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Taxonomic identity of *Musa cheesmanii* (Musaceae) in northeast India

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The taxonomic identity of *Musa cheesmanii* N. W. Simmonds (1956a) has been uncertain to most botanists and the species has commonly been wrongly identified as *M. nagensium* Prain. The aim of this study is to settle the true identity of the species and provide a revised description and colored photo illustrations. Colored photo illustrations of two varieties of *M. nagensium* are also included to avoid misidentifications with *M. cheesmanii*. A key to closely related species is provided. The study is based on morphological characters observed in the field in northeast India, in various herbaria and supported by relevant literature.

Musa cheesmanii was discovered by N. W. Simmonds in Nagaland in 1955 during his historical Banana expedition in northeast India. While describing the new species he wrote: "This handsome species is very abundant on the lower stretches of the Manipur road and it is curious that it has not previously been recognized as distinct. It differs, however, in several important respects from its two large-seeded congeners and its seeds are, so far as is known, unique in the genus. Indeed I have seen nothing like them in any herbarium collection I have studied. They are strangely reminiscent of *Musa balbisiana* in being subglobose and rough-warty but more than twice as large in linear dimensions". However, in fact the first mention about this species appeared in the literature long before its first description (Simmonds 1956b). I. H. Burkill mentioned it in his 'The Botany of the Abor Expedition' (Burkill 1924). The area explored by Burkill falls under present day East Siang district of Arunachal Pradesh. Initially Burkill identified the species as *M. pruinosa* King with some doubt and wrote: "There is in my mind no doubt as to their specific difference, but I am not able to examine for myself material named by Sir George King, and the identity of large Abor plant with it at second hand". Having this doubt he again put a note mentioning: "This large Abor plant suggests *M. nagensium* Prain, but carries its fruit recurved and so is strikingly different in this one respect; in size, waxiness, and other characters agrees unless the colour within the bracts, which colour I forgot to note, is unlike…….The Abor call it Lumkong" (Burkill 1924).

Musa cheesmanii is an elegant species commonly found from northeast India to Myanmar (Häkkinen 2008, pers. obs.) but in the literature it is not well represented (Hore et al. 1992, Uma et al. 2005, Uma 2006, Chowdhery et al. 2009) and there is not even a single collection in the Indian Herbaria CAL, ASSAM, ARUN. Hence, although the plant is found quite commonly, it is almost unknown for the majority of botanists and it is commonly confused with *Musa nagensium* var. *nagensium* Prain (Burkill 1924, Uma et al. 2005, Uma 2006, Häkkinen 2008). In a recent expedition by the first author in July 2013 to the east Siang district, in areas where Burkhill (1924) encountered the above mentioned species, the first author found that there were no natural populations of *M. nagensium*. Instead there was quite abundant and luxuriant growth of *M. cheesmanii* in the foothills. Furthermore, its local name 'Lungkang' (Lumkong) as mentioned in Burkill's account help to correctly identify the species in those areas as *M. cheesmanii* (Gogoi pers. obs).

Musa nagensium has two distinct varieties: *M. nagensium* var. *nagensium* Prain was first reported from Nagaland (Prain 1904), and is naturally distributed from Naga Hills to Eastern Arunachal Pradesh including parts of the Lohit district. The other variety is *M. nagensium* var. *hongii* Häkkinen which was reported from Yunnan, China and also has been found growing wild from Yunnan to Anjaw district of Arunachal Pradesh in northeast India (Häkkinen 2008, Gogoi 2013, Gogoi and Borah 2013).

Musa cheesmanii and both varieties of *M. nagensium* grow sympatrically in the district of Lohit, Anjaw and Lower Dibang valley of Arunachal Praesh (Gogoi 2013). In *M. cheesmanii* the pseudo-stem is dark brown, reddish to blackish (Fig. 1D), fruits are always curved upwards (Fig. 1G–I), and the male bud is purplish with yellowish tip

