A Taxonomic Revision of *Mucuna* (Fabaceae: Papilionoideae: Phaseoleae) in Brazil

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Abstract—In advance of a comprehensive systematic study of New World *Mucuna*, we provide a taxonomic revision of the species of *Mucuna* that occur in Brazil. A new species, *Mucuna anulicostae*, endemic to eastern and central Brazil, is described and illustrated. *Mucuna huberi* is designated as a synonym of *M. elliptica*, and a lectotype for *M. pluricostata* is chosen. *Mucuna pluricostata* is considered to be a synonym of *M. pruriens*, and a lectotype for *M. pluricostata* is chosen. *Mucuna eriocarpa* is excluded from the genus. We recognize seven species of *Mucuna* in Brazil, only two of which are endemic to the country. Two of the seven species are assessed as endangered (EN) according to IUCN criteria.

Keywords—Leguminosae, lectotype, Neotropics, new species, nomenclature, synonym.

*Mucuna* Adans. (Leguminosae-Papilionoideae-Phaseoleae) is a pantropical genus of about 105 species (Schrire 2005). Within the tribe Phaseoleae, *Mucuna* is distinguished by the following combination: habit typically lianescent, stems unarmed, leaves trifoliolate, stipules not extended below the point of attachment, bracteoles frequently present, corolla with the standard usually much shorter than the keel petals and the keel prominently beaked and usually hardened and thickened at the apex, anthers sometimes dimorphic, with five of them larger and (sub-) basifixed and five others smaller and versatile or dorsifixed, pods usually covered with bristly irritant trichomes, and seeds usually large, globose, oblong, or discoid.

Recent taxonomic works on Neotropical *Mucuna* are relatively few, most of them being new species descriptions (Tozzi et al. 2005; Ruiz 2009; Moura et al. 2012; Moura et al. 2013a, b). Treatments differ in their estimates of the number of species of *Mucuna* occurring in Brazil. Tozzi et al. (2005) included six species in their key to Brazilian *Mucuna*; *M. huberi* Ducke, *M. japra* A. M. G. Azevedo, Agostini & Sazima, *M. pruriens* (L.) DC., *M. rostrata* Benth., *M. sloanei* Fawc. & Rendle, and *M. urens* (L.) Medik. In her synopsis of *Mucuna* in Brazil, Ruiz (2009) listed two additional species with ranges extending into Brazil; *M. eriocarpa* Barb. Rodr. and *M. pluricostata* Barb. Rodr. These two names were considered by Tozzi et al. (2005) to be possible synonyms of *Diolea* sp. and *M. pruriens* (L.) DC., respectively, and they were excluded from a subsequent checklist of Brazilian *Mucuna* by Moura and Tozzi (2010).

To resolve taxonomic and nomenclatural issues in *Mucuna* and to better document inter- and intraspecific morphological variation and the geographical distributions of species, the first author undertook an extensive herbarium-based study of the genus throughout its neotropical range. Collections of the genus in 57 herbaria were consulted. The primary literature for all of the published names that have been applied to New World *Mucuna* was also examined.

In agreement with Tozzi et al. (2005), we are unable to find taxonomically significant differences between the types of *M. pluricostata* and *M. pruriens* and confirmed that the description of *M. eriocarpa* is likely based on material of a species of *Diolea*. In addition, we consider *M. huberi* Ducke to be a synonym of *M. elliptica* (Ruiz & Pav.) DC. (based on Negretia elliptica Ruiz & Pav.). Of the 24 species of *Mucuna* currently recognized in the Neotropics, only seven occur in Brazil, two of which are endemic to the country (T. M. Moura, unpublished data). The Brazilian species of *Mucuna* include representatives of both recognised subgenera (*Mucuna* and *Stizolobium*) and display a wide range of morphological variation, including, for example, two contrasting floral pollination syndromes (Agostini 2008).

Below, we formally relegate *M. huberi* to the synonymy of *M. elliptica* and *M. pluricostata* to the synonymy of *M. pruriens*, and provide descriptions of the Brazilian species of *Mucuna* and a key to facilitate their identification.

