Taxonomic updates in *Dolichandra* Cham. (Bignonieae, Bignoniaceae)

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Academic editor: Alan Paton | Received 11 August 2014 | Accepted 17 December 2014 | Published 5 February 2015

Citation: Fonseca LHM, Cabral SM, Agra MF, Lohmann LG (2015) Taxonomic updates in *Dolichandra* Cham. (Bignonieae, Bignoniaceae). PhytoKeys 46: 35–43. doi: 10.3897/phytokeys.46.8421

Abstract

*Dolichandra* is a genus of lianas found in dry and wet Neotropical forests. The genus currently includes eight species and is well characterized by molecular and morphological synapomorphies. Here, *Macfadyna hispida* (DC.) Seemann is removed from synonymy with *Dolichandra uncata* (Andrews) L.G. Lohmann based on the presence of the hispid indument, vinaceous ovary, long fruits, and winged seeds. The combination *Dolichandra hispida* (DC.) L.H. Fonseca & L.G. Lohmann, **comb. nov.** is proposed, increasing the number of accepted species of *Dolichandra* to nine. A taxonomic key for all species of *Dolichandra* is presented.

Keywords

Taxonomic key, Neotropical lianas, *Dolichandra hispida*

Introduction

*Dolichandra* Cham. is a genus of lianas that belongs to the tribe Bignonieae, in the plant family Bignoniaceae (Lohmann 2006; Lohmann and Taylor 2014). The family comprises ca. 80 genera and 840 species of trees, lianas and shrubs (Lohmann and Ulloa 2006, onwards), representing an important component of Neotropical forests...
and dry areas. The tribe Bignoniaceae includes 21 genera and 393 species of lianas and is centered in Brazil (Lohmann and Taylor 2014).

The current circumscription of *Dolichandra* is based on molecular phylogenetic data (Lohmann 2006) and morphological synapomorphies (Lohmann and Taylor 2014). In this circumscription, the genus is composed of eight species (Lohmann and Taylor 2014), one of which was previously included in *Dolichandra*, three in *Macfadyena* DC., one in *Melloa* Bureau, and three in *Parabignonia* Bureau ex K. Schum (Gentry 1973a, 1973b). Under the new circumscription, *Dolichandra* is characterized by unique multiple dissected phloem wedges, trisect and uncinate tendrils, fruits with four lines of dehiscence, a dimorphic growth form, a large and membranaceous calyx, and colporate pollen with a psilate exine (Gentry 1973a, 1973b; Gentry and Tomb 1979; Lohmann and Taylor 2014).

The genus is distributed in wet and dry Neotropical forests, from Mexico to northern Argentina (Gentry 1973a, 1973b; Lohmann and Taylor 2014), being a conspicuous component of seasonally dry forests. The geographic distribution of *Dolichandra* is centered in southern Brazil, northern Argentina and Paraguay, where up to seven species are found. The geographic distribution of members of *Dolichandra* is highly variable, with species found throughout the Neotropics, like the ubiquitous *D. unguis-cati* (L.) L.G.Lohmann, and species with restricted distributions such as *D. dentata* (K. Schum.) L.G.Lohmann, found in riverbanks of the Uruguay river basin (Lohmann and Taylor 2014).

*Dolichandra cynanchoides* (cham.) L.G.Lohmann is cultivated as ornamental in Argentina (García 1992) and *D. unguis-cati* in the USA (Gentry 1982). *Dolichandra unguis-cati* is also an invasive in some countries, like Australia and South Africa (Sparks 1999; Dhileepan et al. 2007). Attempts to reduce population size and control the invasiveness of *D. unguis-cati* are underway in both countries (Sparks 1999; Dhileepan et al. 2007).

During phylogenetic and taxonomic studies of *Dolichandra*, it became clear that *Macfadyena hispida* (DC.) Seem. is morphologically distinct from *D. uncata* (Andrews) L.G.Lohmann and should be recognized as a separate taxon. We here present the necessary new combination. We also provide a taxonomic key for the genus, thus facilitating the identification of the species.

**Material and methods**

This study was based on botanical collections from nine herbaria (ESA, FUEL, INPA, MBM, MO, NY, SP, SPF, and UPCB). Morphological studies were carried out under a stereomicroscope using dried and fresh specimens. Morphological terminology for leaves follows Hickey (1973) and flowers and inflorescences follows Weberling (1989). Other morphological structures follow Harris and Harris (2001).
Taxonomic treatment

*Dolichandra hispida* (DC.) L.H.Fonseca & L.G.Lohmann, comb. nov.
urn:lsid:ipni.org:names:77145082-1
Fig. 1

*Spathodea hispida* DC., Prodr. 9: 205. 1845.

