

Brief Overview of Diversity of Wild Indian Musaceae

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Abstract

The history of Musaceae taxonomy in India briefly presented. The maximum diversity and distribution of Musaceae is located in the Northeastern States, with 30 taxa of which 19 are endemic to the region. This represents about 81% of the total wild Musaceae diversity in India. This also indicates that the region bordering with Bangladesh, China and Myanmar is a biodiversity-rich area for Musaceae and strengthen the view that this region is considered as one of the major centers of origin of family Musaceae. The second largest Musaceae diversity in India is found in Andaman and Nicobar Islands, where three taxa are present all of which are endemic. In the Western Ghats, three taxa are present, including one endemic taxon, and the same is the case in Eastern Ghats. During this work, two species are found to be extinct from the wild and 19 taxa are categorized as threatened.

INTRODUCTION

Musaceae are the most ancient family in the order Zingiberales (Kress, 1990) with three genera, *Musa* L., *Ensete* Horan. and *Musella* (Franch.) H.W. Li. The family consists of large rhizomatous perennial or monocarpic herbs with well-developed aerial shoots except in the genus *Ensete*. Musaceae are mainly distributed in Africa and from South and South-East Asia to northern Australia (Liu et al., 2002b; Chiu et al., 2011). Considering their great economic importance in tropical agriculture, cultivated bananas have attracted a good deal of research in many countries over many years. Conversely, wild bananas have attracted much less attention (Simmonds and Weatherup, 1990; Gaweletal., 1992) as they form a taxonomically difficult group (Liu et al., 2002a).

HISTORY OF MUSACEAE TAXONOMY IN INDIA

The first comprehensive and authentic publication including banana of India was *Hortus Malabaricus*, a colossal work by the former Dutch Governor of Cochin Hendrik Andriaan van Rheedee (1678-1693), Roxburgh (1814), and a Scottish botanist and physician, who enumerated the plants growing in the British East India company's Botanic garden at Calcutta, which included growing seven species, viz. *Musa sapientum* 'wild sort', *M. paradisiaca*, *M. coccinea*, *M. ornata*, *M. superba*, *M. textilis* and *M. glauca* of which *M. ornata*, *M. superba* and *M. glauca* were used for the first time. He was the first to critically observe and accurately described the plants according to the Linnaean system and included several species of *Musa* in his famous works such as *Plants of Coromandel* and *Flora Indica*.

Voigt (1845) in *Hortus Suburbanus Calcuttensis* published a catalogue of the plants which had been cultivated in the Hon. East India Company's Botanical Garden,

Calcutta and in the Serampore Botanical Garden. This included cataloguing nine species of *Musa* along with *Heliconia*, *Strelitzia* and *Ravenala*.

Kurz (1867) supplied notes on the plantains of the Indian archipelago in which he discussed 15 species of *Musa* and some planted cultivars. Four of these were later re-ascribed to the genus *Ensete* and several became synonyms. A correspondent, signing himself J.R.J. (1875), has given notes on the plantains and bananas grown in Bengal and enumerates several cultivars and sub-cultivars grown there.

Kurz (1878) during his work 'The banana: a pomological contribution', discussed more about the cultivars grown in India. He listed five wild bananas of Assam using the local names in correspondence to G. Mann. Kurz also enlisted the native names of cultivated plantains of Assam, Sythet and Khasi Hills.

Baker (1892) British botanist and Keeper of the Herbarium, Royal Botanic Gardens, Kew studied the Scitamineae fraction of Hooker's monumental work, a Flora of British India. It was the first authentic botanical work on the Indian subcontinent and also a comprehensive work on Indian Musaceae. He provided an account of six *Musa* species. He also included several cultivated and wild cultivars and subspecies under *M. sapientum* from India. He also added six species as 'imperfectly known' under *M. sanguinea*.

