

Revising the Classification of Cultivated *Centrosema* and *Clitoria* in the United States

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Abstract. Revised treatments of the genera *Centrosema* (DC.) Benth. (Leguminosae: Fabaceae) and *Clitoria* L. follow the style used in *Hortus Third*. Inventory of species, nomenclature, authorities, morphological descriptions, and distributions have been updated.

The American Society for Horticultural Science (1991) published guidelines for citing correct scientific names, with *Hortus Third* (Liberty Hyde Bailey Hortorium, 1976) as the recommended reference. *Hortus Third* cited one species of *Centrosema* (p. 245) and four species of *Clitoria* (p. 287) in cultivation in the United States. The most recent revisions available on *Centrosema* (Bentham, 1837) and *Clitoria* (Bentham, 1858) to the authors of *Hortus Third* were more than a century old, and there were some inaccuracies in the treatments. The objective of this paper is to provide a more complete inventory of species known to have been cultivated in the United States, to provide more accurate descriptions, and to correct the nomenclature.

Historically, Linnaeus (1753) described four species of *Clitoria*, two that currently are assigned to *Centrosema*. Bentham (1837) segregated *Centrosema* from *Clitoria* and recognized it as a separate genus. Bentham (1837) was the authoritative source for the genus *Centrosema* until Barbosa-Fereiro (1977) provided a treatment for species in Brazil and Fantz (1979a) provided a key to those in Central America. Bentham (1858) published a revision of *Clitoria* that served as the authoritative treatment before those of Fantz (1979b, 1980, 1988, 1990). Economic uses of *Clitoria* worldwide are documented by Fantz (1991).

There is no vernacular name associated with either genus worldwide. Frequent

misidentifications on herbarium vouchers result from confusion by many in segregating *Centrosema* species from those of the genus *Clitoria*. Hence, a similarity in American and Spanish vernacular names are reported for both genera based on vernacular names associated with these misidentified vouchers. *Hortus Third* cited the vernacular names "butterfly pea," "conchita," and "pigeon-wings." The name "butterfly pea" has been applied to both genera, with "spurred butterfly pea" used for segregating *Centrosema* from *Clitoria*. Several *Clitoria* and misidentified *Centrosema* species bear the term "conchita" in Spanish vernacular names. The American Joint Committee on Horticultural Nomenclature proposed standardized vernacular names, coining the name "pigeon-wings" for *Clitoria* (Kelsey and Dayton, 1942). The artificial name "pigeon-wings" has not been accepted, as evidenced by its omission in botanical and horticultural publications in the 50 years since the name's origin.

Species of these genera are desired ornamentals because of their enlarged, resupinate papilionaceous flowers (2 to 8 cm) of various colors and growth forms or unusual morphology, as in the dimorphic leaves of "kilelo." Flowers commonly have a yellowish to white medial eyespot on the banner with prominent, dark veins radiating outward as nectar guides. Some species have azure or blue pigmentation in the petals, a color lacking in most ornamentals. Most species are associated with sandy soils in tropical environments (i.e., wet to dry tropical rain forests, savannas, and coastal dunes), although there are a few temperate perennials whose aerial stems die back to the ground during winter. Tropical members are cultivated under glass, grown outdoors in U.S. Dept. of Agriculture zone 10, or treated as annuals in colder climates. Fantz (1991) documents medicinal uses reported for some of the species found in cultivation in the United States.

Centrosema and *Clitoria* are distinguished easily from other cultivated legumes by their large (>2 cm long), resupinate, papilionaceous flowers. The following key segregates taxa cultivated in the United States.

