutures; ovary superior, of 2 carpels; style elongate, crowned by a capitate stigma; ovule 1

Distinctive features: A tall liana sometimes confused with *Diclidanthera* (refer to key to the genera), or with *Dicranostyles* (Convolvulaceae) but distinguished by the stems with continuous successive rings of xylem and phloem and the presence of nectaries basal to the bracts (vs. successive discontinuous rings, lacking nectaries).

Distribution: A genus of a single species, *B. floribunda* Gleason, distributed in the Guianas, Venezuela (Bolivar), and the Brazilian state of Amazonas, north of the Amazon River.

BREDEMEYERA Willdenow, Ges. Naturf. Freunde Berlin Neue Schriften 3: 412. 1801.



B. lucida, photo by P. Acevedo

Lianas climbing by short, lateral prehensile branches or less frequently clambering or suberect shrubs. Stems cylindrical, and as far as it is known (e.g., *B. lucida* (Benth.) Hassk) with successive cambia that generate continuous concentric rings of xylem and phloem (fig. 1b). Leaves alternate, simple; petioles short. Flowers zygomorphic (papilionaceous), white or yellowish, sometimes with purplish spots, in terminal frondo-bracteate panicles; bracts and bracteoles minute; calyx of 5 free sepals, the two inner petals larger, petaloid; petals 5, united at the base, the central petal in the form of a keel that covers the reproductive organs, the two lateral external petals rudimentary, the two lateral internal petals as long or nearly as long as the keel (central petal); stamens 8,

the filaments united halfway into a staminal sheath, the anthers dehiscent by a subapical aperture; ovary superior, bilocular, with a single, axial, pendulous ovule per locule, the stigma bilobate. Fruit a loculicidal, coriaceous, spatulate, obovate or obcordate capsule; seed one per locule, with long wooly hairs.

Distinctive features: Vegetatively like *Securidaca* but distinguished by the white or light-yellow flowers and the capsular fruits (vs. flowers pink, lilac, violet or purple and fruits one-seeded samaras).

Distribution: A genus of about 16 species native to South America, with one species extending north to southern Mexico.

DICLIDANTHERA Martius, Nova Gen. Sp. 2: 139. 1827 ['1826'].



D. elliptica Miers, photo by P. Acevedo

Twining lianas > 12 m long. Stems cylindrical, many-branched from base, with successive cambia that generate continuous concentric sinuate rings of xylem and phloem. Leaves alternate, coriaceous, simple, with entire margins; petioles short, often with inconspicuous circular nectaries near the apex. Inflorescences axillary or terminal, of simple or compound racemes, shorter than the subtending leaf. Flowers actinomorphic, subtended by a small bract and two bracteoles and sometimes by a pair of nectaries at the base of the bract; calyx of 5 free, valvate, equal, erect sepals; corolla gamopetalous, white, with 5, free, elongated lobes at the apex, these expanding or slightly reflexed; stamens 10, anthers ovoid, sessile, adnate to the apex of the

corolla tube, dehiscent by longitudinal sutures; ovary superior, of 5 carpels; style elongate, crowned by a truncate stigma; ovule 1 per locule, axial, pendulous. Fruit a globose berry, with 4-5 seeds.

Distinctive features: A twining liana with funnel-shaped, white flowers, vegetatively like *Barnhartia* but distinguished by floral and fruiting characters. Superficially similar to *Dicranostyles* (Convolvulaceae) which is distinguished from *Diclidanthera* by the presence of intraxylary phloem on the periphery of the medulla, and the absence of bract nectaries.

Distribution: A genus of five species distributed in northern South America in Colombia, Venezuela, Peru, and northern to southeastern Brazil.

MONNINA Ruiz & Pavón, Syst. Veg. Fl. Peruv. Chil. 169. 1798.

Shrubs, small trees, sometimes herbs or leaning shrubs. Climbing species commonly with



M. parasylvatica, photo by C.M. Taylor

slender, cylindrical stems reaching up to 12 m in length. Leaves chartaceous or membranaceous, usually < than 8 cm long, sometimes with “stipular” glands.

Inflorescences of axillary or terminal racemes or panicles.

Flowers zygomorphic

(papilionaceous), purple or blue,

with yellow or greenish keel; calyx

of 5 free sepals, the inner two sepals

much larger, petaloid, reflexed and

concave, caducous in fruit; petals 3, the central petal in the shape of a trilobed keel, with a central emarginated lobe, lacking apical appendages, the other two petals spatulate; stamens 8, connate in two groups, the anthers 1-celled, poricidal; disc adaxially prominent-glandular; ovary 1-2-locular with geniculate style and stigma of 2 dissimilar lobes, ovule 1 per locule, pendulous. Fruit indehiscent, a 1-2-seeded fleshy drupe, nutlet or bi-winged samara; seed glabrous, exarillate.