**Key to the Species of *Mucuna* Occurring in Brazil**

1. Fruits 7–8.5 cm long; seeds reniform; flowers purple .................................................................................. 2
2. Fruits 10–25 cm long; seeds globose; flowers white, cream, yellow, orange or green, never purple .................................................................................................................. 3
3. Inflorescence peduncle 4–20 cm long; corolla yellow or orange ..................................................................... 4
4. Inflorescence umbelliform, the flowers clustered at the apex of the inflorescence and the internodes not visible; fruits not rugose, not ornamented with lamellae ........................................................................ 5
5. Inflorescence pseudoracemose, the flowers spaced along the inflorescence rachis and the internodes visible; fruits rugose, ornamented with lamellae .................................................................. 6
6. Inflorescence racemus more than 2 cm long; stipels absent; abaxial surface of leaflets densely sericeous .......................... 7
7. Flowers 5.3–7 cm long; corolla yellow; Atlantic Coastal region of eastern Brazil ........................................... 5
8. Flowers (5–)6–9.5 cm long; corolla orange; Amazonian region .................................................................. 6
9. Flowers 7–8 cm long; corolla purple ........................................................................................................ 3

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2. Inflorescence peduncle over 30 cm long; corolla green or white to lilac

6. Nodes on the inflorescence rachis distichously arranged, usually forming a 'zig-zag' pattern;
   inflorescence peduncle more than 1 m long; stipels absent ................................................................. M. urens

6. Nodes on the inflorescence rachis spirally arranged, never forming a 'zig-zag' pattern;
   inflorescence peduncle to 1 m long; stipels present .............................................................. M. analucianae

**Taxonomic Treatment**

1. *Mucuna analucianae* T. M. Moura, V. F. Mansano & A. M. G. Azevedo, sp. nov.—TYPE: BRAZIL. Bahia, Ilhéus, área do CEPEC (Centro de Pesquisas do Cacau), km 2, 1 Setembro 1981, Santos, T.S. 3659 (holotype CEPEC; Isotype RB).

*Mucuna analucianae* has flowers 4–5.5 cm long, the corolla pale green or white to lilac colored, fruits with lamellate ornamentation, stipels present, the inflorescence with the peduncle 30–80 cm long and spirally arranged nodes. It is morphologically closest to *M. urens*, but the latter lacks stipels and has inflorescences with the nodes arranged distichously and the peduncle more than 1 m long.

Liana; leaf-bearing portion of stems with sparse, appressed, silver-colored hairs; stipules 4 ± 2 mm, triangular, pubescent, frequently caducous. Leaves alternate, trifoliolate; pulvinus 2 × 2 mm, cylindrical, covered by erect hairs; petiole ca. 6 cm long, with appressed or erect, sparse hairs; stipels 5–6 mm long, with sparse hairs; rachis 1.3–1.5 cm long, with appressed or erect, sparse hairs; pulvinule 3–5 mm long, with erect silver-colored hairs, these more dense than on the petiole and rachis; laminas ovate to elliptic sparsely sericeous on both surfaces, more densely so abaxially, that of the terminal leaflet 10–11 × 4.8–5 cm, rounded at base, cuspidate to acuminate at apex, those of the lateral leaflets 8.5–10 × 4–5.2 cm, asymmetric at base, cuspidate to acuminate at apex; venation eucamptodromous, with the secondary veins in 4–5 pairs. Inflorescence an axillary, pendant pseudoraceme; peduncle 30–60(–80) cm long, with dense appressed, silver-colored hairs; rachis 4–7 cm long, secondary axis reduced and nodose; bracts not seen; pedicels ca. 1.5 cm long, sericeous, 2–3 mm, cylindrical, 10–17 per inflorescence, 2–5 mm apart, spirally arranged; bracteoles triangular 2–3.5 × 1–2 cm, frequently caducous. Flowers 4–5.5 cm long; calyx 1.7–2.5 cm long, campanulate, the lobes 3–5 mm long; corolla reportedly pale green; filaments 3.2–4 cm long, glabrous; anthers dimorphic, nine with filaments fused in the basal 65% of their length, one with filaments fused in the basal 60% of their length; style 7–9 cm long; ovary 0.7–1 cm long, densely sericeous, glabrescent at apex; stigma 3.5–4 cm, lamellate, the lobes 3–5 mm long; corolla orange-yellow; standard 5–6.5 cm, acute to obtuse at base, rounded at apex, the claw 3–4 mm long; keel petals 7.5–9.0 cm long, rounded at base, cuspidate at apex, that of the terminal leaflet obovate or elliptic, 15.8–18.5 × 10–15 cm, acute to rounded at base, cuspidate at apex. Inflorescence axillary, umbelliform; peduncle 6–20 cm long; bracts foliaceous, 2–3 cm, rounded at apex, densely sericeous on both surfaces; pedicels 1–2 cm long. Flowers 7.5–10 cm long; calyx 2.5 cm long, with the corolla orange-yellow; standard 5–6.5 × 3 cm, attenuate at base, rounded to retuse at apex, the claw 2–3 mm; wing petals 7.5–9 × 2 cm, attenuate at base, rounded to obtuse at apex, the claw 6–7 mm; keel petals 7.5–9.0 × 2.4 cm, attenuate at base, acute at apex, the claw 1 mm; stamen filaments 8–10 cm long, glabrous; style 7–9 cm long; ovary 0.7–1 × 0.4 cm, densely sericeous. Pods 10–24 × 5.5–6 cm, without lamellate ornamentation, clothed with dense, ferrugineous, irritating hairs, acute at base, cاعدate at apex. Seeds 1–4 per pod, 3.5 × 3.5 cm, brownish to black, globose.