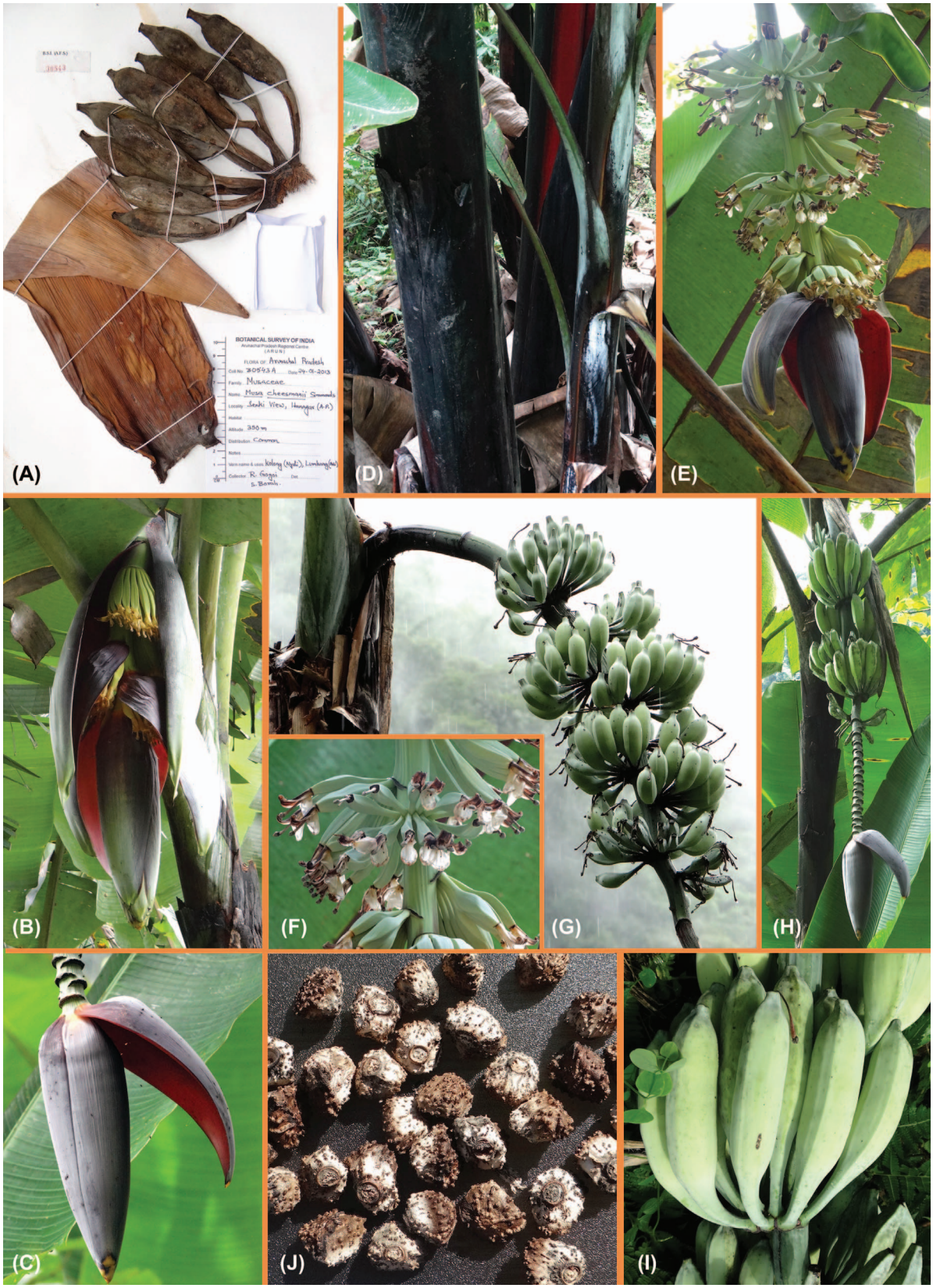

Figure 1. *Musa cheesmanii* N. W. Simmonds. (A) epitype specimen of *M. cheesmanii* (CAL, R. Gogoi and S. Borah 30543), (B) close view of female bud, (C) close view of male bud, (D) pseudo-stem, (E) an immature fruiting bunch with male bud, (F) close view of female flowers, (G) a mature fruiting bunch, (H) plant with fruiting bunch, (I) close view of fruits, (J) seeds. Photo: R. Gogoi and S. Borah.

