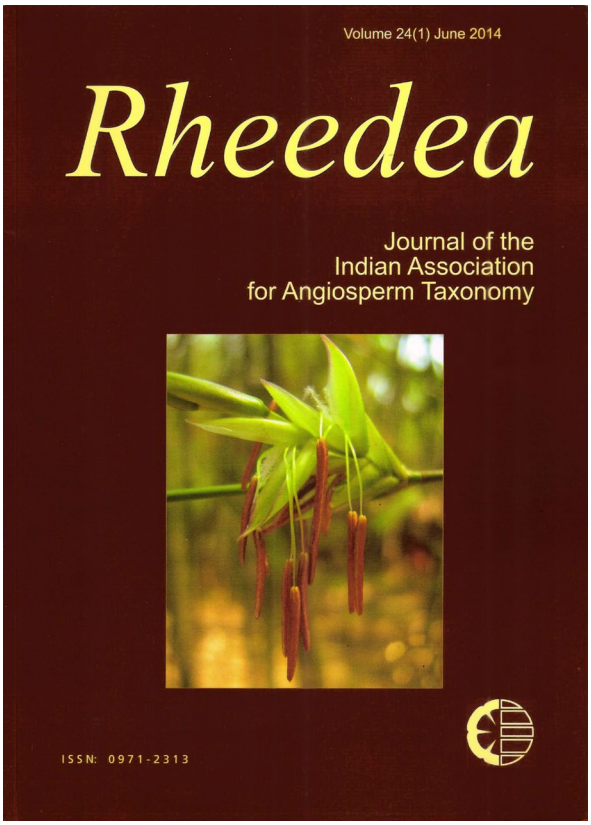
RHEEDEA
Journal of the Indian Association for Angiosperm Taxonomy

Vol. 24(1): 05–11 (2014)
ISSN: 0971-2313 (Print edition)
ISSN: 2582-2438 (Online edition)

Regarding the identity, rediscovery and taxonomic history of *Musa nagensium* (Musaceae) from India

Alfred Joe, Sreejith P.E., Ashfak O.A. & M. Sabu



How to cite:

Joe A., Sreejith P.E., Ashfak O.A. & M. Sabu 2014. Regarding the identity, rediscovery and taxonomic history of *Musa nagensium* (Musaceae) from India. *Rheedea* 24(1): 5-11.

https://dx.doi.org/10.22244/rheedea.2014.24.01.02

Received: 11.11.2013 *Revised and accepted*: 28.05.2014

Published in print: 31.06.2014 *Published Online*: 31.06.2014

Published by Indian Association for Angiosperm Taxonomy
This volume of Rheedea is published with partial financial assistance from Science Engineering Research Board, Government of India, New Delhi

Rheedea
Vol. 24(1)
05-11
2014

Regarding the identity, rediscovery and taxonomic history of *Musa nagensium* (Musaceae) from India

Alfred Joe, P.E. Sreejith, O.A. Ashfak and M. Sabu*
Department of Botany, University of Calicut, Calicut University P.O
Thenhipalam, 673 635, Kerala, India.
*E-mail: msabu9@gmail.com

Abstract

Since the publication of *Musa nagensium* Prain in 1904, this taxon has not been collected from the Indian forests or misidentified under different species. Here, *M. nagensium* is rediscovered after a lapse of more than a century from North-East India. *M. nagensium* var. *hongii* is reduced to the synonomy of *M. nagensium*. Detailed description, photographs, notes on distribution, ecological details and notes on variation are provided. IUCN conservation status based on the field study is also provided.

