

## Taxonomic history and identity of *Musa dasycarpa*, *M. velutina* and *M. assamica* (Musaceae) in Southeast Asia

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**Abstract** Since the initial description, the name *Musa dasycarpa* Kurz (1867) has been unclear to most botanists. It has usually been synonymized with *M. velutina* H. Wendl. & Drude (1875). However, although the original diagnosis was very short, “fruits hairy”, it is adequate. Thus, according to Vienna Codes, *M. dasycarpa* Kurz has priority over *M. velutina* H. Wendl. & Drude. The aim of this study is to settle the true identity and to update the description of *M. dasycarpa* Kurz. For that purpose the names *M. dasycarpa* and *M. velutina* are typified. In addition, critical notes regarding *M. assamica* Bull. are given; it is neotypified here, and considered as conspecific with *M. sanguinea* Hook. f.

**Key words** *Musa*, *Musa assamica*, *Musa dasycarpa*, *Musa velutina*, Musaceae, *Rhodochlamys*, Southeast Asia, wild banana.

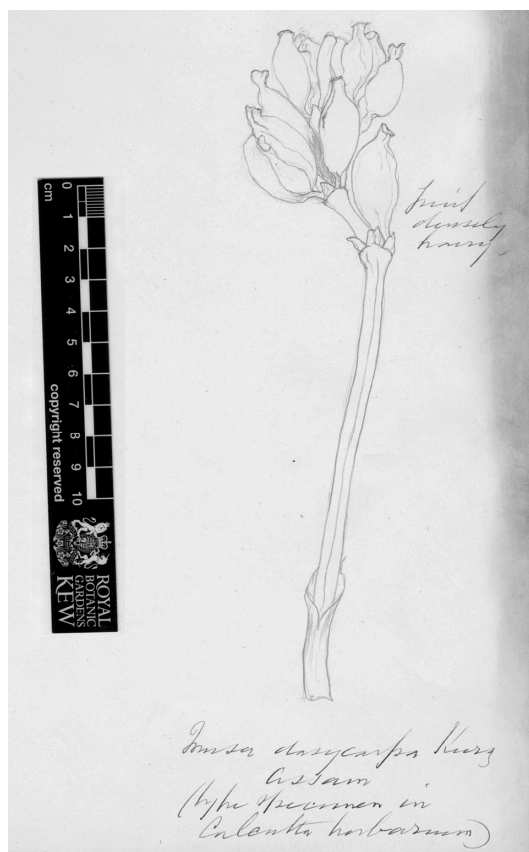
**1. *Musa dasycarpa*** Kurz, J. Agric. Hort. Soc. Ind. 14: 301 (1867). Type: Icon of *Musa dasycarpa* at Kew (lectotype, designated here, K!).

Sulpiz Kurz was a German botanist who worked in India and Myanmar. The name of *M. dasycarpa* Kurz (1867) was diagnosed by him very briefly: “fruits hairy”. There is an icon (Fig. 1) at K, perhaps drawn by Kurz, with the following comments: *Musa dasycarpa* Kurz, Assam (type specimen in Calcutta herbarium), fruits densely hairy. The Calcutta specimen has been lost. Cheesman (1949) noted that he did not find any collection of *M. dasycarpa* at Kew. However, there are two herbarium samples at Kew: sheet 2485 (Fig. 2) of *M. dasycarpa* predating the description, 3.X.[18]50 (incorporated in Herbarium Hookerianum in 1867). The sheet date of Fig. 2 indicates that the collector was not Kurz himself because he arrived to Calcutta, India over a decade later. Kurz (1878) clearly stated that *M. dasycarpa* was only known by its fruits when he described it in 1867. The sheet from 1850 at Kew also has leaves. Therefore it seems very likely, that the icon at K (Fig. 1) represents the only original element known today. A third sheet at K, collected by I. H. Burkhill (no. 35722, Fig. 3), Ahor Exped. Makum [Assam, India] 21.XI.[19]11, shows both fruits and leaves also.

**2. *Musa velutina*** H. Wendl. & Drude, Gartenflora 65, t. 823. 1875. Type: Icon in Wendl. & Drude, Gar-

tenflora 65, t. 823. 1875 (Fig. 4) (lectotype, designated here).

*Musa velutina* was described by a German, Hermann Wendl. and an Englishman, George



**Fig. 1.** Lectotype of *Musa dasycarpa* (K, 1867). Photo: M. Xanthos, K.

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**Figs. 2–5.** 2. Specimen of *Musa dasycarpa* (K, 2485). Photo: M. Xanthos, K. 3. Specimen of *Musa dasycarpa* (K, 35722 1911). Photo: M. Häkkinen, H. 4. Lectotype of *Musa velutina* (t. 823). Photo: T. Deroin, P. 5. Neotype of *Musa assamica* (K, 170B/4/36). Photo: M. Häkkinen, H.