*Phenology*—Based on specimen data, *M. elliptica* flowers and fruits from March to August in Brazil.

**Vernacular Name**—According to the labels of *Mexia 4164* and 5196, this species is known as ‘olho-de-boi’ in Minas Gerais, Brazil.

**Conservation Status**—*Mucuna analucianae* has a restricted area of occupancy (AOO= 24 km²), and appears to be rare based on the paucity of known collections, none of which were made in protected areas. According to IUCN criteria (2001) *M. analucianae* is assessed as endangered [(EN B2ab(ii)iii(iv)].


**Geographical Distribution**—The new species has been collected only in central and eastern Brazil, where it occurs in the states of Rio de Janeiro, Minas Gerais, Bahia, and Goiás (Fig. 2).

**Notes**—Among the Brazilian species of *Mucuna*, it is morphologically most closely related to *M. urens*, but differs in its stipulate (vs. exstipellate) leaf rachis, shorter inflorescence peduncle (30–80 cm long vs. 1–2 m long), and spirally arranged (vs. distichous) nodes on the rachis of the inflorescence.


Liana; stipels 2 mm long; leaflet laminas with an indumentum of dense golden, frequently erect hairs abaxially, these appressed and less dense adaxially, those of the lateral leaflets asymmetrical, 13.5–18.5 × 8.5–16 cm, rounded to weakly cordate at base, cuspidate at apex, that of the terminal leaflet obovate or elliptic, 15.8–18.5 × 10–15 cm, acute to rounded at base, cuspidate at apex. Inflorescence axillary, umbelliform; peduncle 6–20 cm long; bracts foliaceous, 2–3 cm, rounded at apex, densely sericeous on both surfaces; pedicels 1–2 cm long. Flowers 7.5–10 cm long; calyx 2.5 cm long, with the corolla orange-yellow; standard 5–6.5 × 3 cm, attenuate at base, rounded to retuse at apex, the claw 2–3 mm; wing petals 7.5–9 × 2 cm, attenuate at base, rounded to obtuse at apex, the claw 6–7 mm; keel petals 7.5–9.0 × 2.4 cm, attenuate at base, acute at apex, the claw 1 mm; stamen filaments 8–10 cm long, glabrous; style 7–9 cm long; ovary 0.7–1 × 0.4 cm, densely sericeous. Pods 10–24 × 5.5–6 cm, without lamellate ornamentation, clothed with dense, ferrugineous, irritating hairs, acute at base, cاعدate at apex. Seeds 1–4 per pod, 3.5 × 3.5 cm, brownish to black, globose.

*Phenology*—Based on specimen data, *M. elliptica* flowers and fruits from March to May in Brazil.
Conservation Status—*Mucuna elliptica* occurs in Bolivia, Brazil, Ecuador and Peru. The area of occupancy of this species is considered to be restricted (AOO = 112 km²), so on this basis it could be described as globally endangered. However, due to the wide geographical distribution of the species, we do not have enough information about the habitat and populations of *M. elliptica*. In this case we prefer to describe this temporarily as data deficient (DD) according to IUCN criteria (2001).