Subsequently, in his work 'a synopsis of the genera and species of Museae', Baker (1893) discussed altogether 32 species several of which were new species for India. Prain (1903) listed two *Musa* species in his book 'Bengal Plants'. Nairne (1904) discussed briefly about *M. superba* and *M. ornata*. Haines (1910) recorded two species of *Musa* from Chota Nagpur. Fischer (1928) prepared the Musaceae section in Gamble's 'Flora of Presidency of Madras' and reported two wild species of *Musa*, viz. *M. superb* Roxb. (later re-ascribed to *Ensete*) and *M. rosacea* (a name misleadingly given to *M. ornata*). Cowan and Cowan (1929) in their book related to the plants from Bengal included the genus *Musa* under Scitamineae, and discussed two species and two cultivars. Noltie (1994) in Flora of Bhutan, recorded five species of *Musa*, viz. *M. griersonii*, *M. thomsonii*, *M. flaviflora*, *M. balbisiana* and *M. sikkimensis*, including from Sikkim and Darjeeling. The enumeration of the members of the family Musaceae in India was done by Karthikeyan et al. (1989) in which they enumerated 2 species of *Ensete* and 18 species of *Musa* from India. Likewise, Saxena and Brahmam (1995) also reported the same species from Orissa.

There are few studies of Musaceae diversity in the Andaman and Nicobar Islands. Singh et al. (1998) described a cultivar of *M. balbisiana* from Andaman Islands. Sinha (1999) included *M. acuminata*, the only wild species reported by him from Great Nicobar Island. Recently Prasad et al. (2013) and Singh (2014) described two new species from the Andaman and Nicobar Islands, viz. *M. sabuana* Prasad et al. and *M. indandamanensis* L.J. Singh.

Rao and Kumari (2008) described a new species along with *M. ornata* from Visakhapatnam District of Andhra Pradesh during the floristic work. Hore et al. (1992) have given a note on the status of banana in Northeast India, but mainly based on previous works or just a guess about the distribution. They discussed four species of *Ensete* and 12 species under *Musa*. Uma (2006) and Uma et al. (2006) had given a note on wild banana species in India and its distribution. Giri et al. (2009) in the materials for the flora of Arunachal Pradesh failed to record many species present there. Their work was mere compilation of earlier works and included only eight species.

DIVERSITY AND DISTRIBUTION OF WILD MUSACEAE IN INDIA

India is well known for its vast genetic diversity of members of Musaceae comprising seeded wild species to seedless cultivars of various levels of ploidy. The existence of such diversity supports the hypothesis for the origin of *Musa* is South and South-East Asia, including the Indo-Myanmar region (Singh et al., 2001; Prasad et al., 2013). Out of the three genera in the family Musaceae, *Ensete* and *Musa* are present in Indian sub-continent. In India the family is represented by 37 wild taxa and is largely distributed in Northeastern states, bordering China and Myanmar and followed by Western Ghats, Eastern Ghats and Andaman and Nicobar Islands (Joe et al., 2014c).

Ensete is a unique genus with chromosome number $n=9$. It is characterized by a non-stoloniferous habit and is propagated only by seeds. In India there are only two species viz., *E. glaucum* with distributional area restricted to North-Eastern States and *E. superbum* restricted mainly to Peninsular India.

Musa is the largest and most economically important genus in the family. Several new taxa have been recognized, and new records of *Musa* from India have been published after Baker (1892). Recently several authors described some new taxa under *Musa* from India. Gogoi and Häkkinen (2013), Gogoi and Borah (2013, 2014) described *M. pushpanjaliae* Gogoi and Häkkinen, *M. markkui* Gogoi and Borah and *M. argentii* Gogoi and Borah from Arunachal Pradesh respectively. *M. arunachalensis* was described from Arunachal Pradesh by Sreejith et al. (2013) and Joe et al. (2014c) described *M. cylindrical* from Meghalaya. Sabu et al. (2013a) and Joe et al. (2014a) described two new taxa of *M. velutina* H. Wendl. and Drude, viz. *M. velutina* subsp. *markkuana* M. Sabu, A. Joe and Sreejith and *M. velutina* H. Wendl. and Drude var. *variegata* A. Joe, M. Sabu and Sreejith, respectively. Recently a new cultivar of *M. balbisiana*, viz. *M. balbisiana* var. *elavazhai* Joe et al. (2014f) is described from Kerala.

Sabu et al. (2013b) and Joe et al. (2013a) reported the occurrence of *M. chunii* Häkkinen from Arunachal Pradesh and *M. laterita* Cheesman from Manipur as a new record for in India. Joe et al. (2013b, 2014b, d, e) rediscovered *M. cheesmanii* N.W. Simmonds, *M. flaviflora* N.W. Simmonds, *M. mannii* H. Wendl. ex. Baker, *M. nagensium* Prain and *M. thomsonii* (King ex Baker) A.M. Cowan and Cowan after a lapse of more than half of a century. Joe et al. (2013c) recorded the occurrence of *M. ochracea* K. Sheph. from the wild for the first time. These recent description of new taxa and new records from India figured the diversity of Indian Musaceae and several species are yet to be discovered. Of the 37 taxa, 25 are endemic to India, which indicates the diversity of Musaceae in India. In India species from the genus *Musa* mainly occur in Northeastern regions. Thirty taxa are from the region of which 19 are endemic and 3 taxa each from the Andaman and Nicobar Islands, Eastern Ghats and Western Ghats. The details about the taxa present in India, their distribution, endemism etc. are given in the table below.