Drude, from a flowering plant at Herrenhausen Botanic Garden at Hannover. It was introduced from Assam by German Gustav Mann. The diagnosis of *M. velutina* (Wendland & Drude, 1875) was as follows: “Spadix erectus purpureus, pedunculo, rhachi, spathis floriferis inferioribus dense velutinis. Spatha infima sterilis, sequentes tres floribus 3–4 feminis axillaribus, superiores 6–9 floribus totidem masculinis ornatae. Flores femini germine quam perianthium paulo longiore vel ei aequilongo velutino anguloso; labio exteriore tricarinato quinquedentato, dentibus revolutis vel convolutis, labio interiore (labello) obtuso exterius longitudine aequante eoque latiore; staminibus 2 fertilibus, antheris dimidiatis falcatis; stigmatibus crasso lirelliformi. Flores masculini germine rudimentario stipitifolium incurvo glabro; labio exteriore lato bicarinato dentibus 5 revolutis, interiore acuto brevioribus; staminibus inaequalibus 5 fertilibus antheras binas gerentibus; stigmatibus quam in floribus feminis minore. Folia basi inaequali in petiolum longe decurrentia.”

#### ***Musa dasycarpa* or *M. velutina***

Cheesman (1949) was the first who pointed out that the drawing (lectotype of *M. dasycarpa* at K) strongly suggests identity with *M. velutina*, and he regarded it as probable that further study may establish *M. dasycarpa* Kurz as the valid name for the species hitherto called *M. velutina*. Simmonds (1960) came to the same conclusion. No other hairy fruited *Musa* species have been found from Assam (Singh et al., 2001; Uma et al., 2006), and such are not known elsewhere in continental Asia either.

Already Kurz (1878) commented on the name assigned by Wendland and Drude (1875): “They published a supposed new species which they call *M. velutina*.” It seems likely that Kurz recognised that *M. velutina* was the same as his *M. dasycarpa* and he commented: “I cannot embark here upon a sifting of the literature and synonymy, for such would be of too technical a character, and will be published in my revision of the Musaceae under preparation” (Kurz 1878: 163). However, Kurz never published his revision because he died in Penang Malaysia shortly after writing those words.

The true schism on the correct name began when Baker (1893) reduced *M. dasycarpa* to a synonym of *M. velutina* in his synopsis of banana. Subsequent botanists largely followed his view (e.g., Schumann, 1900; Pucci, 1906; de Wildeman, 1912; Burkill, 1925; Worsdell, 1941; Walters et al., 1984; Simmonds & Weatherup, 1990; Hore et al., 1992). Obviously Baker

(1893) was not certain of Kurz’s name (Cheesman, 1949). The reason might be that Wendland and Drude (1875) did not clearly mention the fruits at all in their Latin diagnosis, which was the key character of Kurz’s taxon. However, that did not justify reducing *M. dasycarpa* as a synonym of *M. velutina*, as Baker (1893) did. At the very end of their article, Wendland and Drude (1875) stated concerning the figures “die Samenknospen einhüllenden Haare sind fortgelassen” (hairs covering the ovaries not drawn in the table 823, see figure 4). The only other species with hairy ovaries is *M. hirta* Becc. from Borneo, a species of section *Callimusa* Cheesman. *Musa dasycarpa* belongs to section *Rhodoclamys* Baker (Baker, 1893: 205). *Musa dasycarpa* from India is one of the five known bananas of the family Musaceae in which the fruit is schizocarpic on maturity. The others are *M. johnsii* Argent, *M. lolodensis* Cheesman and *M. schizocarpa* Cheesman from Papua New Guinea, and *Musella lasiocarpa* (Franc.) C. Y. Wu from China (Franchet, 1889; Baker, 1893; Cheesman, 1950; Simmonds, 1956; Li, 1978; Argent, 2001). The older name *M. dasycarpa* has priority over *M. velutina* according to Vienna Code (McNeill et al., 2006).

#### **Characterization of *Musa dasycarpa***

The following description of *M. dasycarpa* is based on cultivated living plants in the Botanic Garden of University Helsinki (accession 1998-0017), by completing the entire INIBAP *Musa* Descriptor List (IPGRI-INIBAP/CIRAD, 1996). The descriptive terms here also follow the tradition of banana taxonomy as used by N. W. Simmonds (Simmonds, 1962, 1966).

