



A New Species of *Mucuna* (Leguminosae-Papilionoideae-Phaseoleae) from Costa Rica and Panama

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Abstract

A new species of *Mucuna* from Costa Rica and Panama is described and illustrated. *Mucuna monticola* is mainly known from the highlands of the Cordilleras of Guanacaste, Tilarán, Central and Talamanca in Costa Rica, and in Panama in particular from the Chiriqui area. It is superficially similar to *Mucuna mutisiana* and *M. killipiana*, but it differs from both in multiple aspects of its morphology and is unique among Neotropical *Mucuna* in its pod, which is larger and longer with conspicuous irregular lamellae or reticulate-ridged, not constricted between the seeds.

Key Words: Biodiversity, Fabaceae, Neotropics, New World, Taxonomy

Introduction

The pantropical and subtropical genus *Mucuna* Adanson (1763: 579) (Leguminosae, Papilionoideae, Phaseoleae) contains about 100 species and is distinctive in its scandent habit, uniformly trifoliolate leaves, umbelliform or pseudoracemose inflorescences, which are usually pendent from a long peduncle, showy, resupinate papilionaceous flowers with a campanulate calyx, and frequently large, woody pods, many with strongly urticating trichomes. The New World members of the genus (ca. 20 species) lack a recent taxonomic review, although several treatments for regional floras were published (Macbride 1943, Burkart 1970, Martinez 1997, Aymard *et al.* 1999, Mori *et al.* 2002, Correa *et al.* 2004, Acevedo-Rodríguez 2005, Lleras & Cruz 2005, Moura & Tozzi 2010, Zamora 2010), as well as descriptions of some new species (Tozzi *et al.* 2005, Ruiz 2009).

In the New World, *Mucuna* is most diverse in South America, where about 15 species occur, but in Central America nine species are present, representing an important secondary area of diversity. The Central American species encompass most of the morphological variation present in New World *Mucuna*. Two of the three pollination syndromes that occur in the genus, bird and bat pollination, are present in Central America, although only the latter has been well-documented by studies (Helvesen & Helvesen 1999, Agostini 2008). Most of the Central American species are not endemic to the isthmus, because they also occur in South America. Also, the geographical range of the widespread species *Mucuna sloanei* Fawcett & Rendle (1917: 36) extends to the Caribbean and Pacific islands, North America, South America and some countries of Africa. Prior to this study, *M. argyrophylla* Standley (1922: 504) was considered to be the only *Mucuna* species endemic to Mesoamerica, but now it is known that it is not true.

As part of a comprehensive taxonomic study of New World *Mucuna*, the first author has examined 54 herbaria with representative collections of the genus: Argentina: LP, LPC, SI; Austria: W; Belgium: BR; Bolivia: LPB; Brazil: ALCB, CEN, CEPEC, CFJP, CGMS, ESA, HST, HUEFS, IAC, IBGE, IPA, INPA, JBB, MIRR, PEUFR, R, RB, SP, UB, UEC, UFG, UFJF, UFP, UFRR; Colombia: ANDES, COAH, COL, CUVC, FMB, HUA, JAUM, MEDEL, UDBC; Denmark: AAU; England: BM, FHO, K, OXF; France: P; Germany: B; Ireland: TCD; Spain: MA; Sweden: GB; USA: A, GH, NY, MO. These investigations and those carried out by the second author brought to light the existence of a new species of *Mucuna*, which appears to be narrowly restricted to Costa Rica and Panama. Several specimens of this species at GH and MO were, long ago, identified as *Mucuna johnstonii* (a nomen nudum) by John D. Dwyer. Moreover, the species here described was included in D'Arcy's (1980) broad concept of *Mucuna urens* (Linnaeus 1759: 1162) Medikus (1787: 399) in the Flora of Panama.

D'Arcy (1980) reported the occurrence of six species of *Mucuna* in Panama. Obviously two different taxa had been treated under *M. urens*, the true species and another one, presented here as a new species: *Mucuna monticola*.

***Mucuna monticola* N. Zamora, T. M. Moura & A. M. G. Azevedo, sp. nov. (Figs. 1–3)**

Lianas; abaxial surface of leaflets strigose; peduncle of inflorescence 0.3–1 m long; flowers 3.5–4.5 cm long, corolla cream-white, greenish-white or greenish-yellow. Fruits 15–24 × 4–4.5(–6) cm, stipitate, reticulate-ridged by longitudinal and transverse lamellae; seeds rounded or subquadrangular, black; hilum nearly as long as seed.