(Fig. 1C, E) whereas in both varieties of *M. nagensium* the pseudo-stem is light greenish yellow (Fig. 2F), fruits are drooping towards gravity (Fig. 2D, I) and male buds are light flame scarlet to orange–yellowish (Fig. 2C–D, G–H). These characters make both species very easily distinguishable in the field. Below, a revised and detailed description based on live material in the wild along with colored photos are provided for easy identification. The original material of *M. cheesmanii* collected by N. W. Simmonds [Simmonds 90] (K) no. 19008 (in spirit), which was designated as lectotype by Häkkinen and Väre (2008) is almost in decaying condition, hence an epitype is designated here.

Musa cheesmanii N. W. Simmonds 1956a (Fig. 1A–J)

Type: India, Assam, near Dimapur, 1954, [Simmonds 90] no. 19008 (in spirit) in K! (lectotype designated by Häkkinen and Väre 2008). – India, Arunachal Pradesh, Itanagar, Senki View, 350 m a.s.l., Gogoi and Borah 30543 in CAL (epitype, designated here).

Description

Plant robust clump forming, suckering close to the parent plant, with 7–12 suckers, vertically arranged; mature pseudo-stem 9–10 m tall, 30–35 cm in diameter at base; base bulbous; sheaths underlying colour brownish red to blackish, shiny; sap milky. Petiole up to 90 cm, 4–5 cm in diameter, its canal margins closed and bases winged, auricled, clasping tightly, with black blotches on green or reddish, waxy when young. Leaves intermediate; lamina oblong, to 290 × 100 cm, truncate at apex, adaxially dark green, abaxially whitish green, with brown margin, at base asymmetric; midrib green on upper side and pinkish on lower side. Inflorescence pendent; peduncle up to 60 cm long, to 4.5 cm in diameter, glabrous, colour green with purple tinge, light waxy; leafy bract 1, to 105 cm long; sterile bracts 2, to 75 cm long, outside green with purple margins, densely waxy, internally scarlet red, persistent at opening of the first female flowers. Female bud lanceolate, up to 65 cm long, to 9 cm in diameter; bracts green with purple margin, internally scarlet red, convolute or slightly imbricate, acute, lifting few bracts at a time, not revolute before falling; basal flowers female; with up to 16 flowers in 2 rows, to 13.5 cm long, to 2 cm in diameter; ovary greenish yellow, glabrous, 9–10 cm long, 1.8–2.0 cm in diameter, 5-ridged; ovules in 2 rows in each locule; style creamy, to 3 cm long; stigma cream, ca 6 mm, dirty creamy; compound tepals cream or light orange, to 3.5 cm, with 2 prominently thickened keels; free tepals ovate without keel, yellowish translucent with obtuse apex, 2.6 × 2.0 cm; staminodes 5, unequal, light cream, to 1.3 cm long; pollen lacking. Male bud lanceolate, to 29 cm long, to 13 cm in diameter; bracts slightly imbricate, reddish purple outside, inside reddish or scarlet red, ovate, their tip yellow, acute; lifting few bracts at a time, sometimes bracts persistent on the rachis, not revolute even after falling, up to 26 × 14 cm; flowers in 2 rows, with up to 23 flowers in each bract; flowers yellow, to 7.5 cm long; ovary cream, to 1.2 cm × 4.0 mm; compound tepal light orange or yellow, to 5.0 × 1.5 cm, with distinct keel; free petals yellow or light orange, translucent, acumenate at apex, ovate or lanceolate, to 2.5 × 1.7 cm, their apex acute with 2 thickened keels, their mid vein prominent; stamens 5, light yellow, exerted, fertile, to 5 cm long; filament 2 cm long; anther lobe to 4 cm long; stigma orange, to 2 mm in diameter; ovary arched, light yellow, to 2.5 × 0.5 cm; style to 4.5 cm long, without additional pigmentation. Male rachis to 2 m long and to 3 cm in diameter. Fruit branch pendent, lax, with up to 16 fruits in two rows and up to 12 hands; fruits to 18 cm (including pedicel) long, 3.5 cm in diameter, not curved, prominently ridged; pedicel to 7.5 cm, glabrous; fruit apex long pointed; immature fruits green; fruit pulp white. Seeds up to 97, angular, spiny, compressed, ca 1.0 × 0.7 cm.

The chromosome number of *Musa cheesmanii* N. W. Simmonds is 2n = 22 (Li et al. 2010).

