



# Reduction of *Breynia* subgenus *Hemisauropus* to *B.* section *Cryptogynium* and discussion of the *B. quadrangularis* complex (*Phyllanthaceae*)

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## Key words

*Breynia* section *Cryptogynium*  
*Breynia quadrangularis* complex  
Euphorbiaceae  
Phyllanthaceae  
*Sauropus*

**Abstract** *Breynia* subgenus *Hemisauropus* is reduced to *Breynia* section *Cryptogynium*. Arguments are given to regard the *Breynia quadrangularis* complex as a single species.

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## INTRODUCTION

The genera *Phyllanthus* L., *Breynia* J.R.Forst. & G.Forst., *Glochidion* J.R.Forst. & G.Forst. and *Sauropus* Blume form a clade in the phylogeny of the *Phyllanthaceae* (Kathirarachchi et al. 2006), where *Phyllanthus* is paraphyletic. Two options exist to address the paraphyly. *Phyllanthus* can be made monophyletic by either subsuming the non-included genera into a gigantic *Phyllanthus* (Hoffmann et al. 2006) or *Phyllanthus* may be split into morphologically recognisable monophyletic genera (Van Welzen et al. 2014). Van Welzen et al. (2014) opt for the latter solution and based on phylogenetic evidence (Pruesapan et al. 2012) they recognised the genera *Synostemon* F.Muell. (formerly united with *Sauropus*) and *Breynia* (including the non-*Synostemon* part of *Sauropus*, also known as *Sauropus* s.str.).

The recent phylogeny of *Breynia* (Pruesapan et al. 2012) shows that the clade splits basally into two groups, recognised as the subgenera *Breynia* and *Sauropus* Welzen & Pruesapan. The subgenus *Breynia* clade splits again in two groups, recognised as section *Breynia* (equalling the genus *Breynia* before union with *Sauropus*) and section *Cryptogynium* (Müll.Arg.) Welzen & Pruesapan (Van Welzen et al. 2014). The infrageneric classification thus reflects the phylogeny.

Shortly after Hoffmann et al. (2006) published their recommendation to unite all genera into *Phyllanthus*, Chakrabarty & Balakrishnan (2009) made all combinations under *Phyllanthus* for all Indian species of *Breynia* and *Sauropus*, reverting these to *Breynia* (Chakrabarty & Balakrishnan 2012) as soon as Pruesapan et al. (2012) published the idea to subdivide *Phyllanthus*.

Recently, Chakrabarty & Balakrishnan (2015) raised *Breynia* section *Cryptogynium* (Van Welzen et al. 2014) to subgeneric rank as *B.* subgenus *Hemisauropus* (Müll.Arg.) Chakrab. & N.P.Balacr. The only argument given is that it facilitates the recognition of the small-leaved species of *Breynia*. This decision is unfortunate for three reasons.

The small-leaved group of *Breynia* species also contains species with larger leaves (e.g., *B. pierreii* (Beille) Welzen & Pruesapan, *B. subterblanca* (C.E.C.Fisch.) C.E.C.Fisch.) and is, as a group, not really recognisable by the size of the leaves. Moreover, section *Breynia*, the sister-group of section *Cryptogynium*, also only comprises small-leaved species. Therefore, the argument by Chakrabarty & Balakrishnan (2015) is invalid.

The raise to subgeneric level disrupts the phylogenetic information (Pruesapan et al. 2012, Van Welzen et al. 2014), because Chakrabarty & Balakrishnan (2015) only retain section *Breynia*, while section *Cryptogynium* (their subgenus *Hemisauropus*) is of equal standing. In their classification it seems that their subgenus *Hemisauropus* equals subgenus *Sauropus* and might be a sister-group, which it is not.

Finally, the name *Hemisauropus*, is very unfortunate (but nomenclaturally necessary at subgenus level). In former classifications (e.g., Airy Shaw 1969), *Hemisauropus* only referred to a part of current section *Cryptogynium*, containing a group of species with staminate flowers with partly infolded sepals grown together via the midrib, absent scales and large stamens. However, this *Hemisauropus* group, though recognisable, was found to be polyphyletic as *B. granulosa* (Airy Shaw) Welzen & Pruesapan was resolved in the *Breynia* phylogeny as separate from the rest of the '*Hemisauropus*' group (f. 3 in Van Welzen et al. 2014; '*Hemisauropus*' group represented by *B. kerrii* (Airy Shaw) Welzen & Pruesapan, both species indicated by the abbreviation HEM). This is supported by pollen characters. *Breynia granulosa* has *Sauropus* pollen type 4 (as *Sauropus granulosa* Airy Shaw in Sagun & Van der Ham 2003), while the '*Hemisauropus*' group has *Sauropus* pollen type 3 (Sagun & Van der Ham 2003).

