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Taxonomic notes on Indian *Terminalia* (Combretaceae)

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Abstract

The species *Terminalia kanchii* Dhabe, *T. manii* King, *T. maoui* Dhabe and *T. shankarraoi* Dhabe were identified to be conspecific with *T. citrina* (Gaertn.) Roxb. and therefore reduced to synonyms of the latter. *Terminalia procera* Roxb., treated recently as a synonym of *T. catappa* L. is reinstated here as a distinct species, and for the name, a lectotype and an epitype have been designated and *T. copelandii* Elmer is considered as its synonym. *Terminalia tomentosa* (Roxb. ex DC.) Wight & Arn., which has recently been recognized as a distinct species, is treated as a synonym of *T. elliptica* Willd. *Terminalia sharmae* M.Gangop. & Chakrab. is merged with *Elaeocarpus rugosus* Roxb. ex G. Don of the Elaeocarpaceae, and a lectotype has been designated for the latter name. *Terminalia vermae* M.Gangop. & Chakrab. is maintained as a distinct species.

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Keywords: Combretaceae; *Terminalia*; *Elaeocarpus rugosus*; *Chebulic myrobalan*; new synonyms; reinstatement; lectotypification; epitypification


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Introduction

While preparing a manuscript of the family Combretaceae for the “Flora of India”, we came across several discrepancies and ambiguities in the taxonomy and nomenclature of the genus *Terminalia* L., which necessitated the present notes clarifying these problems. The genus comprises of about 200 species, distributed in the Old and New World tropics (1). Gangopadhyay & Chakrabarty (2) in their revision of the family Combretaceae for the Indian subcontinent recognized 13 species of *Terminalia* from India. However, in a recent article, Dhabe (3) accepted 16 species in India, of which, *T. kanchii* Dhabe, *T. maoui* Dhabe and

T. shankarraoi Dhabe were described as new species while *T. manii* King was reinstated to specific level, treated by earlier authors as a synonym of *T. citrina* (Gaertn.) Roxb. [Gangopadhyay & Chakrabarty (2)]. Further, Dhabe (3) considered *T. sharmae* M.Gangop. & Chakrab. as well as *T. vermae* M.Gangop. & Chakrab., described from the Andaman Islands as doubtful species and excluded them from his treatment. In addition, he recognized *T. tomentosa* (Roxb. ex DC.) Wight & Arn. as a distinct species. Another discrepancy found is that *T. procera* Roxb. of the Andaman and Nicobar Islands, recognized by Gangopadhyay & Chakrabarty (2) as a distinct species, was merged

with *T. catappa* L. by Shu (4), without any justification. Further, during the present studies, we came across the publication of Ratha & Joshi (5) who mentioned that the species *T. chebula* Retz. is the only botanical source of the Ayurvedic drug *Haritaki*, containing a number of varieties. They (5) expressed the need for further research with the samples of this drug to establish the “botanical standardization” of all the varieties of *Haritaki*.

Materials and Methods

The present investigation is a continuation of the

BM, C, CAL, DD, G, GH, E, K, L, LD, MH, PBL and U. Samples of commercial “Haritaki” (*Chebulic myrobalan*) were collected at random from a number of crude herbal drug shops in Kolkata and they were deposited to the Economic Botany Section of Botanical Survey of India, Howrah with labels after the study.

Discussion

Dhabe (3) distinguished *Terminalia kanchii* from *T. chebula* Retz. [Type (lectotype, designated by Fischer (6), p. 57): INDIA. *J.G. Koenig s.n.*

Table 1. Fruit characters of *Terminalia citrina* and its immediate allies

Plant Name	Characters of fruit
<i>T. citrina</i>	ellipsoid, oblong-ellipsoid, lanceolate-ellipsoid, obovoid-ellipsoid, narrowly subclavate or oblanceolate, (1.4-) 2.5-6 (-7) × (0.6-) 1-2 (-2.5) cm, obscurely 5-angled, obscurely to prominently (on drying) 5-ribbed, glabrous, tapering at ends, sometimes narrowing abruptly towards base forming a stipe, often slightly compressed, endocarp shallow and undulate to 5-pointed star shape in outline in cross section.
<i>T. kanchii</i>	ellipsoid-oblong, lanceolate-oblong, lanceolate-ellipsoid, oblanceolate to narrowly subclavate with short stalk (3-7 mm), 2.5-4.5 × 1.2-1.7 cm, 5-ridged, glabrous, rough, tapering at ends, outline of cross section undulate with 5 obscure angles.
<i>T. maui</i>	lanceolate-ellipsoid, 3-5.5 × 0.8-1.5 cm (as per drawing and description), prominently 5-ridged, glabrous, tapering at ends, outline of cross section 5-angled, star-like.
<i>T. manii</i>	oblong-ellipsoid, ca. 2 × 1 cm, shallowly 5-ridged, glabrous, rounded at base, slightly narrowing towards apex.
<i>T. shankarraoi</i>	ellipsoid-lanceolate, narrowly oblong-ellipsoid to narrowly clavate (with long stalk tapering towards base (2-3 cm long), 4.5-7 × 1.5-2 cm, obscurely 5-ridged, glabrous, tapering at both ends, outline of cross section undulate.
<i>T. chebula</i>	ellipsoid to obovoid or sometimes ovoid, (2-) 3-5 × (1.5-) 2-3 cm, 5-angled and ribbed or ridged, glabrous, rounded to emarginated or occasionally apiculate at apex, often narrowing at base into a stipe (up to 5 mm long), outline of cross section undulate, 5-pointed, star-like.