*Macfadyena hispida* (DC.) Seemann, J. Bot. 1: 227. 1863.
  Type: Brazil. Mato Grosso: Cuiabá, 1832, A. Silva Manso 105A (holotype: G-DC [G00133604]!).

*Spathodea mollis* Sond., Linnaea 22: 561. 1849.

*Macfadyena mollis* (Sond.) Seemann, J. Bot. 1: 227. 1863.
  Type: Brazil. Minas Gerais: Caldas, 1855, A.F. Regnell I-292 (lectotype, designated here: MO [2229711]!).

*Macfadyena pubescens* Moore, Trans. Linn. Soc. London, Bot. ser. 2, 4: 418. 1895.

**Type.** Paraguay. “inter Villa Maria et Corumbá”, Dec 1891–92, S. Moore 1021 (holotype: BM image [578432]!).

**Description.** Liana. Stems terete, striate, interpetiolar region with ridges and glandular fields, eglandular and glandular trichomes covering the stem surface, eglandular trichomes simple, densely distributed in a hispid indument, glandular trichomes peltate and pateliform, flaky bark absent; prophylls 1.6–3 mm long, subulate, apiculate, smooth, hispid. Leaves bifoliolate with a terminal tendril; petioles semi-terete, hispid and with peltate trichomes, 0.95–4.49 cm long; petiolules terete, hispid with simple and peltate trichomes, 0.3–2.9 cm long, with equal length; tendrils trifid and uncinate; leaflets ovate, obovate or elliptic, apex acute to short acuminate with a drip tip, base rounded, symmetric or slight asymmetric, 3.2–8.6 × 1.2–7.14 cm, margin entire, membranaceous, the abaxial surface hispid with simple trichomes more concentrated on the veins, peltate trichomes throughout and pateliform glandular trichomes concentrated at the base, the adaxial surface hispid, primary venation straight, unbranched, secondary venation brochiadodromous and tertiary venation percurrent. Inflorescence an axillary 3-flowered cyme, rarely reduced to one flower; pedicels 0.5–4.3 cm long, hispid and with peltate glandular trichomes; receptacle with pateliform trichomes; bracts deciduous, floral bracts filiform, deciduous, rarely present, elliptic to obovate, 0.7–5.5 mm long, membranaceous, the abaxial surface hispid with simple trichomes more concentrated on the veins, peltate trichomes throughout and pateliform glandular trichomes concentrated at the base, the adaxial surface hispid, primary venation straight, unbranched, secondary venation brochiadodromous and tertiary venation percurrent. Corolla yellow, bilabiate with the upper 2 lobes reflexed and the lower 3 lobes forward, tubular-infundibuliform, glabrate, hispidulous 5.1–9.1 cm long, 1.3–2.2 cm, 4–5.7 cm wide; lobes obcordate, 1.2–2 cm long, 1.2–2.15 cm wide, margin entire. Androecium inserted at the tube, with simple trichomes at the insertion; short filaments 1.15–1.7 cm long, longer filaments 1.74–2.4 cm long, glabrous, attached at the same height from the base of the corolla, 4.5–9.4 mm from the base; staminode 8–9 mm long; anthers pale-yellow or white, 3–3.9 mm long. Gynoecium inserted at the tube, glabrous; pistil 3.3–3.8 cm
long; ovary vinaceous, linear, 7–9 × 1.4 mm long; style 2.6–3 cm long; stigma rhombic. **Fruits** linear, attenuate toward base and apex, 77–125.8 × 1.17–2.2 cm, smooth, with lenticels, glabrous. **Seeds** with hyaline wings, thin, 2.2–3.8 × 1.4–1.8 cm wide, seed body oblong to ovoid, woody, 6–9 × 8–15 mm.

**Nomenclatural notes.** A single specimen was cited by Sonder for *Spathodea mollis* labeled 292 in Regnell’s first series of collections from Brazil. Four specimens labeled as Regnell I-292 were located, one at K [000449792], two at BR [876279] [876378] and one at MO [2229711]. The best quality material is selected here as lectotype.