Type:—PANAMA. Chiriqui: Finca Lérída to Peña Blanca, 1750–2000 m, 09 July 1940 (fl, fr), *Woodson Jr. & Schery 324* (holotype GH!; isotypes MO!, US!).

Lianas; young branches sparsely strigose. Leaves alternate, 3-foliolate; stipules ca. 3 × 1 mm, triangular, strigose; pulvinus cylindrical, 0.5–1 × 0.3 cm, strigose; petiole 6.5–10.5 cm long, angular, sparsely strigose; rachis 1.5–2.5 cm long, angular, sparsely strigose; stipels absent; petiolules 0.5–1 cm long, angular, strigose; blades ovate to elliptic, occasionally obovate, that of the apical leaflet 9–17 × 4.5–8 cm, those of the lateral leaflets 9–12 × 4–6 cm, asymmetrical, all blades acute or rounded at base, acuminate or cuspidate at apex (acumen 1–1.5 cm), thinly strigulose adaxially, more densely or sparse strigulose to glabrescent or glabrous abaxially, venation eucamptodromous, secondary veins 4–6-paired. Inflorescence terminal, pseudo-racemose, pendent, with 15–20 flowers; peduncle 0.3–1 m long, strigulose; axis 3–5 cm long, densely strigose, the nodes spiral, the internodes 0.3–0.9 cm long; bracts caducous; pedicels 4–7 cm long, 2–3-fasciculate from each node, fairly densely strigose or pilose; bracteoles caducous; flowers 3.5–4.5 cm long. Calyx campanulate, greenish-brown, with long and appressed hairs on both surfaces, 2–2.7 cm long; lobes 4, the adaxial lobe 1.1–1.3 × 0.4 cm, formed by two entirely connate sepals, apex acute, the lateral and abaxial lobes 0.5 × 0.3 cm, apex obtuse. Corolla pentamerous, reportedly cream-white, greenish-white or greenish-yellow; standard 2.5–3 cm long, broadly elliptic, basally attenuate, apically rounded, the claw ca. 0.2 cm long, glabrous; wing petals 2–2.5 × 0.5–0.7 cm, oblong-obovate, basally attenuate, apically obtuse, pubescent at base, the claw ca. 0.1 cm; keel petals 3.5–4.5 × 1.5–2 cm, oblong, attenuate at base, obtuse at apex, pubescent at base, the claw ca. 0.1 cm. Stamens 10, diadelphous, with nine stamens fused at basal 85% of filament length, one free; filaments 3.5–4.5 cm long, glabrous; anthers ovate to oblong-elliptic in outline, basifixed, 0.3 cm long, the connective tomentose. Gynoecium composed of a single carpel, 3.5–4.5 cm long; ovary sessile, oblong in outline, 0.8–1 × 0.2 cm, densely sericeous, 4–6-ovulate; style 3–4 cm long, densely sericeous, glabrescent at apex, stigma peltate, vilous. Fruits indehiscent, woody, stipitate, conspicuously hispid pubescent, with long reddish brown stout stinging hairs; stipe ca. 2.5 cm long; body 15–24 × 4–4.5(–6) cm, oblong in outline, laterally compressed, attenuate at base, acuminate at apex, the surface prominently reticulate-ridged, with both transverse and longitudinal ridges, both surface and margin with conspicuous irregular 5–10 mm high lamellae, not constricted between the seeds. Seeds 2–5, ca. 3.7 × 3 cm, rounded or subquadrangular, black; hilum nearly as long as seed.