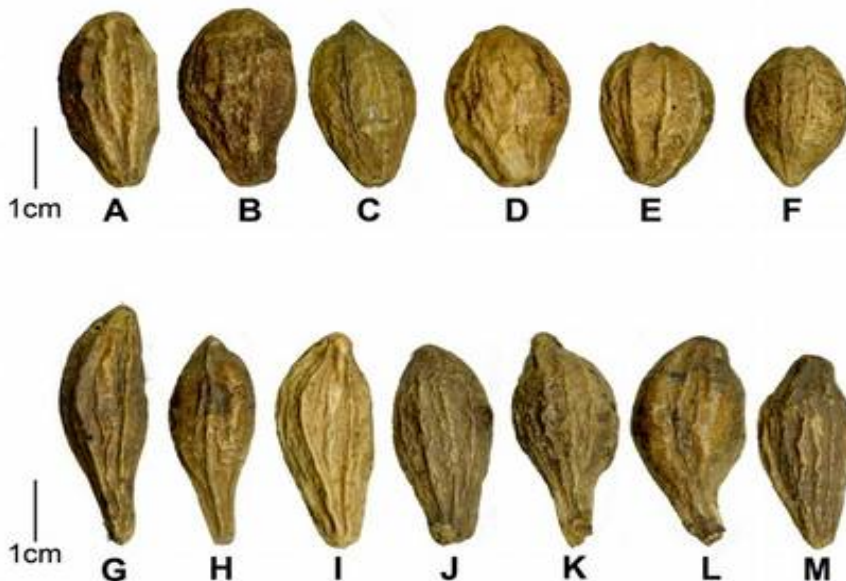


Fig. 1. Commercial *Chebulic myrobalan*. A - F. *Terminalia chebula*, G - M. *Terminalia citrina*.

first author’s studies on the Indian Combretaceae and it is based on the study of herbarium specimens in all major Indian and a few European herbaria and literature. The following herbaria were consulted: A, ASSAM, B, BAMU, BSA, BSD, BSI,

(LD1638155: image!)] by the characters of the leaves and fruits, while *T. maui* and *T. shankarraoi* were differentiated from *T. citrina* (Gaertn.) Retz., also mainly by their fruit characters. *Terminalia chebula* (Fig. 1. A - F; Fig. 3. C - D) is a well known

species of commerce, commonly known as “Hartuki” or “Haritaki” (trade name *Chebolic myrobalan*), distributed in Sri Lanka and peninsular India with disjunct occurrence in the Himalayas, Bangladesh and Myanmar (2) and under cultivation in many parts of India. It differs from *T. citrina* (Table 1, Fig. 1. G - M; Fig. 2; Fig. 3 E) mainly in its fruits which are round to emarginate or sometimes apiculate at apex (at least never narrowing). On the other hand, as per the circumscription of Exell (7), and followed by most subsequent authors [Turner (8)], *T. citrina* is a widespread variable species from India to the Philippines with numerous intermediates between the small-leaved, small-fruited (Philippines) specimens and the large-leaved, large-fruited specimens (from Sikkim and Bengal). This has fruits usually tapering at ends (often tapering abruptly at base forming a stipitate, clavate structure), smooth when ripe and usually conspicuously and irregularly 5-ribbed when drying up rendering the endocarp a shallow and undulate to 5-pointed star shape outline in cross section. In fact, the differences of *T. kanchii*, *T. maui*, *T. manii* and *T. shankarraoi* as elucidated by Dhabe (2) do not stand as they fall well within the range of variation of *T. citrina*, as given in Table 1 (see also Fig. 1). Hence, these species are merged here under *T. citrina*. The ripe fruits of *T. kanchii* are in fact exact match with those of the

reveals that the commercial “Haritaki” (trade name *Chebolic myrobalan*) sold in the markets is a mixture of two elements, *T. chebula* (Fig. 1 A - F) and *T. citrina* (Fig. 1 G - M), which, as already stated, differ from one another only in their fruit characters (Table 1, Fig. 1).