**Taxonomic notes.** *Dolichandra hispida* is easily differentiated from all other species of *Dolichandra* by the unique hispid indument found on the vegetative and repro-
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Productive portions of this species, as well as the presence of a vinaceous ovary. *Dolichandra hispida* has been treated as a synonym of *D. uncata* since Gentry (1973a). However, the differences in indument (hispid vs. glabrous to puberulous), ovary color (vinaceous in *D. hispida* vs. green in *D. uncata*), and seed wing morphology (hyaline in *D. hispida* vs. woody in *D. uncata*) are clear, making the separation of these two species necessary. In addition, the difference in fruit length is also striking, with fruits being much longer in *D. hispida* (77–125.8 cm) than in *D. uncata* (9.2–38.5 cm). In fact, *D. hispida* presents one of the longest fruits of Bignoniaceae, and possibly one of longest capsules within the Angiosperms (Table 1).

*Dolichandra uncata* occurs predominantly in riverbanks, swamps and mangroves, presenting seeds that are corky and supposedly adapted for water dispersal (Gentry 1973b). On the other hand, *D. hispida* is more common in non-flooded areas, presenting seeds adapted to wind dispersal.

**Distribution.** *Dolichandra hispida* occurs in southern, southwestern and central Brazil, Paraguay and Bolivia, whereas *D. uncata* has its northern limit in Mexico and southern limit in Argentina and Uruguay (Fig. 2).

**Phenology.** This species was collected in flower in September, October, November, December and January and in fruit in September, November, December, January and February.

**Conservation status.** *Dolichandra hispida* is here considered as Least Concern [LC] according to IUCN criteria (IUCN 2012; IUCN Standards and Petitions Subcommittee 2014). The extent of occurrence estimated for the species is 2,209,625.833 km² and the estimated area of occupancy is 875.000 km² (cell width of 5 km). Therefore this classification was established based on the wide distribution of the taxon, since no population data is available.

**Specimens examined.** Argentina. Misiones: Guarani, 03 Mar 2000, *N. Deginani* 1630 (MO); Bolivia. Santa Cruz: Estancia San Miguelito, 200 km al E de la ciudad de Santa Cruz, 02 Dez 1996, *A. Fuentes* 1342 (MO); Las Trancas, Lomerio, las parcelas de Bolfor, Las Trancas ’95, 16 Nov 1994, *A. Jardim* 1204 (MO); Brazil. Mato Grosso: Alta Floresta, Fazenda Mogno, Ponte do 27, margem direita, mata de capoeira, solo arenoso, 18 Sep 1991, *Macedo et al.* 3009 (INPA); Paraná: Antonina, Rio Mergulhão, 31 Oct 1973, *G. Hatschbach* 29172 (MBM); Foz do Iguaçu, Parque Nacional das Cataratas do Iguaçu, 14 Oct 1962, *G. Hatschbach* 9378 (MBM); Guaraqueçaba, Tagaçaba

### Table 1. Comparison of *Dolichandra hispida* and *D. uncata*; non-overlapping characters are shown in bold.

| Characters          | *Dolichandra hispida* | *Dolichandra uncata* |
|---------------------|-----------------------|----------------------|
| Leaflet form        | Ovate, obovate (rare elliptic) | Elliptic (rare Ovate, obovate) |
| Leaflet apex        | Acute to short acuminate | Long acuminate (rare short acuminate) |
| Indument            | Hispid                | Pubescent (rare glabrous) |
| Calyx               | Short apiculate (1.2–2.3 mm) | Long apiculate (1.8–3.4 mm) |
| Ovary color         | Vinaceous             | Green                |
| Fruit length        | 9.2–38.5 cm           | 77–125.8 cm          |
| Seed texture        | Hyaline               | Corky/woody          |
de Cima, Rio Tagaçaba, orla da Floresta Atlântica, 20 Nov 2003, G. Hatschbach et al. 76720 (MBM); Irati, Riozinho, 01 Oct 1982, G. Hatschbach 45518 (MBM); Laranjeiras do Sul, Salto Santiago, 07 Mar 1991, Silva et al. 955 (UPCB, SP); Fazenda Santa Ana, 31 Oct 1985, Dias s.n. (FUEL, MO); Morretes, início da Estrada do Itupava, beira do Rio Nhumdiaquara, próximo à ponte de Morretes, 29 m elev., 25°26'1.31"S, 48° 52'26.31"W, 12 Mar 2008, L.H.M. Fonseca et al. 27 (SPF, MBM); Pinhão, Vale do Rio Iguacu, Córrego Estreito, 22 Feb 1996, G. Hatschbach et al. 64429 (MBM); Rio Bonito do Iguacu, Fazenda Giacomet-Marodin, Pinhal Ralo, 23 Jun 1995, Poliquesi & Cordeiro 328 (MBM, SPF); Tibagi, 696 m elev., 12 Oct 1959, G. Hatschbach 6373 (MBM); Rio Grande do Sul: Morrinhos do Sul, Morro do Forno, trepadeira em borda de Mata Atlântica de encosta, 19 Oct 1997, Jarenkow & Sobral 3204 (MBM); Santa Catarina: Apiúna, floresta ombrófila densa, 549 m elev., 27°10’27”S, 49°18’08”W, 11 Oct 2009, K. Kniess 561 (SPF); São Paulo: Iporanga, estrada entre Apiaí e Iporanga, flo-
Key to all species of *Dolichandra*