Distribution and habitat

Musa cheesmanii is widely distributed in northeast India; Arunachal Pradesh. It is the most dominating species and found almost in all the districts between 200 and 1500 m a.s.l. (except high altitude temperate areas); Assam: bordering areas of Bhalukpung; Nagaland: common at lower elevations; Manipur: common in Tamenglong district.

Vernacular names

'Lungkang' by Adis and 'Kolong Papok' by Nyshi tribes of Arunachal Pradesh; 'Kabu' by Naga tribes of Nagaland.

Additional specimens examined

India, Arunachal Pradesh, Lohit district, Tidding to Salangam, 13 Sep 2012, R. Gogoi and S. Borah 21855 (ARUN); Arunachal Pradesh, Jengging, Upper Siang, 19 Jul 2013, R. Gogoi, 30512, (ARUN).

Key to *Musa cheesmanii* and closely related species in India, China and Myanmar

1. Plant slender; inflorescence erect; basal flowers hermaphrodite in female bud 2
   – Plants robust; inflorescence pendent; basal flowers female in female bud 3
2. Male bud purplish with pilosebracts; fruit peel pink, hairy, self peeling at maturity ..... *M. velutina*
   – Male bud pink with glabrous bracts; fruit peel green, glabrous, not self peeling at maturity ..... *M. markkui*
3. Four (4) rows of ovules in each locule in the ovary ... 4
   – Two (2) rows of ovules in each locule in the ovary ... 6
4. Plants stoloniferous; male bud purple red with yellow margin ..... *M. itinerans*
   – Plants clump-forming, male bud crimson or purple without yellow margin 5
5. Pseudo-stem densely covered with dead sheaths; male bud deep purple; fruit bunch oblique; peduncle densely brown-hairy; fruiting pedicel hairy ..... *M. sikkimensis*
   – Pseudo-stem not covered with dead sheaths; male bud crimson; fruit bunch straight; peduncle glabrous; fruiting pedicel glabrous ..... *M. balbisiana*

Figure 2. (A)–(E) *Musa nagensium* Prain var. *nagensium*. (A) plants in natural habitat (photo: S. Borah), (B) close view of pseudo-stem (photo: S. Borah), (C) close view of female bud (photo: S. Borah), (D) mature fruiting bunch with male bud (photo: S. Borah), (E) seeds inside fruit (photo: S. Borah). (F)–(J) *M. nagensium* var. *hongii* Häkkinen. (F) plants in natural habitat (photo: Markku Häkkinen), (G) close view of male bud (Photo: R. Gogoi), (H) view of immature fruit, male flowers in male bud (Photo: R. Gogoi), (I) close view of mature fruits (Photo: R. Gogoi), (J) close view of seeds (Photo: Markku Häkkinen).

6. Plants less than 6 m tall; pseudo-stem base to 20 cm in diameter, its underlaying colour green with black or dark brown blotches; male bud pink reddish; fruit peel deep green ..... *M. flaviflora*
– Plants more than 7 m tall; pseudo-stem base to 35 cm in diameter, its underlaying colour black, dark brown, reddish or yellowish green; male bud purple or scarlet or orange; fruit peel pale green or whitish 7
7. Pseudo-stem dark brown, reddish or blackish; female bracts greenish with purplish margin; male bud purplish; fruits recurved and tip pointing against gravity ..... *M. cheesmanii*
– Pseudo-stem yellowish green; female bracts flame scarlet or orange; male bud flame scarlet or orange; fruits drooping, tip always pointing towards gravity 8
8. Male bud flame scarlet; fruits apex less pointed; mature seeds black and smooth ... *M. nagensium* var. *nagensium*
– Male bud orange and yellowish; apex of fruit long pointed; mature seeds brown and warty ..... *M. nagensium* var. *hongii*

Conclusions

It is interesting to note that a distinct species like *M. cheesmanii* N. W. Simmonds has been totally ignored or neglected by most botanists. It is one of the most dominating species in northeast India with pure large colonies in the hilly slopes (Gogoi pers. obs.). Although the species is widely distributed, the characters are so uniform and there is no traces of any hybrids or other intra specific taxa in the wild. The species grows in close proximity to *M. nagensium* Prain, *M. sikkimensis* Kurz, *M. flaviflora* N. W. Simmonds, *M. markkui* Gogoi & Borah, *M. velutina* H. Wendl. & Drude, *M. itinerans* Cheesman in a non-overlapping population.

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