Keywords: *Musa nagensium*, *M. nagensium* var. *hongii*, Rediscovery, taxonomic notes, synonymy, lectotype

Introduction

Musa nagensium Prain (1904) was initially described based on the plant grown at the Royal Botanical Garden, Calcutta from the rootstocks collected by Abdul Huq from Jaboca Naga Country (Naga hills of Assam, the present Nagaland), North-East India. Fawcett (1913) included this taxon in his book based on Prain's description. Fischer (1931) reported the occurrence of *M. nagensium* from Myitkyina District of Upper Burma, some 200 miles from its type locality, based on a specimen collected by Parkinson. Wilson (1946) in his cytological studies in the *Musae*, used two varieties of *M. nagensium* for breeding experiment, and reported both consists of 11 chromosomes. He further added that these varieties may be identical, with different labels. Cheesman (1948) provided a breif description of the taxon from the plants grown at Imperial College of Tropical Agriculture (I.C.T.A.), Trinidad, which was introduced from the Myitkyina District, Burma. It was raised from the seeds sent by C.W.D. Kermode in July 1939, labelled '*Ngapyaw-new*'. He added that the detailed description and photographs taken from that plant will be supplied later if the plant survives, which was not materialized. He also commented on Prain's quoting "the fruits, instead of being recurved as in most species, point persistently forward and downward in the direction of the apex of the long pendulous rachis". Subsequently, Simmonds (1956) came across this species from a Thai collection. He couldn't see the plant in flowering stage, but the vegetative characters of the plant agrees with the plant grown in I.C.T.A. (Introd. No. 188). Simmonds noticed that seeds are obscurely warty, sub-globose but somewhat tapered towards the hilum and have a distinct and relatively large hilum cavity. However, Simmonds recorded its type in "Herb. Calcutta, some duplicates in Herb. Kew", but has not designated a lectotype.

After Simmonds (1956) this species remained unnoticed by botanists and no collections were made. Hore *et al.* (1992) mentioned the occurrence of this species in North-East India with a brief description based on earlier works. Karthikeyan *et al*. (1989) included this species in their '*Florae Indicae Enumeratio Monocotyledonae*'. Uma *et al*. (2005) misidentified *M. cheesmanii* N.W.Simmonds as *M. nagensium* and provided the photograph of the former. Liu *et al*. (2002) lectotypified *M. nagensium* by designating a specimen collected by Abdul Huq *s.n*., from Naga Hills, preserved at K (image !). They also mentioned it as an 'incompletely known species' in China because of its limited distribution. Later, Häkkinen (2008) described a new variety of *M. nagensium viz*., *M. nagensium* var. *hongii* Häkkinen, based on the imbricate nature of its male bud, bract color and warty nature of seeds. Detailed studies based on live collections from different parts of North-East India, protologues, herbarium specimens etc, have

shown all these characters shown by *M. nagensium* and are highly variable. Recently, Gogoi (2013) reported *M. nagensium* var. *hongii* from India, which is also a variant of *M. nagensium.* There was no mention about the bract arrangement in the protologue of *M. nagensium* and the bract color was given as 'Indian red'. The subsequent botanists used the terms bracts convolute, bract color scarlet red or 'Indian red' to *M. nagensium* and the nature of seeds is also given as smooth (Häkkinen, 2008; Gogoi, 2013). According to Cheesman (1948) and Simmonds (1956) seeds of *M. nagensium* are big and somewhat warty and bracts are imbricate due to its remote nature from each other. The color of bract is highly variable with different shades of orange, yellow and red. Based on the observations of a large number of live specimens from different parts in India, it is concluded that *M. nagensium* is highly variable and hence *M. nagensium* var. *hongii* cannot be treated as distinct taxon and hence merged with the typical variety.

M. nagensium had been unknown to botanists, either misidentified or generalized under other *Musa* species. There were no collection after type collection from India and beleived it to be a lost species or rather rare species (Häkkinen, 2008). Lack of detailed account on Indian Musaceae after Baker (1892) and properly identified well preserved herbarium specimens made the situation worse. Various other factors such as inaccessibility to the dense evergreen forests during monsoon, insurgency coupled with difficulty in handling bulky specimens for processing resulted in the poor representation of Musaceae specimens in Indian herbaria. Recent studies in India by the authors have brought out a few new taxa *viz*. *M. velutina* subsp. *markkuana* M.Sabu *et al*. (2013a), *M. velutina* var. *variegata* A.Joe *et al*. (2014a), *M. sabuana* Prasad *et al*. (2013), *M. arunachalensis* A.Joe *et al*. (Sreejith *et al*. 2013), *M. cylindrica* A.Joe *et al.* (2014c). A few taxa new to Indian Musaceae were added by Sabu *et al.* (2013b) and Joe *et al*. (2013a) include *M. chunii* Häkkinen and *M. laterita* Cheesman respectively. Joe *et al*. (2013b,c, 2014b,d) rediscovered *M. cheesmanii* N.W.Simmonds, *M. flaviflora* N.W.Simmonds, *M. mannii* H.Wendl. *ex* Baker, *M. ochracea* K.Sheph. and *M. thomsonii* (King *ex* Baker) A.M.Cowan & Cowan after a lapse of more than half of a century.