1a Calyx 5-lobed; branchlets with flaky bark; leaflets chartaceous........................2
- Calyx 2–3-lobed; branchlets without flaky bark; leaflets chartaceous or membranaceous.................................................................3

2a Floral bracts linear–lanceolate to subulate, < 1 mm wide; calyx lobes rounded and shortly mucronate, magenta, puberulent; corolla puberulent outside with peltate trichomes at the lobes; Colombia, Costa Rica, and Ecuador................

\[D. \text{steyermarkii}\]
- Floral bracts elliptic or lanceolate, 2–3 mm wide; calyx lobes ovate–lanceolate, attenuate and mucronate, green, glabrous (except at margin); corolla glabrous outside (sometimes sparsely pubescent at apex); Brazilian Atlantic Forest...........................................................................

\[D. \text{unguiculata}\]

3a Leaflet margins toothed; seed wings woody with a narrow hyaline margin; prophylls subulate, and smooth; riverbanks of Uruguay River basin ...........

\[D. \text{dentata}\]
- Leaflet margins generally entire (rarely toothed); seed wings hyaline, rarely woody but then, never with a hyaline margin; prophylls generally ovate and lanceolate, if ovate then striate, if smooth then lanceolate or subulate........

4a Anthers and stigma exserted; corolla bilabiate with the upper 2 lobes forward and the lower 3 lobes reflexed, red; fruit elliptic and coriaceous............................

\[D. \text{cynanchoides}\]
- Anthers and stigma included; corolla bilabiate with the upper 2 lobes reflexed and the lower 3 lobes forward, yellow or purple; fruit linear, rarely elliptic, but then woody ...........................................

5a Leaflet chartaceous; calyx 3-lobed, covering approximately 1/3 of the corolla; corolla purple.................................................................

\[D. \text{chodatii}\]
- Leaflet membranaceous; calyx 2-lobed or truncated, covering approximately 1/4 or 1/5 of the corolla; corolla yellow ........................................

6a Floral bracts foliaceous; calyx with a recurved apicule; fruit an oblong-elliptic capsule.................................................................

\[D. \text{quadriivalvis}\]
- Floral bracts filiform; calyx without an apicule, if apiculated then the apicule is incurved and never recurved; fruit a narrow, linear capsule......................
Calyx cupular, truncate to sinuous, without an apicule; prophylls ovate and striate.................................................................D. unguis-cati
– Calyx usually subspathaceously split, often with an incurved apicule; prophylls subulate-lanceolate or subulate and smooth ........................................8

Indument hispidous; ovary vinaceous; fruits 77–125.8 cm long; seeds with hyaline wings; deciduous forests of northern Argentina, southern, southwestern and central Brazil, Paraguay and Bolivia ........................................D. hispida
– Species glabrous to puberulous, never hispid; ovary green; fruits 9.2–38.5 cm long; seeds woody and opaque, hyaline wings absent; mangroves and swamps from Mexico to Argentina and Trinidad........................................D. uncata

Acknowledgements

We thank FAPESP for a Master’s scholarship to LHMF (2009/12508-3) and a regular research grant to LGL (2011/50859-2); a collaborative Dimensions of Biodiversity Grant supported by FAPESP (2012/50260), NSF and NASA; CNPq for a Pq-1C fellowship to LGL and a Pq-2 fellowship to MFA; and, IDEA WILD for field equipment. We are also grateful to Iona Stevens for her review and comments on this manuscript; Dayane Tarabay for field assistance; Iona Stevens, Alberto Vicentini and André Olmos Simões for comments on earlier versions of the manuscript; and, the curators of the herbarium ESA, FUEL, INPA, MBM, MO, NY, SP, and UPCB for specimen loans.

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