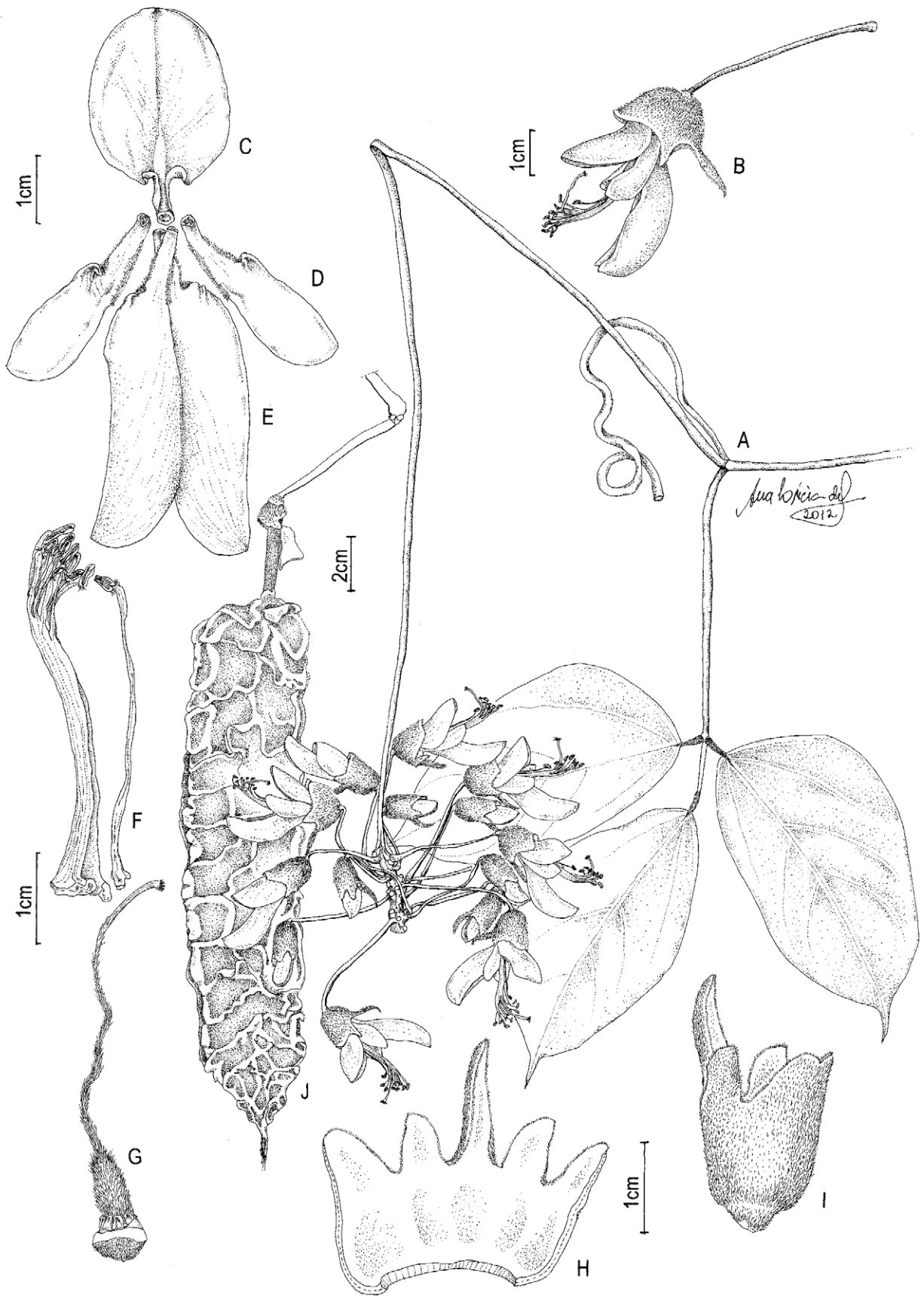


FIGURE 1. *Mucuna monticola*. A: branchlet with leaf and inflorescence; B: flower; C: standard; D: wings; E: keel; F: androecium; G: gynoeceum; H: opened calyx; I: calyx, lateral view; J: fruit. From Dwyer & Lallathin 8738 (GH), drawn by Ana Lucia Souza.

Distribution and ecology:—*Mucuna monticola* is better known, as is shown by the number of studied collections, from the main Cordilleras of Costa Rica and western Panama, especially in the Chiriqui area (Fig. 2), where it occurs in humid premontane and cloud forest, usually near water courses. The majority of the collections are from (900–)1000–2000(–2400) m elevation, but few collections were also found at some lower elevations, such as 450–700 m.