1. Calyx short-campanulate; standard spurred; wings auricled near base; staminal sheath and style broadly U-shaped; fruit sessile, flat, costate with two ribs, one near each margin... **CENTROSEMA**
 - 2a. Bracteoles broad, obscuring calyx, 6-9 mm wide, 13-17 mm long; calyx teeth obscure; fruit 8-12 mm wide; flowers 3.5-5 cm long; liana... *C. plumieri*
 - 2b. Bracteoles narrow, not hiding calyx, 3-7 mm wide, 7-10 mm long; calyx teeth prominent; fruit 4-8 mm wide; flowers 2-3.5 cm long; perennial scandent herbs.
 - 3a. Leaflets 1, sagittate... *C. sagittatum*
 - 3b. Leaflets 3, ovate to elliptic to lanceolate.
 - 4a. Upper and lateral calyx teeth 2-4 mm long, much shorter than the ventral tooth, 5-8 mm long; inflorescence 2-9 cm long; bracteoles 7-10 mm long; fruit 6-7 mm wide... *C. pubescens*
 - 4b. Upper and lateral calyx teeth subequal to ventral tooth, 6-10 mm long; inflorescence to 2 cm long; bracteoles 5-8 mm long; fruit 4-5 mm wide... *C. virginianum*
1. Calyx narrow funnelform, rarely tubular-campanulate; standard spurless; wings lacking auricle; staminal sheath and style geniculate; fruit stipitate, flat and ecostate, or turgid to convex, ecostate or costate with one rib medially... **CLITORIA**
 - 5a. Leaflets 5-7; flowers blue (rarely white); fruit flat, narrow (4-11 mm wide).
 - 6a. Flowers "double," actinomorphic, petals all standard-like... *C. ternatea* var. **pleniflora**
 - 6b. Flowers zygomorphic, petals papilionaceous.
 - 7a. Flowers 2-3.5 cm long, blue; calyx tube 4-8 mm long, lobes 4-8 mm long; fruit 30-50 mm long.
 - 8a. Erect herb; bracteoles 6-11 mm long; fruit 6-8 mm wide; leaflets 5, 1.5-3 cm wide... *C. annua*
 - 8b. Vine; bracteoles 2-3 mm long; fruit 45 mm wide; leaflets 5-7, dimorphic, to 1 cm wide... *C. heterophylla*
 - 7b. Flowers 3.5-5 cm long, blue or white; calyx tube 8-14 mm long, lobes 7-12 mm long; fruit 70-110 mm long... *C. ternatea*
 - 5b. Leaflets 3; flowers lilaceous to purple; fruit turgid, or flat and broad (12-35 mm wide).
 - 9a. Inflorescence multiflowered; fruit flat, 120-280 mm long; cleistogamy lacking; tall shrub or tree.
 - 10a. Flowers rose-purplish; bracteoles broad, obscuring calyx, 7-11 mm wide, 17-23 mm long; inflorescence terminal or axillary after leaves borne; calyx tubular-funnelform, lobes 46 mm long; fruit 22-33 mm wide... *C. fairchildiana*

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- 10b. Flowers white; bracteoles narrow and not hiding calyx, 1–1.5 mm wide, 2–3 mm long; inflorescence cauliflorous before leaves appear; calyx tubular-campanulate, lobes 1–2 mm long; fruit 12–17 mm wide... *C. bractystegia*
- 9b. Inflorescence 1–2 (4) flowered; fruit turgid, 25–70 mm long; cleistogamy present; small shrubs to perennial herbs.
- 11a. Fruit costate, 8–11 mm wide, stipe 9–11 mm long; style 19–23 mm long; staminal sheath 28–34 mm long, leaflets oblong; sparsely branched shrub to 2 m tall... *C. laurifolia*
- 11b. Fruit ecostate, 4–8 mm wide, stipe 12–21 mm long; style 13–20 mm long; staminal sheath 17–30 mm long; leaflets ovate to lanceolate to linear erect perennial herbs 0.1–0.6 m tall with older apices twining.
- 12a. Calyx tube 7–10 mm long; stipules 24 mm long; leaflets narrow, 0.5–1 cm wide; stipe 15–21 mm long; cleistogamous flowers with bracteoles 2–3 mm long and calyx tube 3–4 mm long... *C. fragrans*
- 12b. Calyx tube 10–14 mm long; stipules 3–8 mm long; leaflets broad, 1–6.5 cm wide; stipe 5–17 mm long; cleistogamous flowers with bracteoles 3–5 mm long and calyx tube 4–5 mm long... *C. mariana*

The revised treatments of these genera cited below follow the style used in *Hortus Third*. Literature research plus data from examining >11,000 herbarium specimens of these genera provide the foundation for these changes. Vernacular names reflect names on herbarium specimen labels and in literature. Inventory of species, nomenclature, authorities, morphological descriptions (habit, racemose flowers, standard, wings, stamens, style, fruit), and distributions have been corrected. Measurements are in metric units, unlike those in *Hortus Third*. Comments follow some entries for clarification.