During intensive explorations in Arunachal Pradesh and Nagaland since 2010, authors could find large populations of *M. nagensium*, including from its type locality, *ie*. Naga hills of Nagaland. This forms the first authenticate collection from the type locality after a lapse of 109 years. A detailed botanical description of the species is provided to avoid confusion of the species and to facilitate its easy identification. Herbarium specimens were deposited at CALI, and also established a live germplasm of the species in Calicut University Botanical Garden (CUBG) for further studies.

Taxonomic treatment

Musa nagensium Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 73(1): 21. 1904; Fawc., The Banana 266. 1913; Fischer, Bull. Misc. Inform. Kew 1931(1): 28. 1931; Cheesman, Kew Bull. 3(3): 325. 1948; Simmonds, Kew Bull. 11(3): 477. 1956; *et* Kew Bull. 14(2): 204. 1960; Karthik. *et al*., Fl. Ind. Enum. Monocot. 4: 104. 1989; Hore *et al*., J. Econ. Taxon. Bot. 16(2): 451. 1992; Liu *et al*., Bot. Bull. Acad. Sin. 43: 80. 2002; Häkkinen & Väre, Adansonia 30(1): 84. 2008; Häkkinen, Novon 18(3): 336. 2008; *et* Taxon 62(4): 810. 2013. **Fig. 1, 2.**

Typus: INDIA, **Assam [Nagaland]**, Jaboca, *Abdul Huq s.n.* (K, image!) (*Lectotypus*, designated by Liu *et al*., 2002).

M. nagensium var. *hongii* Häkkinen, Novon 18(3): 337. 2008; Gogoi, R. Taiwania 58(1): 50. 2013. ***syn. nov.***

Typus: CHINA, **Yunnan,** Dehong District, Yingjiang County, Xima, Mu Lai River, 930 m, 8 January 2006, *Wang Hong* 8383 (*Holotypus*: HITBC, image!).

Plants slender, slightly-suckering, close to parent plant, 20–25 cm, suckers 3–4, vertically arranged. Mature pseudostems 3.5–7 m high, 50–60 cm diam. at the base, greenish yellow or olive green at young stage, reddish-brown to almost black at maturity, glaucous, more waxy towards the top, most conspicuously waxy in young suckers, underlying color light green with reddish-brown pigmentation or with reddish-brown large patches, shiny. Leaf habit drooping, more remote from each other, lamina 130–210 × 40–46 cm, oblong-lanceolate, truncate at apex, upper surface green, dull, with reddish-brown margin, lower surface hardly waxy though grayish in tone, leaf bases asymmetric, one side rounded and other auriculated, midrib dorsally and ventrally yellow-green. Petioles slender, 45–55 cm long, yellow-green, waxy, without any blotches at the base, petiole bases winged, with red margins and clasping the pseudostem. Inflorescence semi-pendulous or first horizontal then pendulous, peduncle 20–45 cm long, 3–5 cm in diam., dark green with some purple pigmentation, glaucous, without grooves. Sterile bracts 1–5, deciduous