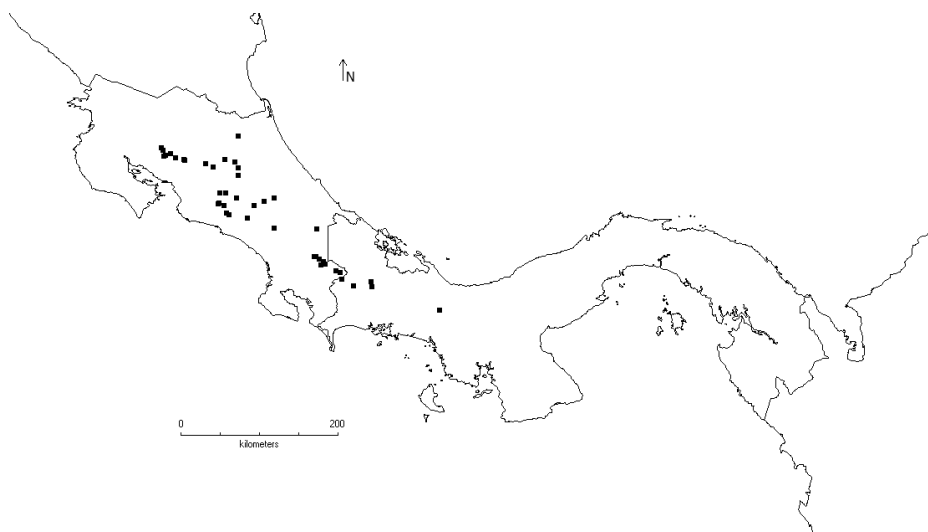


FIGURE 2. Geographical distribution of *Mucuna monticola*. Map created using BRAHMS 6.9 via Diva GIS.

Phenology:—Flowering and fruiting material has been collected throughout the year.

Etymology:—The specific epithet refers to the montane habitat with which the species is most often associated.

Additional specimens examined (paratypes):—COSTA RICA. Guanacaste: Cordillera de Tilarán, 1 km al N de Las Nubes de Río Chiquito, Zona Monteverde, Atlantic slope rain forest, 10°22'N, 84°51'W, 1300 m, 4 September 1988 (fr), *Haber & Zuchowski 8670* (MO, INB); 10 km NW Monteverde, 2 km N Las Nubes, Atlantic slope, forest remnant on north facing side of steep hill, 10° 22' N, 84° 51' W, 1050–1320 m, 30 April 1989 (fl), *Haber & Zuchowski 9231* (CR). Puntarenas: Monteverde, Sierra de Tilarán, 4500 ft., March 1959 (fl), *Palmer 119* (CR); vicinity of Santa Elena, 1600 m, 28 April 1980 (fr, fl), *Meerow et al. 1035* (CR); Reserva de Monteverde, Centro Científico Tropical, en árboles de bosque, cerca de la Reserva, 1520–1560 m, 28 October 1976 (fl, fr), *Dryer 892* (CR), 17 June 1977 (fl), *Dryer 1469* (CR); Cordillera de Talamanca, area around Río Canasta, 9.5 airline km NW of Agua Caliente, between Cerro Frantzius and Cerro Pittier, 1500–1600 m, 09°02'N, 82°59'W, 6 September 1984 (fr), *Davidse et al. 28421* (CR, MO); Monteverde Cloud Forest Reserve, Pacific slope, lower montane wet forest, 10°20'N, 84°50'W, 1400 m, 22 April 1986 (fl), *Haber et al. 4665* (MO); Monteverde, lower montane forest, 1400 m, 14 July 1990 (str), *Gentry et al. 71669* (MO); Cantón de Puntarenas, Finca Buen Amigo, 10°16'20" N, 84°49'30" W, 1100 m, 16 April 1993 (fl), *Fuentes 297* (MO, INB); Coto Brus, Reserva de la Biosfera la Amistad, cerca Estación Las Alturas de Cotón, 08° 57' 00.3" N, 82° 49' 56.8" W, 1650 m, 9 July 1994 (fr), *Kress & Patterson 94-4417* (CR); Cantón de Coto Brus, Parque Internacional La Amistad, Cordillera de Talamanca, Estación Pittier poteros alrededor de la estación, 09°01'30" N, 82° 57' 40" W, 1680 m, 12 June 1995 (fr), *Villalobos 201* (INB, MO); Parque Internacional La Amistad, Estación Pittier, Sendero Altamira, Río Canasta, 09°01'30"N, 82°57'40" W, 1680 m, 28 January 1995 (fl), *Fletes 18* (INB, MO); Cantón de Coto Brus, Parque Internacional La Amistad, Estación Pittier, Sendero Río Gemelo, 09° 01' 30" N, 82° 57' 40" W, 1845 m, 19 January 1995 (immat fr), *Azofeifa 9* (INB); Cantón de Buenos Aires, Cuenca Térraba-Sierpe, Puesto Tres Colinas, Camino al Puesto a 200 m de la Escuela, 09°06'45" N, 83°04'05" W, 1750 m, 16 September 1996, *Gamboa & Picado 607* (INB, MO); Pitahaya, Arancibia Norte, Rincón, cabeceras del río Aranjuez, orillas de la quebrada Socorro, 10° 15' 10" N, 84° 41' 20" W, 1250 m, 27 May 1996 (fr), *Kuss 90* (CR); Coto Brus, Zona Protectora Las Tablas,