Distinctive features: Leaning shrubs, usually several m long, with blue and yellow flowers and fleshy fruits.

Distribution: An American genus with about 150 species extending from southern United States to Argentina, but most diverse in the Andean region; only 8 species (*M. cacumina* N.E. Br., *M. celastroides* (Bonpl.) Chodat, *M. lechleriana* Chodat, *M. ovata* Ferreyra, *M. parasylvatica* C.M. Taylor, *M. pavoni* Chodat, *M. pseudopolystachya* Chodat, and *M. wurdackii* Ferreyra) consistently recorded as climbers, these mostly occurring in humid forests, from sea level to about 3000 m elevation.

MOUTABEA Aublet, Hist. Pl. Guiane 679. 1775.

Twining lianas up to 20 m long. Stems with dispersed inconspicuous thorns, becoming asymmetrical, slightly flattened, in some species fenestrate, up to 12 cm in diam., with



M. guianensis, photo by P. Acevedo

successive cambia that generate discontinuous concentric sinuate rings of xylem and phloem. Leaves alternate, coriaceous, simple, usually > 10 cm long, with entire margins; petioles short, without glands. Inflorescences axillary or terminal, of simple or compound racemes, shorter than the subtending leaf; bracts minute, with a pair of glands at the base.

Flowers slightly zygomorphic (not papilionaceous); calyx white, asymmetrical, tubular, crowned by 5 unequal imbricate erect sepals; corolla white, with 5 slightly unequal petals, connate at base, slightly reflexed at the apex; stamens 8, the filaments connate into a staminal sheath which is adnate to the corolla-tube, anthers sessile, joined into 2 groups of 4; ovary superior, (2-)4-5-locular, surrounded by a disc, the ovules 1 per locule, pendulous, the style filiform crowned by a sub-capitate stigma. Fruit globose, indehiscent, leathery to sub-woody, usually orange, 2-5-seeded; seeds ellipsoid to ovoid, laterally compressed, with thin, fleshy pericarp.

Distinctive features: Twining lianas with slightly asymmetrical white flowers, vegetatively like *Barnhartia* and *Diclidanthera* but distinguished by the stems with dispersed thorns, the lack of petiole glands, and by floral characters.

Distribution: A genus of eight species distributed in northern South America in Colombia, Venezuela, the Guianas, Peru, and northern to southcentral Brazil, with one species extending north to Costa Rica.

POLYGALA Linnaeus, Sp. Pl. 701. 1753.

Herbs, subshrubs, shrubs, small trees and very rarely leaning herbs. Leaves chartaceous



P. securidaca, photo by O.M. Montiel

to subcoriaceous, lacking “stipular” glands. Inflorescences of terminal or axillary racemes. Flowers zygomorphic (papilionaceous), variable in color, but usually lavender or purple with a light yellow keel; calyx of 5 free sepals (or inferior sepals connate), inner 2 sepals larger, petaloid, usually reflexed, caducous or persistent in fruit; corolla of 3 petals connate on

lower half, keel petal boat-shaped, cucullate, 3-lobed or entire, enclosing the reproductive organs, apex often rostrate or fimbriate; stamens 6-8 with filaments connate for most of their length into a staminal sheath that is open on upper side and adnate to the petals, the anthers sessile, 1- or 2-celled, dehiscent by a terminal pore or slit; disk annular, adaxially glandular or absent; ovary 2-locular, compressed, with a single pendulous ovule per locule, the style erect or curved, the stigmas usually asymmetrically bilobed. Fruit capsular, compressed, often emarginate or winged with a smaller, indehiscent locule; seeds 2, usually black, fusiform or ovoid, usually with straight or uncinat hairs.

Distinctive features: A leaning shrub several m long, flowers with lavender wings and light-yellow keels; fruits capsular.

Distribution: A nearly cosmopolitan genus with about 500 species of which *P. Securidaca* Chodat, from Honduras and Nicaragua, is consistently reported as a vine, in scrubs and pine forests, between 1200-1300 m elevation.

SECURIDACA Linnaeus, Syst. Nat. ed. 10. 1151, 1155. 1759, (nom. cons.).

Lianas reaching > 25 m long, or less frequently clambering shrubs or small trees. Stems



S. diversifolia, photo by P. Acevedo

cylindrical, flattened, asymmetrical or bilobed, cross section with successive cambia producing continuous, concentric or unilateral arcs of xylem and phloem, rarely stems simple.

Leaves alternate, simple; petioles short; nodes usually glandular.

Inflorescence of axillary or terminal racemes; bracts minute.