CONCLUSION

In India, the maximum diversity and distribution of Musaceae is located in the Northeastern States, with 30 taxa of which 19 are endemic to the region. This represents about 81% of the total wild Musaceae diversity in India. This also indicates that the region bordering with Bangladesh, China and Myanmar is a biodiversity-rich area for Musaceae and strengthen the view that this region is considered as one of the major centers of origin of family Musaceae. The second largest Musaceae diversity in India is found in Andaman and Nicobar Islands, where three taxa are present all of which are endemic. In the Western Ghats, three taxa are present, including one endemic taxon, and

the same is the case in Eastern Ghats. During this work, two species are found to be extinct from the wild and 19 taxa are categorized as threatened.

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Tables

Table 1. Diversity of wild Musaceae in major diversity regions in India.

Sl. No.	Name of taxa	Major diversity regions of Musaceae in India			
		NE	AN	EG	WG
1	<i>Ensete glaucum</i> (Roxb.) Cheesman	√			
2	<i>E. superbum</i> (Roxb.) Cheesman				√
3	<i>Musa acuminata</i> var. <i>acuminata</i> Colla	√			
4	<i>M. acuminata</i> subsp. <i>burmannica</i> N.W. Simmonds				√•
5	<i>M. argentea</i> Gogoi and Borah	√*			
6	<i>M. arunachalensis</i> A. Joe et al.	√*•			
7	<i>M. aurantiaca</i> Baker	√			
8	<i>M. aurantiaca</i> var. <i>homenborgohainiana</i> Gogoi	√*•			
9	<i>M. aurantiaca</i> var. <i>jengingensis</i> Gogoi	√*•			
10	<i>M. balbisiana</i> var. <i>balbisiana</i> Colla	√		√	
11	<i>M. balbisiana andamanica</i> D.B. Singh et al.		√*•		
12	<i>M. cheesmanii</i> N.W. Simmonds	√*			
13	<i>M. chunii</i> Hakkinen	√•			
14	<i>M. cylindrica</i> A. Joe et al.	√*•			
15	<i>M. flaviflora</i> N.W. Simmonds	√*•			
16	<i>M. indandamanensis</i> L.J. Singh		√*•		
17	<i>M. itinerans</i> Cheesman	√			
18	<i>M. kamengensis</i> Gogoi and Häkkinen	√*•			
19	<i>M. kattuvazhana</i> K.C. Jacob				√*•
20	<i>M. laterita</i> Cheesman	√			
21	<i>M. mannii</i> Baker	√*•			
22	<i>M. mannii</i> var. <i>namdangensis</i> Gogoi and Borah	√*			
23	<i>M. markkui</i> Gogoi and Borah	√*•			
24	<i>M. nagensium</i> Prain	√			
25	<i>M. ochracea</i> K. Sheph.	√*			
26	<i>M. ornata</i> Roxb.	√		√	
27	<i>M. pushpanjaliae</i> Gogoi and Hakkinen	√*			
28	<i>M. rubra</i> Kurz	√°			
29	<i>M. sabuana</i> K. Prasad et al.		√*•		
30	<i>M. sanguinea</i> Hook. f	√*°			
31	<i>M. shankarii</i> Subba Rao and Kumari			√*•	

32	<i>M. sikkimensis</i> Kurz	√*			
33	<i>M. swarnaphalya</i> Uma et al.	√*•			
34	<i>M. thomsonii</i> (Baker) A.M. Cowan and Cowan	√*•			
35	<i>M. velutina</i> H. Wendl. and Drude	√			
36	<i>M. velutina</i> subsp. <i>markkuana</i> M. Sabu et al.	√*•			
37	<i>M. velutina</i> var. <i>variegata</i> A. Joe et al.	√*•			

NE- North-East India; **AN-** Andaman and Nicobar Islands; **EG-** Eastern Ghats; **WG-** Western Ghats.

√- Presence in area; *- Endemic; •- Endangered; ◦- Extinct