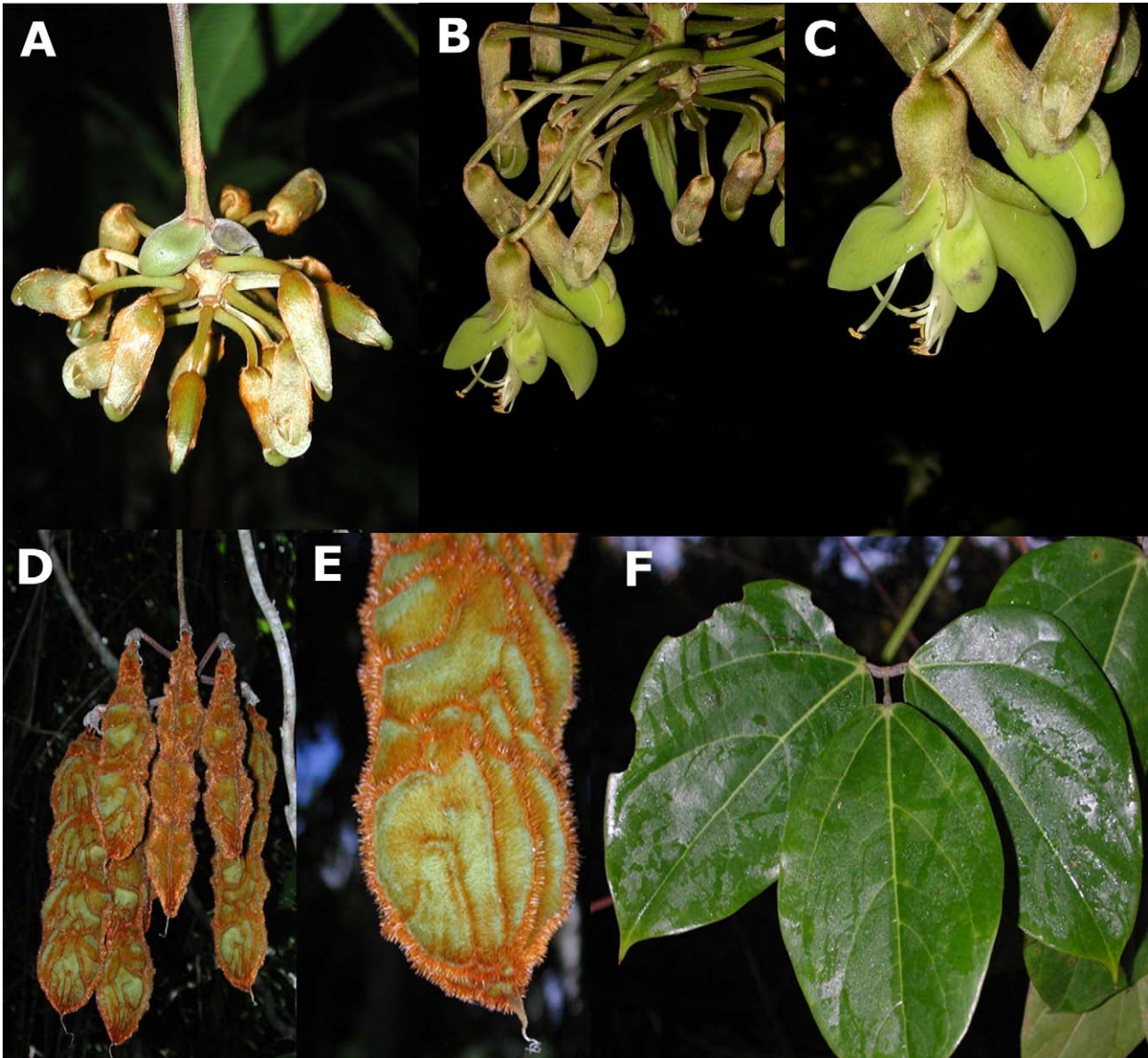


FIGURE 3. *Mucuna monticola*: A: inflorescence (Solano 2199, INB); B–C: flower (Solano 5265, INB), D–E: fruit (Solano 3198, INB); F: leaf (Solano 2199, INB).