CENTROSEMA (DC.) Benth. [*Bradburya* Rafin.]. SPURRED BUTTERFLY PEA. Leguminosae (subfamily Faboideae). About 35 spp. of shrubs, lianas, or suffruticose perennial herbs with annual aerial stems from subterranean xylopodia climbing or trailing, W. Hemisphere; lvs. alt., pinnate, lfts. 3 or occasionally 1, stipulate and stipellate; infl. pseudoracemose, axillary, one to several flwd.; fls. papilionaceous, resupinate, showy, purplish to pink or white, calyx short-campanulate, bracteolate, standard orbicular, emarginate, spurred or gibbous near base, wings auricled near base, adherent and subequal to the broad U-shaped, incurved keel, stamens 10, united (9 + 1), style broad U-shaped, barbellate basally; fruit sessile, linear, flat, costate with 1 rib near each margin. Characteristics of calyx, bracteoles and flower size are those primarily used for identifying species.

plumieri (Turp. ex Pers.) Benth. [*Clitoria plumieri* Turp. ex Pers., *Bradburya plumieri* (Turp. ex Pers.) Kuntze]. GALLITO, GALLITANITA BLANCA. Liana; lfts. ovate to rhombic-ovate, 6–19 cm long, 3–12 cm wide; infl. several flwd., 6–10 cm long; fls. white with purplish center and veins, 3.5–5 cm long; br. hide calyx, 13–17 mm long, 6–9 mm wide; calyx tube 4–5 mm long, teeth obscure; fr. 80–130 mm long, 8–12 mm wide. Mex. to Braz., W. Indies, introduced trop. Afr. Zone 10b. Commonly cult. ornamental worldwide, rarely in Fla. or under glass.

pubescens Benth. BUTTERFLY PEA, SPURRED BUTTERFLY PEA, GALLINITA, PATILLO, FRIJOL CUCHILLO. Per. scandent herb; lfts. variable, often ovate to elliptic to oblong, pilose to glabrate below, 3–8 cm long, 2–5 cm wide; infl. 2–9 cm long, few flwd.; fls. white with yellow medially and purple veins or tinged purplish, 2.5–3.5 cm long; br. 7–10 mm long, 4–5 mm wide; calyx tube 3–4 mm long, upper and lateral teeth 24 mm long with ventral tooth 5–8 mm long; fr. 70–150 mm long, 6–7 mm wide. Mex. to Argen. to Braz., W. Indies, introduced Afr. and Asia. Zone 10b. Commonly cultivated worldwide ornamentally or forage, rarely in Fla. or Tex. or under glass.

sagittatum (HBK. ex Willd.) Brandeg. ex Riley. SAGITTATE BUTTERFLY PEA, GALLINITAS, FRIJOILLO. Per. scandent herb; lfts. 1, sagittate, 7–17 cm long, 3–9 cm wide, petiole winged; infl. 1.5–6 cm long, few flwd.; br. 7–9 mm long, 5–7 mm wide; fls. white with purple veins, 2.5–4 cm long; calyx tube 5–6 mm long, upper and lateral teeth 4–6 mm with ventral tooth 7–9 mm long; fr. 110–180 mm long, 7–8 mm wide. Mex. to Argen. Zone 10b. Rarely cult. in Fla.

virginianum (L.) Benth. SPURRED BUTTERFLY PEA, BUTTERFLY PEA, FRIJOLILLO. Per. scandent herb; lfts. variable, ovate to elliptic to linear-lanceolate, 2–7 cm long, 1–3 cm wide; infl. to 2 cm., 14 flwd.; fls. purplish to white, 2.5–4 cm long; br. 5–8 mm long, 3–5 mm wide; calyx tube 3–4 mm long, teeth longer than tube, 6–10 mm long; fr. 80–130 mm long, 4–5 mm wide. U.S. to Peru to Braz., W. Indies. Zone 6–9. S.E. U.S., cult. orn.

CLITORIA L. BUTTERFLY PEA, CONCHITA. Leguminosae (subfamily Faboideae). 60 spp. of trees, shrubs, lianas, or suffruticose perennial herbs with annual aerial stems from subterranean xylopodia erect, trailing, or climbing; mostly pantropical, few temperate; lvs. alt., pinnate or unifoliate, lfts. 1–11, usually 3, stipulate and stipellate; infl. pseudoracemose, terminal, axillary or cauliflorous; fls. papilionaceous, resupinate, showy, purplish to pink or white, calyx narrow funnelform, rarely tubular-campanulate, bracteolate, standard orbicular, emarginate, spurless, wings lacking auricles, adherent and longer than the incurved keel, stamens 10, united (9 + 1) or 1 free, style geniculate, barbate apically; fruit stipitate or subsessile, linear, flat or turgid to convex, ecostate or occasionally costate with 1 rib medially. Characteristics of calyx, bracteoles, flower size, fruit, and inflorescences are those

primarily used for identifying species.