Especially the first two reasons compel me to restore subgenus *Hemisauropus* to section *Cryptogynium*:

***Breynia* section *Cryptogynium* (Müll.Arg.) Welzen & Pruesapan (*Phyllanthaceae*)**

*Breynia* section *Cryptogynium* (Müll.Arg.) Welzen & Pruesapan in Van Welzen et al. (2014) 89. — *Sauropus* Blume section *Cryptogynium* Müll.Arg. (1863) 73. — Type: *Sauropus rigidus* Thwaites [= *Breynia quadrangularis* (Willd.) Chakrab. & N.P.Balacr.].

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*Ceratogynum* Wight (1852) 26, t. 1900. — Type: *Ceratogynum rhamnoides* Wight [= *Breynia quadrangularis* (Willd.) Chakrab. & N.P.Balacr.].  
*Sauropus* Blume sect. *Hemisauropus* Müll.Arg. (1866) 243. — *Sauropus* Blume subgenus *Hemisauropus* (Müll.Arg.) Pax & K.Hoffm. (1922) 225. — *Breynia* J.R.Forst. & G.Forst. subgenus *Hemisauropus* (Müll.Arg.) Chakrab. & N.P.Balacr. (2015) 416. — Type: *Sauropus rostratus* Miq. [= *Breynia temii* (Welzen & Chayam.) Welzen & Pruesapan].

More references for each name can be found in Van Welzen et al. (2014).

## BREYNIA QUADRANGULARIS COMPLEX

It is obvious that Chakrabarty and colleagues prefer to maintain entities in the *Breynia quadrangularis* complex (sect. *Cryptogynium*) as distinct species (Chakrabarty & Gangopadhyay 1996, under *Sauropus*; Chakrabarty & Balakrishnan 2015), while I (Van Welzen 2003, under *Sauropus*; Van Welzen et al. 2014) regard them as one single, variable species. These species were also partly used as infraspecific entities (var. *compressus*, var. *puberulus*; see Van Welzen 2003). Time will tell who is correct. I only would like to add three remarks to the discussion.

The identification table in Chakrabarty & Balakrishnan (2015) nicely shows that the variability is more or less continuous and the differences do not always seem to be very distinct, especially not between their *B. compressa* (Müll.Arg.) Chakrab. & N.P.Balacr. and *B. concinna* (Collett & Hemsl.) Chakrab. & N.P.Balacr. Particularly sepal shapes are difficult as a character, because sepals can become, by exception, free and narrow. This is discussed in Van Welzen et al. (2014: 88), where an example for *B. androgyna* (L.) Chakrab. & N.P.Balacr. is provided.

What is not obvious from the discussion by Chakrabarty & Balakrishnan (2015), is whether or not the whole distribution and variability of the species complex was covered, as they focus on India. It is unlikely that they have seen material from the species' full range, because they do not refer to it and they do not acknowledge loans from other herbaria. Quite a number of specimens are known from outside India (see Van Welzen 2003, map 15 under *Sauropus quadrangularis*). If the complete variability is not covered then the status of the taxa recognised by Chakrabarty & Balakrishnan (2015) is uncertain as intermediates specimens occur outside and even inside India (Van Welzen 2003: 367, note 4).

Chakrabarty & Balakrishnan (2015) discuss only differences in morphology. A synthetic approach, also taking into account similarities, may be more clarifying. All other species in section *Cryptogynium* and subgenus *Sauropus* have pistillate flowers with horizontal, partly split stigmas resembling a crescent moon. The pistillate flowers in the *quadrangularis* group have erect, non-crescent moon-like stigmas. This obvious apomorphy, together with transitions between forms, is especially for me important to regard all forms as one, though variable, species.

Describing variability is difficult. Two extremes are presented here: splitting into various species (Chakrabarty & Balakrishnan 2015) or uniting all forms into one (Van Welzen et al. 2014) with a description of the variability via notes (Van Welzen 2003). The best way forward will be to use molecular data in a phylogeographic approach to see if the complex contains a single or multiple species. Until such studies have been performed, disagreements like these are likely to persist.

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