Cuenca Térraba-Sierpe, alrededores de la Estación, 08° 55' 23.2640" N, 82° 47' 45.7540" W, 1540 m, 11 December 1997 (fl), *Gamboa 2034* (INB); Monteverde, Cuencas del Lagarto y Guacimal, San Luis, camino Real trail, 10° 16' 54.0540" N, 84° 48' 22.3650" W, 1000–1100 m, 22 May 2002 (fr), *Landrum 10431* (INB); Buenos Aires, Cuenca Térraba Sierpe, Altamira, Finca ASOPROLA, 09° 00' 31.9353" N, 83° 00' 21.3540" W, 1100 m, 22 February 2006 (ster), *González et al. 434* (INB); Buenos Aires, Parque Internacional La Amistad, Cuenca Térraba Sierpe, Sabanas Esperanza, 09° 04' 33.0000" N, 83° 01' 55.0000" W, 1600–1900 m, 31 May 2006 (fr), *Solano et al. 3198* (INB); Buenos Aires, Parque Nacional La Amistad, Cuenca Térraba-Sierpe, 09° 06' 51.4000" N, 83° 04' 59.1000" W, 1642 m, 3 March 2010 (fr), *Vargas & Villalobos 4007* (INB). Alajuela: Zarcero, upper Pacific tropical zone, 4500 ft., 16 January 1938 (ster), *Smith 139* (MO); Ojo de Agua, 28 July 1940 (fl), *Vargas 1* (CR); Upper drainage of the Río Peñas Blancas below the Monteverde Cloud Forest Nature Reserve, 09° 17' N, 84° 86' W, 1250–1350 m, 25–26 February 1977 (fl), *Burger et al. 10793* (CR); along Highway 15 between Naranjo and Quesada, 3.2 miles of Zapote, 3 February 1979 (fl, fr), *Croat 46911* (CR, MO); Bajos de Jamaical, Reserva de San Ramón, 700–1000 m, 10 May 1985 (ster), *Chacón 1794* (CR); Cantón de San Ramón, Reserva Florestal San Ramón, Cordillera de Tilarán, Estación Río San Lorenzo,