Terminalia procera was described by William Roxburgh (9) on the basis of cultivated plants introduced to the Calcutta Botanic Garden from the Andamans by Robert Kyd in 1794. This species was recently united with *T. catappa* L. by Shu (4) who, however, did not justify the ground of this merger. The present authors find that *T. procera* (Fig. 3 G - H) is different and distinct from *T. catappa* (Fig. 3 A - B) in the cuneate-attenuate (rather than narrowly cordate) leaf-base and the inflated (rather than laterally compressed), narrower fruits (1.5 – 3 cm in diameter as compared to fruits of *T. catappa* which are 3 – 5 cm in diameter) and therefore it is reinstated here as a distinct species (with designation of a lectotype and epitype for the name). Interestingly, the Malesian *T. copelandii* Elmer agrees well with the characters of *T. procera* which is therefore treated here as its synonym (with designation of lectotype), as done by Gangopadhyay & Chakrabarty (2).

Dhabe (2) excluded *Terminalia sharmae* M.Gangop. & Chakrab. (Fig. 4) and *T. vermae* M.Gangop. & Chakrab. (Fig. 5) from his treatment and expressed doubt about the status of the latter. With regard to *T. sharmae*, the present study reveals that it represents *Elaeocarpus rugosus* Roxb. ex G. Don of the Elaeocarpaceae. One of us (LR) noticed an isotype of *T. sharmae* in PBL in flowering, not seen by the original authors (10), and this flowering specimen clearly revealed the identity as *E. rugosus*. On the other hand, we consider *T. vermae* as a distinct species, although described from a single collection from the Baratang Island of the Andamans. The collector noted it to be a tall tree in the “Extraction area” (deforestation area) at the South Creek of the Island and he obviously could collect the same due to felling of the tree at that site. The dark crimson, glossy fruits are characteristic, not to be found in any other species of *Terminalia* occurring in Indian subcontinent [Gangopadhyay & Chakrabarty (10)].

With regard to the treatment of *Terminalia tomentosa* (Roxb. ex DC.) Wight & Arn. as a distinct species by Dhabe (3), he was possibly not aware that it is a synonym of the variable *T. elliptica* Willd. (Fig. 3 F), as elucidated and clarified by Chakrabarty & Kumar (11).



Fig. 2. Conserved type of *Myrobalanus citrina*

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Available at <http://specimens.kew.org/herbarium/K000608176>

conserved type of *T. citrina* (Fig. 2).

Interestingly, Ratha & Joshi (5) mentioned that the Ayurvedic medicine “Haritaki” contains several varieties. However, the present work

Nomenclature and typification

Terminalia citrina (Gaertn.) Roxb. in *Asiat. Res.* 11: 183. 1810; *Hort. Bengal.* 33. 1814 & *Fl. Ind.* 2: 435. 1832. – Basionym: *Myrobalanus citrina*



Fig. 3. *Terminalia* species. A - B. *Terminalia catappa*, C - D. *Terminalia chebula*, E. *Terminalia citrina*, F. *Terminalia elliptica*, G - H. *Terminalia procera*.

Gaertn., Fruct. Sem. Pl. 2: 91, t. 97, fig. 2 n - s. 1790, *nom. cons.*; I.M. Turner in Taxon 62(6): 1338. 2013. **Fig. 2; Fig. 3 E.**

– **Type** (conserved type): BANGLADESH. Mymensingh District, Gabtulli, 8 July 1872, C.B. Clarke 17257 (K000608176: image!).

= *Terminalia manii* King in J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 66: 329. 1897; Dhabe in Pleione 12(2): 322 (*in obs.*), 330 (*in key*). 2018.

– **Type** [lectotype, designated by Gangopadhyay & Chakrabarty (2), p. 348]: INDIA. Andaman and Nicobar Islands, Nicobar, 15 Nov. 1884, King's collector 485 (CAL0000015978!). **Syntypes**: INDIA. Andaman & Nicobar Islands, South Andaman Island, Port Mouat,

23 Jan. 1892, King's collector s.n. (CAL0000015977!, K000786085: image!).

= *Terminalia kanchii* Dhabe in Pleione 12(2): 323, f. 1, f. 4. 2018, **syn. nov.**

– **Type** (holotype): INDIA, Gujarat, Satpura, 20° 35' 11.5" N, 73° 45' 44.7" E, 904 m, 20 Dec. 2015, A.S. Dhabe 7203 (CAL: image!; isotype BAMU: image!). **Paratype**: INDIA. Gujarat, Satpura, 5 Oct. 2003, A.S. Dhabe 2503 (BAMU: image!).