Geographical Distribution—*Mucuna elliptica* occurs in Bolivia, Brazil, Ecuador and Peru. In Brazil it is restricted to the Amazon region (in the states of Acre and Amazonas).

Notes—Amongst the Brazilian *Mucuna* species, *M. elliptica* is unique in its umbelliform inflorescence and fruits that lack lamellate ornamentation on the valves (both characters only found in *M. elliptica* among the Brazilian species).

Ruiz and Pavon (1798) did not cite any specimens in the protologue of *Negretia elliptica*, but described the flowers and fruits and gave a collection locality in Peru for their new taxon. Among the Ruiz and Pavon material at BM, F, Fl, and MA, the lectotype is the only specimen of *M. elliptica* that has both flowers and fruits. Although the label on the specimen does not cite the specific locality given in the protologue, it does have “Peru” written on it, and there is a hand-written annotation, probably by Ruiz, that reads “Negretia elliptica.” The specimen BM 000951436 in the Natural History Museum, London, has previously been cited as the type of *N. elliptica*. It carries the same annotation as the newly selected lectotype, but only comprises flowers.

Ducke (1925) listed several purportedly diagnostic characters for *Mucuna huberi*, including an umbelliform inflorescence and a comparatively large corolla. Nevertheless, the type collection of *M. huberi* (Ducke s. n. RB 17264) falls squarely within the range of variation contained within our circumscription of *M. elliptica*. Since the name *M. elliptica* has priority, *M. huberi* is relegated to synonymy.

*Mucuna eriocarpa* Barb. Rodr. was described based on material from Bahia that also apparently had fruits lacking ornamentation, but we have been unable to locate any type material for the name, beyond an illustration of the fruit. Since the original description and illustration lack diagnostic characters for the genus, and since species of *Mucuna* with fruits lacking ornamentation are otherwise unknown in this part of Brazil, we conclude that *M. eriocarpa* was likely based on material of the morphologically similar genus *Dioclea*, of which there are several species in Bahia.


Liana; stipels absent; leaflet laminas densely sericeous on the abaxial surface, appressed and sparse on the adaxial surface, those of the lateral leaflets asymmetrical, 6.2–10.5 × 3.2–5.2 cm, rounded to truncate at base, cuspidate at apex, that of the terminal leaflet elliptic, 10–13.5 × 3.8–6.5 cm, acute at base, cuspidate at apex. Inflorescence an axillary pseudoraceme; peduncle 4–8.5 cm long; bracts and bracteoles caducous; pedicels c. 1 cm long. Flowers 5–7 cm long; calyx 1.7–3 cm long; corolla yellow, the standard 4.8–5.3 × 3–3.5 cm, attenuate at base, rounded at apex, with the claw 2 mm long, the wing petals 6–7 × 1.5 cm, attenuate at base, obtuse at apex, with the claw 3–4 mm long, the keel petals 6–7 × 1 cm, attenuate at base, acute at apex, with the claw 1 mm long.
long; stamen filaments cream-colored, 6–7 cm long, glabrous; style 5–6 cm long; ovary 10 × 2 mm. Pods 10–20 × 4 cm, acute at base and apex, with a dense covering of irritating hairs, ornamented by transversal lamellae. Seeds (only a photograph examined), 1–5 per pod, globose.

**Phenology**—Flowering in May and June; fruiting in August.

**Conservation Status**—Mucuna japira presents a restricted extent of occurrence (EOO = 4,336.53 km²), and area of occupancy (AOO = 60 km²). Therefore, following IUCN (2001) criteria, M. japira is assessed as endangered [EN B2ab(v)].


**Geographical Distribution**—Mucuna japira is endemic to the Atlantic Forest of the states of Rio de Janeiro and São Paulo.

Notes—The closest species morphologically is M. rostrata, but M. japira has yellow flowers (versus orange in M. rostrata), and in Brazil M. rostrata occurs only in Amazonian Forest.