Sendero El Saíno, 10° 55' 00" N, 84° 36' 25" W, 1000–1100 m, 29 April 1993 (fr), *Reyes et al. 133* (CR, INB); San Ramón, Cordillera de Tilarán, Estación San Lorenzo, Sendero Volcán Muerto, 10° 13' 45.0000" N, 84° 35' 25.0004" W, 1000 m, 28 April 1993 (fl), *Fuentes 308* (INB); Reserva Biológica Monteverde, Río Peñas Blancas, Refugio Alemán, 10° 18' N, 84° 45' W, 900 m, 20 Marzo 1990 (fl), *Bello 2015* (CR, INB); Cantón de Upala, Parque Nacional Guanacaste, Cordillera de Guanacaste, Estación San Ramón, Dos Ríos de Upala, Sendero el Nispero, 10°52'50" N, 85°24'05" W, 550 m, 31 January 1995 (fr), *Chavarría 1214* (CR, INB, MO); Naranjo Zona Protectorada El Chayote, Cuenca del Barranca, Toro Amarillo, camino de tierra entre Robles y carretera que lleva a Bajos del Toro, 10° 10' 50" N, 84° 20' 40.0001" W, 2100 m, 17 August 2000 (ster), *Rodríguez et al. 6218.1* (CR, INB); San Ramón, Los Ángeles, Reserva de San Ramón, 10°13' N, 84°35' W, 800–900 m, 16 February 2006 (fl), *Acosta 4037* (INB); Cuenca del Tárcoles, Bosque del Niño, Sendero Pinares, 10° 08' 40.0000" N, 84° 15' 01.0000" W, 1700 m, 30 March 2006 (immat fr), *Vargas & Villalobos 1232* (INB). Heredia: Vicinity of Vara Blanca, north of Central Cordillera, between Poás and Barva volcanoes, 1680 m, March 1938 (fl), *Skutch 3723* (GH, K, MO, US); a few miles downhill from Vara Blanca on the Pacific side, 2 September 1970 (fl, fr), *Janzen 113* (MO); along the Río Clara Valley (Bajo La Hondura) below La Palma northeast of San Jeronimo, 10°03' N, 83°58' W, 1000–1200 m, 23 October 1975 (fr), *Burger et al. 9381* (MO); Río Bajo La Hondura, Parque Braulio Carrillo, a 25 km al N de San José, 1120 m, 23 January 1983 (fr), *Sousa et al. 12675* (MO); Acosta, Palmichal, San Pablo, 09° 50' 32" N, 84° 10' 21" W, 1450 m, 18 June 2004 (fr), *Quesada 1445* (CR); Cordillera Volcánica Central, Cuenca del Sarapiquí, Albergue ALAS-1500 m, en Finca de Oscar Murillo, 10° 13' 45.0000" N, 84° 07' 0000" W, 1539 m, 8 April 2005 (fl), *Soto & González 741* (INB); same locality, 12 April 2005 (fl), *Santamaría & Solano 1622* (INB); same locality, 13 April 2005 (fl), *Solano & Santamaría 2199* (INB). San José: Río Claro valley (Río La Hondura drainage) below La Palma northeast of San Jeronimo. 10° 3' N, 83° 58' W, 19 November 1969 (fl), *Burger & Liesner 6281* (CR, MO, US); a la vera de las quebradas innominadas entre Las Nubes y Cascajal de Coronado, 1700–1900 m, 14 June 1980 (fl), *Gómez-Laurito 5483* (CR); Cerros de Escazú, Cedral, Falda noreste del Alto Hierba Buena, 09°50'39" N, 84°06'46" W, 31 July 1991 (fr), *Morales 105* (CR, INB, MO); Cantón de Acosta, Fila Bustamante Hda. Tiquires, Los Arayaes, al S. del Río Tiquires, 09°42'55" N, 84°11'55" W, 1400 m, 4 June 1995 (fr), *Morales 4336* (MO, INB); Cantón de Aserrí, Cuenca Pirris-Damas, Cerros Caraigres, Falda Quebrada Concha en el camino viejo a Bijagual, 09°42'12" N, 84°07'51" W, 1000–1600 m, 8 December 1996 (fr), *Morales 5903* (INB, MO); Tarrazú, Cerro Pito, 9° 35' 30"N, 84° 04' 10" W, 1300–1400 m, 8 July 1997 (fr), *Valverde et al. 78* (CR); Pérez Zeledón, Parque Nacional Chirripó, Cuenca Térraba-Sierpe, Sendero Río Talari, 09° 26' 19.1085" N, 83° 32' 44.0221" W, 2400 m, 6 April 2000 (fl, fr), *Alfaro et al 3026* (INB); Acosta, Zona Protectorada Caraigres, Cuenca del Pirris-Damas, Acosta-Tiquires, falda S del Alto Reffis, 09° 43' 45.0000" N, 84° 11' 00.0000" W, 1400–1650 m, 6 April 2005 (fr), *Morales & Santamaría 12535* (INB); Dota, Los Santos, Cuenca del Savegre, 09° 33' 09.1314" N, 83° 51' 42.5378" W, 1650 m, 10 June 2005 (fr), *González et al. 338* (INB); Tarrazú, cuenca del Río Naranjo y Paquita, ca. 17 km suroeste de San Marcos de Tarrazú por el camino a Cerro Cura, 09° 36' 27.0000" N, 84° 06' 03.0000" W, 1500 m, 12 January 2006 (fl), *Hammel et al. 24017* (INB). Cartago: Steep slopes with open forest and many epiphytes between 7 & 12 km south of the bridge over the Rio Grande de Orosi at Tapantí, 09°42'N, 83°47'W, 1400–1600 m, 2 December 1978 (fl), *Antonio 881* (CR, MO); El Pizote, San Ramón de Tres Ríos, 1500 m, 26 June 1984 (fl), *Gómez & Herrera 22862* (MO); Turrialba, Jicotea, por fila al lado oeste del Río Jicotea, Finca del Sr. Israel Martínez, 09° 47' 05" N, 83° 33' 15" W, 1100–1200 m, 7 December 1994 (fl), *Cascante et al. 429* (CR, K); Cartón del Guarco, Cuenca del Reventazón, San Isidro ruta hacia el Cerro de La Muerte, 09° 47'00" N, 83° 59'00" W, 1800 m, 3 November 1998 (fl), *Rodríguez et al. 4088* (INB, MO); Turrialba, Monumento Nacional Guayabo, Cuenca del Reventazón, límite sur, orillas de la calle, 09° 58' 42.6000" N, 83° 41' 58.1000" W, 1240 m, 24 May 2006 (fl), *Vargas & Villalobos 1341* (INB); La Unión, Dulce Nombre, Zona Protectorada Río Tiribí, faja de bosque ripario alrededores del puesto Pizote (A y A), 09° 56' 10.8" N, 83° 58' 15.7" W, 1600 m, 23 April 2008 (fl), *Cascante & Quesada 1924* (CR). Limón: Cantón de Talamanca, Bratsi, Alto Lari, siguiendo la fila entre Río Dapari y Río Lari, bajando hasta el cause del mismo, 09° 25' 50" N, 83° 03' 20" W, 450 m, 3 March 1992 (fl), *Aguilar & Schmidt 1035* (CR, INB). PANAMA. Chiriquí: Vicinity of Casita Alta, Volcán de