Plant slender, suckering freely, close to parent plant, 2–3 suckers, position vertical. Mature pseudostem up to 1.5 m high, 7 cm in diameter at base, often smaller, underlying colour light green, devoid of wax and without pigmentations, sap watery. Petiole up to 30 cm, petiole canal margins straight with erect margins, petiole bases winged and not clasping the pseudostem. Leaf habit intermediate, with very corrugated lamina, lamina up to 1 m long and 35 cm wide, truncate at the apex, colour of upper surface dark green, and lower surface green, appearance shiny, midrib dorsally green and ventrally red, leaf bases asymmetric, both sides pointed. Inflorescence erect, peduncle up to 10 cm long and 2 cm in diameter, heavily clothed with white pubescence and red in colour, sterile red bract one, persistent at the opening of the first female flowers. Female bud ovoid, up to 15 cm long and 6 cm wide, bracts pale pink in external and internal faces, no imbrications, no wax, lifting two

bracts at a time, revolute before falling. Basal flowers female, hermaphrodite, 3–5 per bract in a single row, ovary 3 cm long, pale pink, velvety, densely pubescent, arrangements of ovules in two rows per loculus, compound tepal 3 cm long, orange pink in colour and the lobes orange, free tepal as long as the compound, boat shaped, yellowish, strongly grooved, stamens 5, whitish, light green style with orange stigma. Male bud ovoid, 12 cm long and 5 cm wide, bracts pale pink in external and internal faces, lifting two bracts at a time, revolute before falling, commonly aborting after producing about a dozen of bracts with male flowers. Male flowers on average 5 per bract in one row, falling with the bract, compound tepal 3.8 cm long, orange-yellow, with a pink flush on the back, with 5-toothed apex, free tepal 3.7 cm long, translucent white, oblong, with a short broad acumen, stamens 5, whitish, anthers yellow, light green style with orange stigma, anthers and style at the same level, ovary straight, orange, without pigmentation.

Fruit bunch compact, with 5 hands and 4 fruits per hand on average, in 1 row, fruit bright pink, rounded, 7 cm long, 3–4 cm in diameter, pubescent like the peduncle, broadly truncate at apex, and sessile at base, without any floral relicts, pericarp 3–4 mm, thick, splitting at maturity and separating in irregular strips from apex to base, exposing the central

mass of white pulp and seeds.

Seeds black, tuberculate, irregularly angulate-depressed, 4–6 mm across, 2–3 mm high, 80–90 per fruit. Chromosome numbers are  $2n = 22$  (Cheesman, 1947).

**Additional specimens examined:**

**Burma** (Myanmar). Myitkina, Tawgin, Ehaung, alt. 800 ft. 24.XI. [19]28, *C. E. Parkisson 1765* (K!); Trinidad. Cult. Imp. Coll. Trop. Agric., Introduction 212, H. 1171/1949, *R. E. D. Baker* 23.VI.1949. (K!).

**China. Yunnan:** Xishuangbanna Tropical Botanical Garden, beside dinner room in XTBG, alt. 570 m, 1.X.2005, *Heliqing 5* (HITBC 111415!).

**Distribution and habitat** *Musa dasycarpa* is distributed at lower altitudes across Assam to Arunachal Pradesh in northeast India and northern Myanmar. It has become a menace as a weed in agricultural fields due to its fast suckering and spreading seed habit by birds and bats (Uma et al., 2006). Its fruits do not change the colour upon ripening but they dehisce as a sign of maturity. It has also been disseminated all over the world as the most ornamental banana. It also hybridizes well with the other *Rhodochlamys* species so there are number of unidentified artificial hybrid clones in horticulture all over the world (Simmonds, 1962; Shepherd, 1999; Häkkinen & Sharrock, 2002; Häkkinen, 2005, 2007).

**Key to some closely related *Rhodochlamys* species**

- 1a. Basal flowers hermaphrodite, ovary 3 cm long and pale pink, peduncle dark red and very hairy, male bracts pink at both sides, fruits 7 cm long, hairy, angular, pink at maturity, self peeling at ripening.....***Musa dasycarpa***
- 1b. Basal flowers female, ovary 4 cm long and light green, peduncle light green, male bracts lilac at both sides, fruits 8 cm long, glabrous, straight, rounded, light green, becoming pale yellow at maturity.....2
- 2a. Up to 15 pseudostems in the same plant, close to parent plant, inflorescence erect, free tepal as long as compound tepal.....***M. ornata***
- 2b. Up to 2–3 pseudostems in the same plant, emerging 2 meters from the parent plant, free tepal 1/4 long as compound tepal ...3
- 3a. Inflorescence erect, male flowers 6–10 per bract in two rows, orange in colour, bracts brick red in colour.....***M. laterita***
- 3b. Inflorescence horizontal, male flowers 2–3 per bract in one row, light yellow in colour, bracts rose in colour.....***M. mannii***