annua Grab. [*C. biflora* Dalz.]. Erect per. herb 70 cm ht, subhispid; lfts. 5, linear-lanceolate to ovate-lanceolate, acute, 3–9 cm long, 1.5–3 cm wide; infl. axillary, biflwd., to 0.5 cm long; fls. blue, 2.5–3.5 cm long; br. 6–11 mm long calyx tube 5–8 mm long, lobes 4–8 mm long fr. subsessile, flat, ecostate, 30–50 mm long, 6–8 mm wide; stipe to 2 mm long. Zone 10b. W. India. Cult. Fairchild Trop. Gard. Fla. 1970s as *C. biflora*, no longer known in cult.

brachystegia Benth. FLOR DE LA REINA. Shrub or tree to 8 m; lfts. ovate-elliptic to elliptic to ovate to rarely obovate, acuminate, 7–15 cm long, 4–8 cm wide; infl. cauliflorous before lvs. or axillary and terminal, multiflwd., to 22 cm long fls. white tinged rose to pale purple with darker veins, 4–6 cm long; br. 2–3 mm long calyx tubular-campanulate, tube 9–13 mm long, lobes 1–2 mm long; fr. stipitate, flat, ecostate, 150–240 mm long, 12–17 mm wide; stipe 24–29 mm long. Zone 10b. Ecuador. Cult. Fla. in 1950s as *C. arborescens* Ait. (a misidentification), no longer known in cult.

fairchildiana Howard. [*C. racemosa* Benth.]. Tree 3–8 m; lfts. 3, lanceolate-elliptic to oblong-elliptic to oblanceolate, 6–18 cm long, 3–7 cm wide; infl. axillary or terminal, multiflwd., 842 cm long; fls. purplish to rose, 4–6 cm; br. obscure calyx, 17–23 mm long, 7–11 mm wide; calyx tube 11–16 mm long, lobes 4–6 mm long; fr. stipitate, flat, ecostate, 120–280 mm long, 22–33 mm wide; stipe 13–22 mm long. Zone 10b. N.E. Brazil, cult. Brazil, Colombia, India, Philippines. Cult. Fla. and under glass.

amazonum Mart. ex Benth. cited in *Hortus Third*, but no evidence found cult. in U.S. Name historically misapplied to several species including *C. fairchildiana*. Shrub to tree to 8 m, sometimes apically scandent; lfts. 3, ovate to ovate-elliptic to ovate-lanceolate to sometimes orbicular, acuminate, to 15 cm long to 8.5 cm wide; infl. terminal or axillary, multiflwd., 4–16 cm long; fls. pale purple to rose or white with dark violet veins, 6–8 cm long; br. obscure calyx, 20–28 mm long, 9–16 mm wide; calyx tube 16–25 mm long, lobes 5–7 mm long; fr. stipitate, flat, ecostate, 100–270 cm long, 13–19 mm wide; stipe 24–51 mm long. N.E. Braz.

fragrans Small. Erect per. herb to 50 cm becoming twining vine; lfts. 3, linear-lanceolate to oblong-lanceolate, obtuse, 2–4.5 cm long, 0.5–1.5 cm wide; infl. axillary, 1–2 flwd., to 4 cm long; fls. lilaceous, 3.5–4.5 cm, br. 4–5 mm long; calyx tube purplish, 7–10 mm long, lobes 5–7 mm long; fr. stipitate, turgid around seeds, ecostate, 30–55 mm long, 6–8 mm wide; stipe 15–21 mm. Zone 10b. S. Fla. Endangered native sp. rarely cult. in Fla., aerial stems in wild erect, a twining vine in second season under glass; cleistogamous fls. common, often producing fruit.

heterophylla Lam. [*C. pedunculata* Boj. ex Benth.]. KILELO. Per. herb vine to 2 m; lfts. 5–9 (11), dimorphic, (I) oval to suborbicular,

elliptic to lanceolate-elliptic, 0.5–2 cm long, 0.4–1.1 cm wide, or (II) narrowly linear to oblong, 1–4 cm long, 0.1–0.5 cm wide; infl. axillary, 1–2 flwd., 0.3–1 cm long; fls. blue, 2.5–3 cm; br. 2–3 mm long; calyx tube 4–7 mm long, lobes 2–3 mm long; fr. subsessile, flat, ecostate, 20–40 mm long, 4–5 mm wide. Madagascar and Mauritius. Zone 10b. Cult. Fla. in 1930s, no longer known in cult.

