

## ARISTOLOCHIACEAE

P. Acevedo-Rodríguez

A primarily tropical family extending to temperate regions of the Northern Hemisphere with ~8 genera and 710 species of twining lianas or vines, or less often rhizomatous herbs or shrubs. Vines and lianas in the Neotropics belong to *Aristolochia* and *Isotrema* with ~211 species. The family is found in diverse habitats including moist, wet, or seasonal lowland forest and savannas; 0–1,700 m.

**Diagnosics:** Twining lianas or vines, commonly with corky, fissured bark, and no exudate; stem cross sections with xylem and phloem of very wide multicellular rays dividing their axial elements into segments; leaves alternate, often with 3 to 5 main veins from the base, exstipulate; flowers zygomorphic, with an expanded distal limb; fruits septicidal capsules with numerous thin, wind-dispersed seeds. Sometimes confused with Convolvulaceae but distinguished by the lack of exudate, 3- or 5-plicate veined leaves, wood anatomy, and fertile characters.

### General Characters

1. **STEMS.** Herbaceous to woody, cylindrical, smooth, known to reach up to 10 m in length and in some species up to 5 cm in diam.; bark commonly corky with longitudinal furrows (Figure 13B). Cross section commonly with vascular axial elements divided in radial segments; these segments are the result of the activity of the fascicular cambium, while the wide, tall multiseriate rays are produced exclusively by the interfascicular cambium (Figure 13A). Vessel elements are very wide and visible to the naked eye (Figure 13A).
2. **EXUDATES.** Watery or no visible exudate.
3. **CLIMBING MECHANISMS.** All climbing species of *Aristolochia* and *Isotrema* are twiners (Figure 13C).