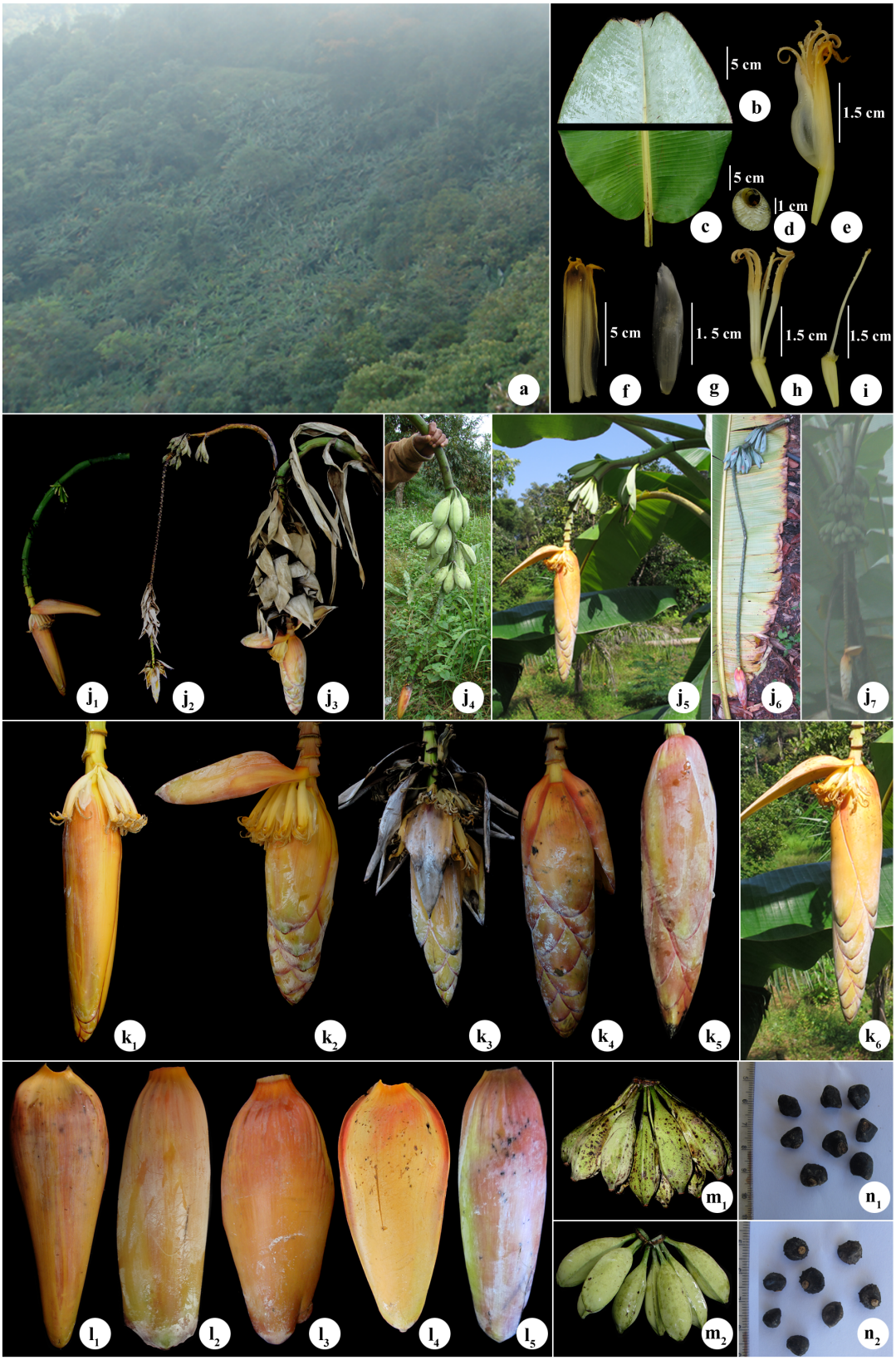


Fig. 1. *Musa nagensium* Prain: **a.** Habitat; **b.** Leaf apex(ventral surface); **c.** Leaf base (dorsal surface); **d.** Cross-section of petiole; **e**–**i.** Male flower parts; **e.** Entire flower; **f.** Compound tepal; **g.** Free tepal; **h.** Flower without tepals; **i.** Rudiment pistilode; $\mathbf{j_1}$–$\mathbf{j_7}$. Variations in inflorescences; $\mathbf{k_1}$–$\mathbf{k_6}$. Variations in arrangement of bracts and shape of male bud; $\mathbf{l_1}$–$\mathbf{l_5}$. Variations in shape and color pattern of bracts; $\mathbf{m_1}$–$\mathbf{m_2}$. Variations in fruit bunch; $\mathbf{n_1}$–$\mathbf{n_2}$. Variations in seed structure and shape.