Flowers zygomorphic

(papilionaceous) usually purple,

lavender or pink; calyx of 5 free sepals, the two inner sepals larger, petaloid; petals 3, united at the base, the central petal in the form of a keel, the lateral petals usually smaller than the keel; stamens 8, the filaments united into a staminal sheath, the anthers dehiscent by a subapical aperture; ovary superior, unilocular, with a single ovule, the stigma bilobed. Fruit a samara with a distal wing, the seminiferous locule basal, with a single seed.

Distinctive features: Lianas with short, prehensile lateral branches, with papilionaceous pink, lavender or purplish flowers, and samaroid fruits.

Distribution: A pantropical genus of about 60 species, 49 of which are found in the Neotropics from Mexico to southern South America, including the West Indies; mostly in humid or wet, lowland forests.

RELEVANT LITERATURE

- Abbott, J.R. 2011. Notes on the disintegration of *Polygala* (Polygalaceae), with four new genera for the Flora of North America. *Journal of the Botanical Research Institute of Texas* 5 (1): 125-137.
- Acevedo-Rodríguez, P. 2005. Vines and climbing plants of Puerto Rico and the Virgin Islands. *Contrib. United States National Herbarium* 51: 1-483.
- Blake, S.F. 1916. A revision of the genus *Polygala* in Mexico, Central America, and the West Indies. *Contr. Gray Herb.* 47: 1-122.
- Jacobs-Brouwer, A. 2002. Polygalaceae. In: S.A. Mori et al. (eds). *Guide to the vascular plants of Central French Guiana. Memoirs of the New York Botanical Garden* 76 (2): 585-589.
- Marques, M.C.M. 1979. Revisão das espécies do gênero *Polygala* L. (Polygalaceae) do Estado de Rio de Janeiro. *Rodriguésia* 31(48): 69-339.
- Marques, M.C.M. 1980. Revisão das espécies do gênero *Bredemeyera* Willd. (Polygalaceae) do Brasil. *Rodriguésia* 32(54): 269-321.
- Martin, F.W., C.W. Campbell and R.M. Ruberté. 1987. Perennial edible fruits of the tropics. An inventory. U.S.D.A. *Agricultural Handbook* 642. Washington, D.C., U.S.A.
- Nkoana, I, L. McGaw, J.F., Finnie, and J. Staden. 2015. *Securidaca longipedunculata* Fresen (Polygalaceae): A review of its ethnomedicinal uses, phytochemistry, pharmacological properties and toxicology. *Journal of ethnopharmacology* 165: 215-226.
- Persson, C., 2004 Polygalaceae. In: N. Smith, et al. (eds.). *Flowering plants of the Neotropics*. Princeton University Press. N.J., U.S.A.
- Taylor, C.M. 1985. A revision of the Central American species of *Monnina* (Polygalaceae). *Rhodora* 87: 159-188.

PICTURE VOUCHERS

Figure 1.

- A. *Securidaca diversifolia* (L.) S.F. Blake (Acevedo 16404).
- B. *Bredemeyera lucida* (Benth.) Klotzsch ex Hassk. (Acevedo 3345)
- C. *Securidaca virgata* Sw. (Acevedo 3747)
- D. *Securidaca virgata* (Acevedo 6954)

- E. *Securidaca* sp. (no voucher)
- F. *Securidaca diversifolia* (Acevedo 15219)
- G. *Moutabea aculeata* Ruiz & Pav. (Acevedo 13682)
- H. *Moutabea* sp. (Acevedo 17901).

Figure 2.

- A. *Diclidanthera elliptica* Miers (Acevedo 16945).
- B. *Securidaca* sp. (no voucher).
- C. *Moutabea* sp. (Acevedo 17091).

Figure 3.

- A. *Securidaca diversifolia* (no voucher).
- B, C. *Diclidanthera elliptica* (Acevedo 16945).

Figure 4.

- A. *Securidaca paniculata* Rich. (Acevedo 14587).
- B. *Diclidanthera* sp. (Acevedo 17082).
- C. *Bredemeyera brevifolia* (Benth.) A. W. Benn. (Roque 2618).
- D. *Moutabea guianensis* Aubl. (Acevedo 7982).

Figure 5.

- A. *Securidaca longifolia* Poepp. & Endl. (Acevedo 8267).
- B. *Moutabea guianensis* Aubl. (Acevedo 14740).
- C. *Diclidanthera* sp. (Acevedo 17082).
- D. *Bredemeyera myrtifolia* A.W. Benn. (Acevedo 14673).

Figure 6.

- A. *Diclidanthera* sp. (Acevedo 17082).
- B. *Moutabea longifolia* Poepp. & Endl. (Acevedo 7592).