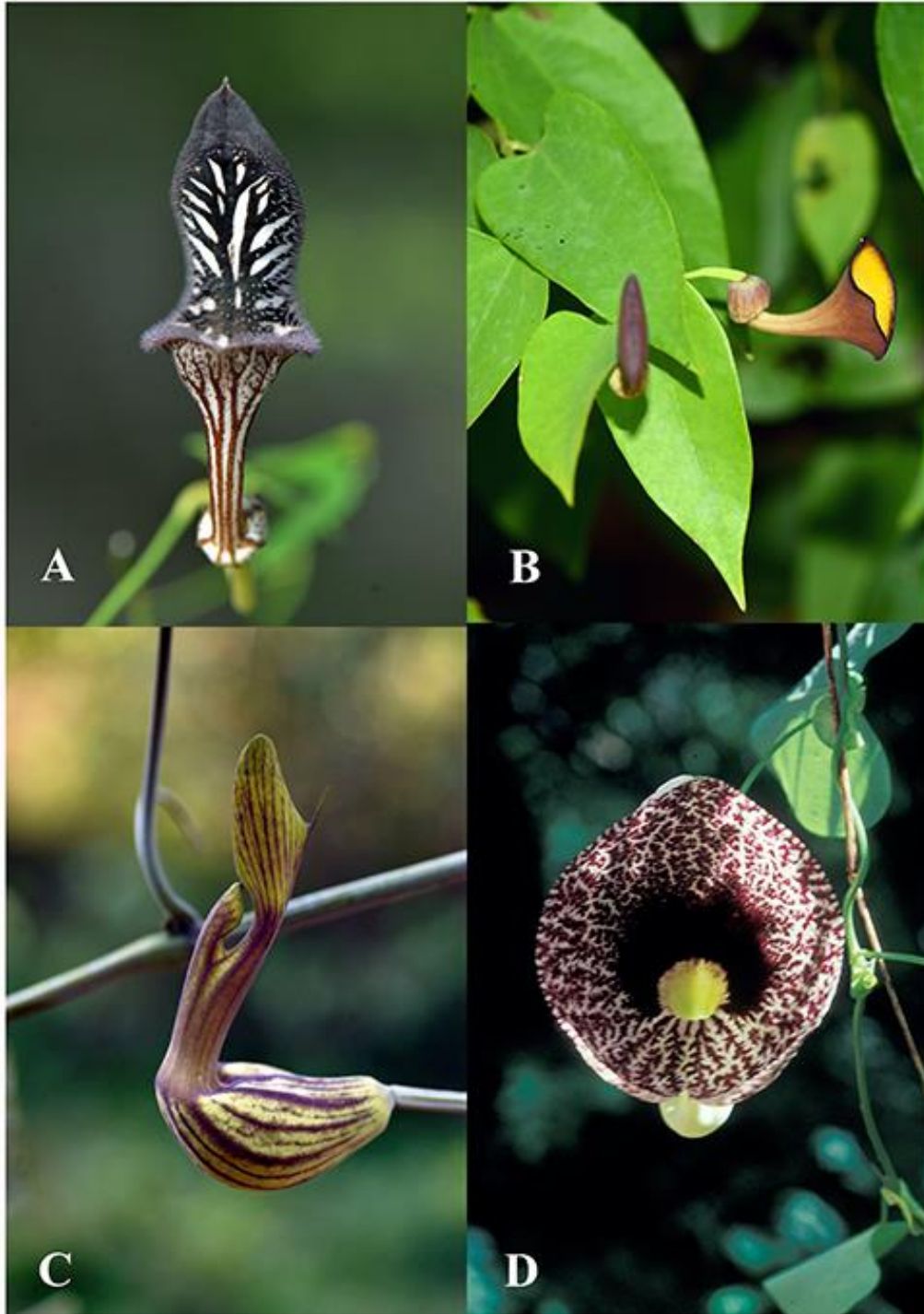
4. LEAVES. Alternate, distichous, chartaceous to coriaceous, simple, commonly cordiform, less often trilobed, oblong or lanceolate, with 3–5 main arcuate, subparallel veins from base, margins entire. Petioles short to long, sometimes twisted (Figure 13D). Exstipulate but *Aristolochia* often with pseudo-stipules.
5. PEDICELS. Commonly long.
6. FLOWERS. Solitary and axillary or clustered and cauliflorous; bisexual, zygomorphic, apetalous, consisting of a well-developed calyx differentiated into an utricle (inflated basal portion, Figure 14), a median tube and an expanded distal limb; anthers fused to the stigmas forming a gynostemium; ovary inferior.
7. FRUIT. Septicidal, 5–6-locular, elongate to rounded, pendent, dry capsules with numerous seeds per locule. Seeds commonly flat, triangular, surrounded by a marginal wing, or less often with a sticky aril.

## USES

Several species of *Aristolochia* are cultivated in tropical gardens for their large, showy, flowers, and vine trellises. In addition, several species have been used in traditional healing for the treatments of various ailments.



**Figure 13.** Stems in species of *Aristolochia*. **A.** Cross section of *A. maxima*, showing wide rays dividing the vascular axial elements into radial segments and vessel elements with very wide lumen. **B.** Corky, fissured bark of *A. elegans*. **C.** *Aristolochia* sp. showing twining stems. **D.** *Aristolochia* sp. with recurved petioles. Photos by P. Acevedo.



**Figure 14.** Flowers in *Aristolochia*. **A.** *Aristolochia* sp. with ascending limb. **B.** *Aristolochia* sp., with abaxially yellow limb. **C.** *A. esperanzae* with erect bilabiate limb, upper lip bifurcate. **D.** *A. elegans*, flower with wide circular limb. Photos by P. Acevedo.

### Key to the genera of climbing Aristolochiaceae

1. Perianth limb and gynostemium 3-lobed; perianth strongly curved; anthers in pairs on the outer surface of each gynostemium segment; capsules basipetally dehiscent (Mexico and Central America) .....*Isotrema*
1. Perianth limb variously shaped but not 3-lobed, gynostemium 5- or 6-lobed; perianth not strongly curved; anthers single on outer surface of each gynostemium segment; capsules acropetally dehiscent (Neotropics) .....*Aristolochia*

**ARISTOLOCHIA** Linnaeus, Sp. Pl. 1032. 1753.

*Euglypha* Chodat & Hassl. (1906).