***Musa assamica*** Bull in A retail list of new, beautiful and rare plants offered by William Bull: 6. 1871. Type: Britain, Kew. *Hort. Kew. 170B/4/36*. 3XII. 1884. (neotype, designated here, K!). Fig. 5

Bull (1871) published the name *Musa assamica* without proper diagnosis: “This is a peculiarly dwarf-habited and elegant species, and has been imported from Upper Assam. The slender pseudostems are about a foot and half high, green, bearing a crowded tuft of several elliptic lanceolate leaves, which are stalked, about a foot in length, remarkably unequal-sided at the base, acute at the apex, and running out into a slender tendril-like point. The leaves are green, with a narrow purple border. It will make good plant

for table decoration, on account of its exotic aspect and moderate size and stature – 1 guinea”. Also Cheesman (1949) was aware of this description, which has been almost neglected ever since.

Baker (1892) included the name in his list of imperfectly known species allied to *M. sanguinea*, with a short “diagnosis”: “Leaves about 1 ft. very unequal-sided bright green – Assam”. He did not refer to Bull (1871) at all, and his name is a younger synonym for *M. assamica*. Further, *M. assamica* Baker could be considered as an invalid name according to Art. 34.1. (McNeill et al., 2006), as Baker considered the name uncertain.

According to Cheesman (1949) there is a note



among the *Musa* material in Kew Herbarium in which Mann (who was responsible for collecting altogether four new species of *Musa* in Assam) states that he does not know which of [his] Assam species has been called “*assamica*”. Cheesman (1949) continued: “We may conclude fairly safely that the plants offered for sale under the name *M. assamica* were young specimens of either *M. aurantiaca*, *M. mannii*, *M. sanguinea* or *M. velutina*. It is quite impossible, from a description which fits almost any *Musa* seedling, to connect *M. assamica* with any of the four species from Assam”.

*Musa mannii* Baker was first introduced to Kew from Herrenhausen in 1885 and *M. aurantiaca* Baker in 1894 (Baker, 1894); both much later than Bull’s sales catalogue. That eliminates the possibility that the plants for sale under the name *M. assamica* were either *M. mannii* or *M. aurantiaca*. It is no longer possible to determine which of the other two species mentioned by Cheesman (1949) in his quotation was *M. assamica*. The material associated with that name probably become extinct in cultivation many years ago (Baker, 1892, 1893, 1894; Hooker, 1893; Fawcett, 1913; Champion, 1967; Häkkinen & Sharrock, 2002; Häkkinen & Väre, 2007). Chittenden and Synge (1956) speculated in The Royal Horticultural Society Dictionary of Gardening that “*M. assamica* is probably identical with *M. sanguinea*”. That view is adopted here, and consequently, *M. assamica* Bull. is neotypified with *M. sanguinea* Hook. f. collection at K. The neotype was collected from a plant cultivated at Kew Gardens, of which Bull perhaps collected his seed material.

Baker must be cited as an author alone concerning *M. mannii*, as he refers to an unpublished manuscript by Hermann Wendland (Baker, 1892: 263). Thus the publication by Wendland was not effective (McNeill et al., 2006; Art. 29.1). The genus *Musa* was printed as a part of Fl. Brit. Ind. in 1892 (Stafleu & Cowan, 1979), not in 1893 as often cited.

## Conclusion

*Musa* taxonomy is still very obscure today just as it has been throughout its history despite attempts to clarify it. The Kew superintendent William Watson wrote in 1894 in *Garden and Forest*, New York as: “Mr. J. G. Baker, keeper of the Herbarium at Kew, has recently prepared a *Synopsis of the Genera and Species of Musa*, which was published in *Annals of Botany* [1893].” He continued: “The genus *Musa*, I believe, gave Mr. Baker considerable trouble. He admits thirty-two species, and divides them into three sub-

genera: *Physocaulis*, *Eumusa* and *Rhodochlamys*.” The next classification revision was made by E. E. Cheesman in his monumental series “Classification of the Bananas, Critical Notes on Species” published in *Kew Bulletin* 1947–1950. He divided wild bananas into four sections, viz., *Australimusa*, *Callimusa*, *Eumusa* and *Rhodochlamys*. N. W. Simmonds continued the taxonomical work in 1950–1960 by describing several new species, also published in *Kew Bulletin*. This article is part of the revision work with the old taxa and the authors do believe that the taxonomical question regarding *M. dasycarpa* versus *M. velutina* and *M. assamica* is now solved. However, it might prove necessary to conserve *M. velutina* H. Wendl. & Drude.

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