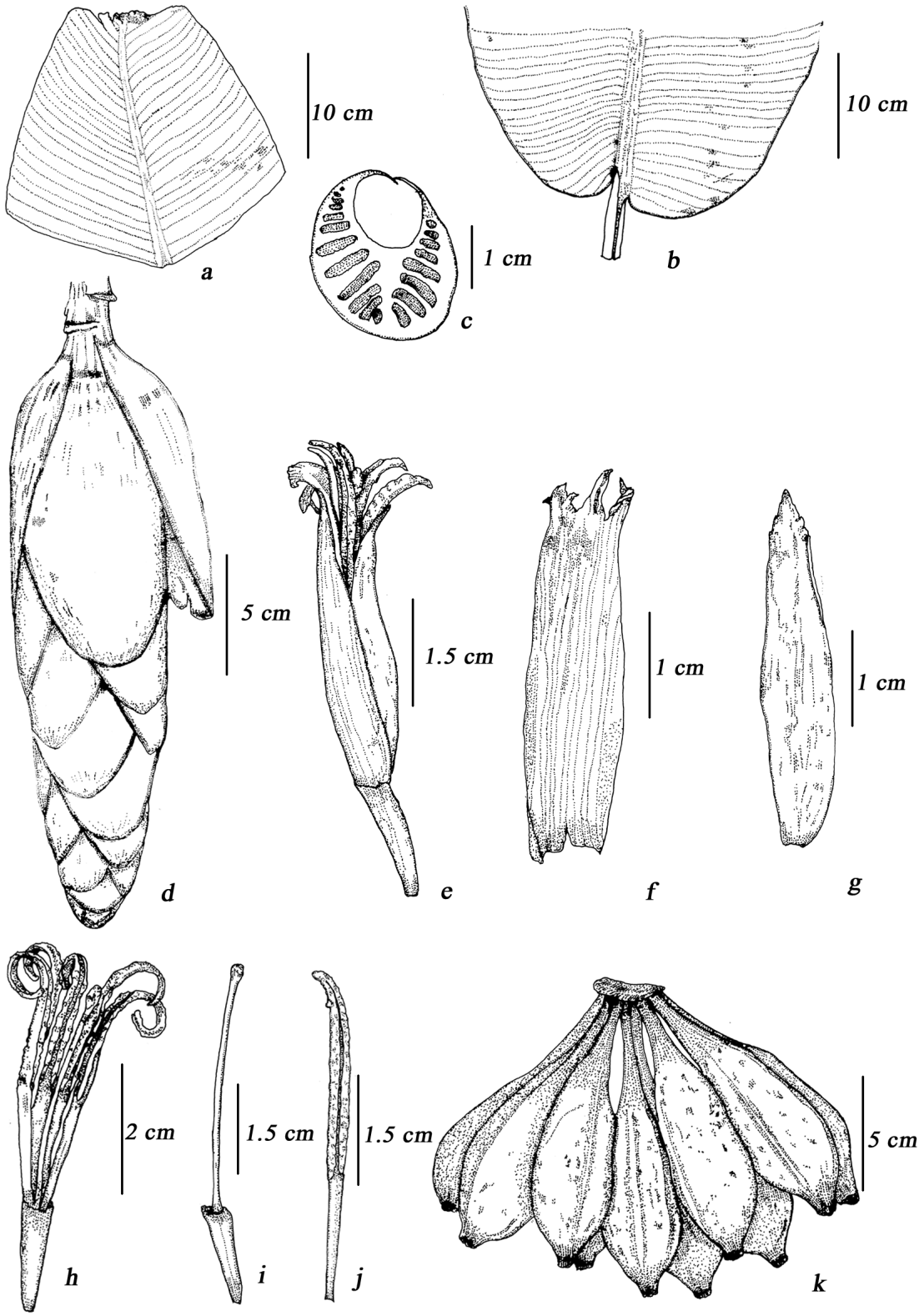


Fig. 2. *Musa nagensium* Prain: **a.** Leaf apex; **b.** Leaf base; **c.** C.S. of petiole; d male bud; **e**–**j.** Male flower parts; **e.** Entire flower; **f.** Compound tepal; **g.** Free tepal; **h.** Flower without tepals; **i.** Pistilode; **j.** Stamen; **k.** Fruit bunch. Illustration by Alfred Joe.