Twining vines or lianas, herbaceous or commonly woody (Figure 15). Stems cylindrical,



*Aristolochia* sp., photo by J. Amith.

up to 20 m long and 5 cm in diam.; bark corky and fissured in woody species (Figures 1E; 13B); cross sections with visible wide vessel element lumens and axial elements divided in radial segments (Figure 13A).

Leaves alternate, distichous, simple to deeply trilobed, commonly cordiform or hastate at base, with palmate venation (3–5 main arcuate, parallel veins), the margins entire; petioles short to long, not pulvinate, sometimes geniculate; stipules absent, but ~60 species have circular,

sessile prophylls that resemble a stipule, hence called

pseudo-stipules. Flowers solitary and axillary, or

congested and cauliflorous, pendent, ascending or plagiotropic, long-pedicellate, bisexual,





*Aristolochia bukuti*

**Figure 15.** *Aristolochia bukuti*. **A.** Branch with leaves. **B.** Cluster of cauliflorous flowers. **C.** Flower, lateral & frontal views. **D.** Flower, longitudinal section. **E.** Gynostegium in pistillate phase. **F.** Older gynostegium in staminate phase. **G.** Mature stem with corky bark and cauliflorous inflorescences. **H.** Seed, dorsal & frontal views. **I.** Cross section of stem showing vascular axial elements divided into radial segments. Drawing courtesy of Bobbi Angell.

zygomorphic, 5- to 6-merous. Perianth showy, formed by 3 fused sepals forming a pitcher-like structure with an inflated basal portion (utricle) and a median tube that expands toward the margins into an entire, circular or bilobed limb, the lobes generally unequal, some forming a long tail; corolla absent; stamens 5 or 6, sessile, the anthers fused to the stigmas forming a gynostemium; ovary inferior or partly inferior, of 5–6 united carpels; ovules numerous per locule; styles 5–6 connate. Fruit a 5–6-locular, septicidal, 5 or 6 lobed, cylindrical or nearly globose capsule, that opens acropetally (with pedicels splitting into strands that retain the opened valves at a 45° angle exposing the wind dispersed seeds); seeds numerous flat, triangular, surrounded by a marginal wing, or less often with a sticky aril.

**Distinctive features:** Herbaceous to woody twiners with corky bark, lacking exudate, with alternate, distichous, entire to trilobed, leaves with palmate venation; flowers pitcher-like, often with foul smell.

**Distribution:** A pantropical genus with over 500 species, 272 of which are distributed in the Western Hemisphere, and 205 species in the Neotropics; occurring in lowland moist, wet or seasonal forests, scrubs, and open habitats.

**ISOTREMA** Rafinesque, Amer. Monthly Mag. & Crit. Rev. 4(3): 195. 1819.

Twining lianas, erect shrubs or small rhizomatous herbs; bark corky and fissured. Leaves



*Isotrema veracruzana*, photo by J. Meerman.

alternate, veins pinnate or 3–7-palmate from base, margin entire (in neotropical species). Flowers solitary and axillary, fasciculate and cauliflorous or in distal racemes, long-pedicellate, bisexual, zygomorphic, 6-merous. Perianth showy, formed by fused sepals forming a pitcher-like structure with an inflated basal portion (utricle) and a geniculate curved median tube that expands toward the margins into a 3-lobed limb; corolla absent; stamens 6, sessile, the anthers fused in pairs to the stigmas forming a 3-lobed gynostemium; ovary inferior, of 6 united

carpels. Fruit dry, 6-locular capsules, dehiscent basipetally; seeds flat or plano-convex, with fleshy funicle.

**Distinctive features:** Similar to *Aristolochia* but differing by the characters shown in the key.

**Distribution:** A predominantly pantropical genus of ~98 species distributed in East Asia, South Asia, North America, Mexico, and Central America; six of which are twining lianas distributed from Mexico south to Nicaragua; occurring in lowland, moist, wet or seasonal forests 0–1,600 m.