Chiriquí, ca. 1500–2000 m, 28 June–2 July 1938 (fl, fr), *Woodson et al.* 969 (GH, MO, NY, US); Vicinity of Bajo Mona and Quebrada Chiquero, 1500 m, 18 July 1940 (fl), *Woodson & Schery* 517 (MO); Boquete region, June 1940 (fr), *von Hagren & von Hagren* 2111 (MO); Boquete near Fred Collin's finca, 6000 ft, 3 August 1960 (fl), *Ebinger* 740 (MO, US); NW of Boquete, Cerro Horqueta, trail to lower edge of cloud forest, 5000–5800 ft, 13 December 1966 (fl), *Dwyer et al.* 1968 (MO); Finca Collins, vicinity of Boquete, 24 July 1966 (fr), *Blum & Dwyer* 2531A (MO); Cerro Horqueta, 5700–7000 ft., 8 August 1967 (fr), *Kirkbride* 156 (MO, NY); Cerro Horqueta, 4500–5500 ft., 20 July 1968 (fr), *Dwyer & Lallathin* 8738 (GH, MO); on slopes of La Popa above Boquete, 5400 ft, 5 August 1972 (fl), *D'Arcy & D'Arcy* 6389 (MO); Boquete–Palo Alto–Finca Arco Iris, 11 August 1977 (fl), *Béliz* 193 (MO); 3.5 miles NE of Boquete, end of road along Río Palo Alto, 19 November 1978 (fr, fl), *Hammel* 5729 (MO); Finca Ojo de Agua, 1300 m, 08° 51' N, 82° 46' W, 14 October 1981 (fr), *Knapp* 1595 (MO); Río Palo Alto, high SE fork 1 km W to Cerro Azul, 13 May 1983 (fl), *Schmalzel et al.* 1585 (MO); Palo Alto, SE fork, 1800 m, 21 September 1983 (fl), *Schmalzel* 1767 (MO); Trail to Cerro Pata de Macho, Palo Alto, 5 June 1983 (fl), *Schmalzel* 1646 (MO). Coclé: Valle de Antón and Vicinity, 500–700 m, 23–27 July 1935 (fl), *Seibert* 434 (MO).

Discussion:—It is unique among Neotropical *Mucuna* in its pod, which is larger and longer with conspicuous irregular lamellas or reticulate-ridged and not constricted between the seeds. *Mucuna monticola* most closely resembles the species *M. mutisiana* (Kunth 1824: 443) Candolle (1825: 406) and *M. killipiana* Camacho & Barbosa (1988: 38). It differs from both by its prominently reticulate-ridged fruit surface, with both latitudinal and longitudinal ridges. In *M. mutisiana*, the fruit surface presents interrupted or irregular lateral lamellae, while in *M. killipiana* the fruit surface has two longitudinal lamellae that extend from the base of the fruit to its apex. *Mucuna monticola* also differs from both species by having the wing petal shorter than the keel.

In his treatment of *Mucuna* for the Manual de Plantas de Costa Rica, Zamora (2010) included three possibly new species of *Mucuna*, which he lettered A–C. *Mucuna monticola* represents *Mucuna* sp. C in Zamora's treatment.

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