or persistent, 20–30 cm long, green to yellow-orange, glaucous adaxially. Female bud almost cylindrical or lanceolate, highly imbricated or imbrications confined to apex. Bracts 13–23 × 5–10 cm, oblong-lanceolate, smooth, adaxially yellow-orange combined with brick red or variables of red, yellow and orange, margins red, waxy, abaxially orange, shiny, apex obtuse, lifting one bract at a time, not revolute before falling. Basal 4–8 hands female. Flowers 4–12 per bract in two rows, Male bud lanceolate to cylindrical, highly imbricate or imbrications confined to apex, rachis falling vertically, growing around 1 m. Bracts comparatively remote on the slender rachis give the bud highly imbricate nature, 9.5–19 × 5–8.5 cm, smooth, lanceolate, adaxially glaucous, mixed with orange-yellow and brick red or yellow, margins red, apex green or orange, obtuse, adaxially creamy orange to orange, shiny, lifting one bract at a time, just open, deciduous or persistent, the bud growing at maturity of fruits. Male flowers on average 8–16 per bract in two rows, 4.8–6.4 cm long, falling with the bract, bract scars prominent. Compound tepal 3.9–5 × 0.9–1.4 cm, creamy orange, ribbed at dorsal angles, and with 5-toothed orange lobes, outer two lobes much larger, 0.6–0.7 × 0.5 cm. Free tepal 2.8–3.7 × 0.8–1.9 cm, translucent cream, boat-shaped, corrugated at apex, incised along margins or not, apex acuminate, with or without acumen. Stamens 5, 3.5–4.5 cm long, exserted, filament cream to white, 1.9–2.2 cm long, anther cream to golden yellow, 1.4–2.7 cm long, apex curved backwards. Ovary straight, rudiment, 1.5–1.7 cm long, creamy white with yellow tinge, style straight, inserted, 3–4.1 cm long, stigma globose, cream to creamy yellow. Fruit bunch lax, with 4–8 hands and 4–12 fruits per hand, in two rows, clavate-oblong, hanging in slender rachis and pointed towards the male bud, straight, distinctly angular, green to dark green, glaucous, sometimes with black spots, long stalked, individual fruit 12–15 cm long, pedicel 1.8–2 cm long, glabrous, apex slightly pointed, without any floral relicts, immature fruit pulp white, becoming white and soft at maturity, fruits not self-peeling at maturity. Seeds large, irregularly angular, somewhat warty, 0.9–1.4 mm across, 0.5–0.6 mm high, tapered towards the circum-hilar area, brown-black except for the circum-hilar region which is white, 25–40 per fruit.

Flowering and fruiting: June – December.

Specimens examined: INDIA, **Arunachal Pradesh,** Changlang, Way to Khela, 450 m, 18 .10.1959, *R.S.Rao* 20280 (ASSAM, CAL); 9 mile, way to Changlang, N 27° 13.067′ E 095° 43.402′, 444 m, 16.08.2011, *A. Joe & Sreejith* 130709 (CALI), Way to Changlang, N 27° 13.234′ E 095° 43.583′, 446 m, 16.08.2011, *A. Joe & Sreejith* 130713 (CALI); **Nagaland,** Jaboca District, Naga Hills, 16.05.1899, *Abdul Huq s.n.* (CAL, K); Tingali Bam, 16.06.1899, *Abdul Huq s.n.* (CAL, K); Mokokchung District, Minkgong Reserve Forest, Momgsanyemti, N 26° 25.936′ E 094° 37.565′, 1063 m, 27.11.2012, *A. Joe & Ashfak* 121605 (CALI), Minkgong Reserve Forest, N 26° 26.068′ E 094° 38.053′, 1029 m, 27.11.2012, *A. Joe & Ashfak* 121606 (CALI). **West Bengal,** Calcutta Botanical Garden (Cultivated), 1904, *D. Prain* (CAL); Darjeeling District, Kalimpong, Kenibreed plants (originally collected from Changlang area of Arunachal Pradesh), N 27° 03.455′ E 088° 28.151′, 1253 m, 21.04.2013, *M. Sabu* 130770 (CALI). MYANMAR, Myitkyina District, Tagwin Chaung, 400 ft., 24.11.1928, *C.E. Parkinson* 1759 (K).