Liana; stipels linear, 3–4 mm long; leaflet laminas with silvery appressed hairs on both surfaces, these denser on the abaxial surface, those of the lateral leaflets asymmetrical, 15.5–17.5 × 10–10.8 cm, truncate at base, acute or mucronate at apex, that of the terminal leaflet ovate to elliptic, 10–17 × 7–12 cm, acute to rounded at base, acute to mucronate at apex. Inflorescence an axillary, pseudoraceme; peduncle 3.5–15 cm long; bracts and bracteoles 5.5–10 cm long; rachis 5–35 cm long; flowers (5 –) 6–9.5 cm long; calyx 2–3 cm long; corolla purple, the standard 2–2.5 × 1.5 cm, attenuate at base, rounded at apex. Inflorescence an axillary, pseudoraceme; peduncle 6.5–9.5 × 2.2 cm, obtuse at apex, with the claw 1–2 mm long, the wing petals 5.7–8.5 × 2 cm, attenuate at base, obtuse at apex, with the claw 3 mm long, corolla orange, the standard 3.5–6 × 4 cm, attenuate at base, acute at apex, with the claw 1–2 mm long, the wing petals 5.7–8.5 × 2 cm, attenuate at base, obtuse at apex, with the claw 3 mm long, keel petals (5 –) 6.5–9.5 × 0.2 cm, densely sericeous. Pods 8–20 × 4 cm, ornamented by transversal lamellae, with a dense indumentum of irritating hairs, acute at base, acute to aristate at apex. Seeds 3–5 per pod, blackish, globose, 2 × 2 cm.
Phenology—Based on specimen data, *M. rostrata* flowers and fruits from April to July.

Conservation Status—Due to its wide distribution, *Mucuna rostrata* is assessed as of least concern (LC).


Geographical Distribution—*Mucuna rostrata* is widely distributed in the Neotropics. In Brazil it is found only in the Amazonian Region (in the states of Acre, Amazonas, Amapá, Pará, and Rondônia), frequently in riverine forests.

Notes—*Mucuna rostrata* is characterized by its distinctive orange colored corolla, the principal characteristic that differentiates this from *M. japira*. *M. elliptica* also presents an orange-yellow corolla, however the inflorescence in *M. elliptica* is pseudumbelliform, whilst in *M. rostrata* is pseudoracemose.


Liana; stipels linear, 1–4 mm long; leaflet laminae sericeous abaxially, sparingly sericeous adaxially, those of the lateral leaflets asymmetrical, 7–14 (– 17) × 4–11 cm, truncate to rounded at base, acute to acuminate at apex, that of the terminal leaflet ovate to elliptic, 7.5–14 (– 17) × 3.5–10 cm, acute to rounded at base, acute to acuminate at apex. Inflorescences an axillary, pseudoraceme; peduncle 5–18 cm long; rachis reduced, 1–3 cm long; bracts caducous; bracteoles 1–2.5 × 0.7–1.5 cm, occasionally persistent; pedicels 1–1.5 cm long. Flowers 5–6.5 cm long; calyx 2–3.3 cm long; corolla yellow, the standard occasionally persistent; pedicels 0.7–2 cm long. Flowers 3.5–4 cm long; calyx 1.7–1.8 cm long; corolla reportedly cream-colored or greenish, the standard 3.2–3.5 × 0.3–3.5 cm, attenuate at base, margainate at apex, with the claw 1 mm long, the wing petals 3.5–4.1 × 1.4 cm, attenuate at base, rounded to obtuse at apex, with the claw 1–2 mm long, the keel petals 3.5–4 × 1.6 cm, attenuate at base, acute at apex, with the claw 1 mm long; stamen filaments cream-colored, 3–4 cm long; glabrous; style 3–4 cm long; ovary 7 × 1–2 mm. Pods 8–20 × 3–4 cm, aculeate at base and apex, with a dense covering of irritating hairs, ornamented by transversal lamellae. Seeds 1–5 per pod, brownish, globose, 3.5 × 3.5 cm.

Phenology—Based on specimen data, *M. urens* flowers and fruits from October to July.

Conservation Status—Given its wide distribution in the Neotropics, *M. urens* is assessed as of least concern (LC).


Geographical Distribution—*Mucuna urens* is widely distributed in the Neotropics, occurring in the Caribbean Islands and from Honduras to Brazil. It occurs throughout Brazil and is commonly collected close to rivers, near the sea (in Restinga vegetation), and also in disturbed areas, especially along roads.

Notes—*Mucuna urens* is the only Brazilian species of the genus that has the primary axis of the inflorescence forming a ‘zig-zag’ pattern. The other Neotropical species that presents this characteristic is *Mucuna mitis* (Ruiz & Pavon) DC., occurring in Bolivia, Ecuador and Peru.

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Literature Cited