laurifolia Poir. [*C. cajanifolia* Presl.]. CHOCALHO, TIMBO, GENERALA. Subshrub to shrub to 2 m; lfts. 3, oblong to elliptic-oblong, 4–10 cm long, 1.3–3 cm wide; infl. axillary, 1–2 flwd., 1.5–7 cm long; fls. pale purplish to white, 4–5.5 cm; br. 6–9 mm long; calyx tube 11–16 mm long, lobes 6–9 mm long; fr. stipitate, convex, costate, 37–65 mm long, 8–11 mm wide; stipe 9–11 mm long. Zone 10b. S. America, W. Indies, introd. S.E. Asia as em., cover crop, and green manure (Fantz, 1991). Cult. in Fla. and N.C. in 1930s–50s, respectively, no longer known in cult. The name “generalá” more commonly applied to *C. guianensis* (Aubl.) Benth. with which this species frequently is confused.

mariana L. BUTTERFLY PEA. Per. herb, erect to 60 cm, or trailing or twining; lfts. 3, ovate to oblong-ovate to elliptic-oblong to lanceolate to ovate-lanceolate, 2–9 cm long, 1–4 cm wide; infl. axillary, 1–2 flwd., 0.5–4.5 cm

long; fls. lilaceous, 4–6 cm; br. 4–9 mm long calyx tube 10–14 mm long, lobes 6–8 mm long; fr. stipitate, turgid around seeds to convex, ecostate, 25–70 mm long, 4–6 mm wide; stipe 12–17 mm long. Zone 6–9. E. and S.E. U.S.

ternatea L. BUTTERFLY PEA, BLUE PEA, ZAPOTILLO, ZAPATICO DE LA REINA, CONCHITAS, PAPITO. Per. twining herb climbing 5 m; lfts. 5–7, ovate, elliptic to obovate-elliptic, 1–5 cm long, 1–3 cm wide; infl. axillary, uniflwd., to 1.5 cm long; fls. pale to dark blue, 3.5–5.5 cm; br. subobscure calyx, 615 cm diam.; calyx tube 8–14 mm long, lobes 7–12 mm long; fr. subsessile, flat, ecostate, 70–110 mm long, 8–11 mm wide. f. *albiflora* (Voigt) Fantz. Fls. white with greenish medially and purplish veins. Var. *pleniflora* Fantz. Fls. actinomorphic, blue; petals all standard-like (“double”); stamens free or united in bundles. E. Afr., cult. pantrop. orn., medicinal, dyes and forage crop (Fantz, 1991), and naturalized pantrop. Zone 10b. Cult. Fla. and Tex. and under glass or U.S. as an annual.

Literature Cited

American Society for Horticultural Science. 1991. ASHS publications manual. Amer. Soc. Hort. Sci., Alexandria, Va. p. 19–20.

Barbosa-Fevereiro, V.P. 1977. *Centrosema* (A.P. De Candolle) Benth. do Brasil—Leguminosae—Faboideae. *Rodriguesia* 29:159–219.

Bentham, G. 1837. Commentationes de leguminosarum generibus. *Annalen des Wiener Museums des Natugeschichte* 2:111–120.

Bentham, G. 1858. Synopsis of the genus *Clitoria*. *J. Linnean Soc.* 2:33–44.

Fantz, P.R. 1979a. A new species of *Centrosema* (Leguminosae) from Nicaragua and a key to species in Central America. *Sida* 8:152–156.

Fantz, P.R. 1979b. Taxonomic notes and new sections of *Clitoria* subgenus *Bractearia* (Leguminosae). *Sida* 8:90–94.

Fantz, P.R. 1980. *Clitoris*, p. 582–593. In: J.D. Dwyer (ed.). *Flora of Panama*. part V. Leguminosae subfamily Papilionoideae. *Annu. Mo. Bot. Garden* 67.

Fantz, P.R. 1988. A new section of *Clitoris* subgenus *Neurocarpum* (Leguminosae). *Madroño* 35:23–31.

Fantz, P.R. 1990. *Clitoris* (Leguminosae) *Antillarum*. *Mocosoa* 6:152–166.

Fantz, P.R. 1991. Ethnobotany of *Clitoria* (Leguminosae). *Econ. Bot.* 45:511–520.

Kelsey, H.P. and W.A. Dayton. 1942. Standardized plant names McFarland Co., New York.

Liberty Hyde Bailey Hortorium. 1976. *Hortus third: A concise dictionary of plants cultivated in the United States and Canada*. 3rd ed. Macmillan, New York. p. 287.

Linnaeus, C. 1753. *Species plantarum*. Holmiae, Stockholm. 2:753.