Distribution and Ecology: China, Myanmar, India and Thailand. In India *M. nagensium* is widely distributed in some areas of Arunachal Pradesh and Nagaland, occurring typically at elevations from 400–1100 m in moist ravines. This species is found inside the thick forests in moist ravines in small populations, also near small water streams in black humus soil. We can also find big populations in open places in forest slopes.

Conservation status: *M. nagensium* is widely distributed in Arunachal Pradesh and Nagaland. Also common in some areas of China, Myanmar and Thailand. Based on the field experience for the past several years, it is kept under Least Concern (LC) category according to IUCN Red List Criteria (IUCN, 2011).

Notes: *M. nagensium* can be easily distinguished from the other members of sect. *Musa* by the characteristic slender pseudostem, slightly suckering plant, widely spaced leaves, intense wax on the lower surface of leaves, imbricate male bud and also in the fruits. Fruit bunch instead of being curved backwards as in most species, point persistently forward and downward in the direction of the apex of the long pendulous rachis.

Etymology: The specific epithet '*nagensium'* is based on its type location, *ie*. Naga Hills of Nagaland.

Notes on Variation: M. nagensium shows remarkable variation in pseudostem, inflorescence, buds, bracts, fruits and seeds in different conditions within populations and also under cultivation (**Fig. 1, j–n**). The variation in inflorescence is portrayed in the presence or absence of female flowers and fruits. The imbricate nature of male bud shows

high degree of variation from prominent or confined to the apex. Bracts may be persistent or deciduous and their color varies with different shades of yellow, orange, red and green (**Fig.1. k4 - male bud in wild condition, k2, k3, k6 - the same under cultivation in different seasons**). The shape, size and color of fruits as well as seeds vary considerably. Seeds within a fruit shows smooth or warty surface.

Acknowledgements

The authors are grateful to the Department of Science and Technology, New Delhi, for the financial assistance for the research projects on Indian Marantaceae and Musaceae (Sanction No. SR/SO/PS-115/09, dtd 19.08.2010). We also thank the officers of the Forest Department, Arunachal Pradesh and Nagaland for granting permission and providing necessary help for the field studies in the forest. Thanks are also due to Shyam Sunder Agarwal (Assam) and Mr. Santanu Dey (Nagaland) for their help during the collection of specimens. Alao thankful to Mr. Keshow Chandra Pradhan (Kenibreed plants, Kalimpong) for collecting, conserving and providing plants for our study..

Literature Cited

Baker, J.G. 1892. Musaceae. In. Hooker. *The flora of British India*. Vol. **4.** London: L. Reeve & Co. pp. 261-263.

Cheesman, E.E. 1948. Classification of the Bananas: Critical Notes on Species: *Musa nagensium*. *Kew Bull.* **3(3):** 325-328.

Fawcett, W. 1913. The Banana: Its Cultivation, Distribution, and Commercial Uses. London: Duckworth & Co.

Fischer, C.E.C. 1931. *Musa nagensium*. Contribution to the flora of Burma: IX. *Bull. Misc. Inf.* (Royal Gardens, Kew) **1931(1):** 28.

Gogoi, R. 2013. *Musa nagensium* var. *hongii* Häkkinen - a new addition to the flora of India. *Taiwania* **58(1):** 49-52.

Häkkinen, M. 2008. Identity of *Musa nagensium* (Musceae) in Southeast Asia. *Novon* **18(3):** 336-339.

Hore, D.K., Sharma, B.D. & Pandey, G. 1992. Status of banana in North-East India. *J. Econ. Tax. Bot.* **16(2):** 447-455.

IUCN Standards and Petitions subcommittee. 2011. Guidelines for Using the IUCN Red List Categories and Criteria. Version 9.0. Prepared by the Standards and Petitions Subcommittee of the IUCN Species Survival Commision. IUCN, Gland, Switzerland and Cambridge, UK.

Joe, A., Sabu, M. & Sreejith, P.E. 2013c. On the rediscovery of *Musa ochracea* K.Sheph. (Musaceae) from North-East India. *Taiwania*. **58(4):** 321-325.

Joe, A., Sabu, M. & Sreejith, P.E. 2014a. A new variety of *Musa velutina* H.Wendl. & Drude (Musaceae) from Assam, North-East India. *Plant Syst. Evol.* **300:** 13-17.

Joe, A., Sabu, M., Ashfak, A. & Sreejith, P.E. 2013a. *Musa laterita* Cheesman (Musaceae): A new record for India from the wild, with a key to the *Musa* (Section *Rhodochlamys*) in India. *Folia Malaysiana* **14(1):** 37-44.

Joe, A., Sreejith, P.E. & Sabu, M. 2014b. On the rediscovery and extended didtribution of *Musa Cheesmanii* (Musaceae) from North-East India. *Int. J. Pl. Anim. Environ. Sci.* **4(2):** 1-4.

Joe, A., Sreejith, P.E. & Sabu, M. 2013b. Notes on the rediscovery and taxonomic status of *M. flaviflora* N.W.Simmonds and *M. thomsonii* (King ex Schumann) A.M. Cowan & Cowan (Musaceae) from India. *Ann. Plant Sci.* **2(8):** 260-267.

Joe, A., Sreejith, P.E. & Sabu, M. 2014c. *Musa cylindrica*, a new species of *Musa* (Musaceae) from North-East India. *Phytotaxa* **172(2):** 137-140.

Joe, A., Sreejith, P.E. & Sabu, M. 2014d. Notes on the rediscovery, taxonomic history and conservation of *Musa mannii* H.Wendl. *ex* Baker (Musaceae) *Webbia* **69(1):** 115-120.

Karthikeyan, S., Jain, S.K., Nayar, M.P., & Sanjappa, M. 1989. Musaceae. In. *Florae Indicae Enumeratio Monocotledonae*, Flora of India Series 4, India: Botanical Survey of India, Calcutta. pp. 103-105.

Liu, A-Z., Li, D-Z. & Li, X-W. 2002. Taxonomic notes on wild bananas (*Musa*) from China. *Bot. Bull. Acad. Sin.* **43:** 77-81.

Prain, D. 1904. An undescribed Indian *Musa*. *J. Asi. Soc. Bengal* **73(1):** 21-22.

Prasad, K., Joe, A., Bheemalingappa, M. & Rao,

B.R.P. 2013. *Musa sabuana* (Musaceae): A new species from Andaman and Nicobar Islands, India. *Indian J. Forestry* **36(1):** 151-153.

Sabu, M., Joe, A. & Sreejith, P.E. 2013a. *Musa velutina* subsp. *markkuana* (Musaceae): a new subspecies from northeastern India. *Phytotaxa* **92(2):** 49-54.

Sabu, M., Joe, A. & Sreejith, P.E. 2013b. *Musa chunii* Häkkinen (Musaceae): An addition to the wild banana flora of India and notes on conservation of a Critically Endangered species. *Ann. Plant Sci.* **2(5):** 160-162.

Simmonds, N.W. 1956. Botanical results of the banana collection expedition, 1954-5. *Kew Bull.* **11(3):** 463-489.

Sreejith, P.E., Joe, A. & Sabu, M. 2013. *Musa arunachalensis*: a new species of *Musa* section *Rhodochlamys* (Musaceae) from Arunachal Pradesh, northeastern India. *Phytotaxa* **134:** 49-54.

Uma, S., Sathiamoorthy, S., & Durai, P. 2005. Banana. Indian Genetic Resource and Catalogue. India: National Research Centre for Banana (NRCB), Tiruchirapalli. pp 1-268.

Wilson, G.B. 1946. Cytological studies in the *Musae*. II. Meiosis in some diploid clones. *Genetics* **31:** 475-482.

Received: 11.11.2013
Revised and accepted: 28.05.2014