= *Terminalia maoui* Dhabe in Pleione 12(2): 325, f. 2, 5. 2018, **syn. nov.**

– **Type** (holotype): INDIA. Meghalaya, Shillong, Barapani, 25° 40' 85.17" N, 91° 54' 11.47" E, 876.7 m, 11 Mar. 2016, A.S. Dhabe 7264



Fig. 4. Holotype of *Terminalia sharmae*
(© Director, Botanical Survey of India)

(CAL: image!; isotype BAMU: image!).
Paratypes: INDIA. Assam, Goalpara, 11 June 1919, *U. Kanjilal* 7565 (ASSAM!); Assam, Borengajuli, Bornadi Wildlife Sanctuary, 20 Sept. 2010, *C. Deori & D.K. Roy* 49290 (ASSAM!).

= *Terminalia shankarraoi* Dhabe in *Pleione* 12(2): 326, f. 3, f. 6. 2018, **syn. nov.**

– **Type** (holotype): INDIA. Gujarat, Satpura, 20° 35' 11.5" N, 73° 45' 44.73" E, 904 m, 20 Dec. 2015, *A.S. Dhabe* 7202 (CAL: image!; isotype BAMU: image!). *Paratypes*: INDIA, Gujarat, Satpura, 29 Oct. 2013, *A.S. Dhabe* 6085 (BAMU: image!). INDIA. Meghalaya, West Garo Hills, Nokrek Biosphere Reserve, 13 Oct. 2007, *V.N. Singh & B. Singh* 115994 (ASSAM!).

Note: In India, *Terminalia citrina* is known to occur on the eastern and western Himalayas (Uttarakhand, West Bengal), north-eastern India and Andaman & Nicobar Islands. Thus, with the merger of *T. shankarraoi*, it forms a new record for north-western India, in the State of Gujarat, showing a curious extended distribution, if not under cultivation.

Terminalia elliptica Willd., *Sp. Pl.*, ed. 4, 4(2): 969. 1806; Chakrab. & V.S. Kumar in *Phytotaxa* 295(3): 298. 2018. **Fig. 3 F.**

– **Type** [lectotype, designated by Gangopadhyay & Chakrabarty (12), p. 601]: SRI LANKA. Puttalam [as “Putland”], 23 Apr. 1796, *J.G. Klein* 480 (B-W 18943-010: image!).

= *Pentaptera tomentosa* Roxb. ex DC., *Prodr.* 3: 14. 1828. – *Terminalia tomentosa* (Roxb. ex DC.) Wight & Arn., *Cat. Indian Pl.* 1: 63. 1833 & *Prodr. Fl. Ind. Orient.* 1: 314. 1834; Dhabe in *Pleione* 12(2): 330 (in the key). 2018.

– **Type** [lectotype, designated by Chakrabarty & Kumar (11), p. 298]: INDIA. Hort. Bot. Calcutt., June 1818, *Wallich s.n.* (G00470811: image!). *Syntypes*: INDIA. Hort. Bot. Calcutt., 1815, *Wallich* 164 (G00470800: image!); *Wallich* 3978, 3978 G (CAL!).

Terminalia procera Roxb., *Pl. Coromandel* 3(1): 18, t. 224. 1811; *Hort. Bengal.* 33. 1814 & *Fl. Ind.*, 2: 429. 1832; M.Gangop. & Chakrab. in *J. Econ. Taxon. Bot.* 21(2): 360, f. 20 A. 1997. **Fig. 3 G - H.**

– **Type** (lectotype, designated here): INDIA. Hort. Bot. Calcutt., *Roxburgh s.n.* (BR0000006975173: image!). *Syntype*: INDIA. Hort. Bot. Calcutt., *Roxburgh s.n.* (BR0000006975500: image!). **Epitype**



Fig. 5. Holotype of *Terminalia vermae*
(© Director, Botanical Survey of India).

(designated here): [icon] Roxburgh, Pl. Coromandel 3(1): 18, t. 224. 1811.

= *Terminalia copelandii* Elmer in Leaflet. Philipp. Bot. 5: 1759. 1913.

– **Type** (lectotype, designated here): PHILIPPINES. Island of Palawan, Brooks Point (Addison Peak), Feb. 1911, A.D.E. Elmer 12594 (GH00068676: image!; isolectotypes CAL0000015985!, A00068675, E00273941, K000786169, L.2493583, U0120707, images!).

Terminalia catappa sensu Shu in Zhengyi et al., Fl. China 13: 314. 2007, p.p., tantum quoad syn. *T. procera*, non L. 1767.

Note: The lectotype of *Terminalia procera* is a twig with three bare inflorescence axes. Hence, an epitype is also designated here for the name to avoid ambiguity in interpreting the lectotype, in accordance with Art. 9.9 of the ICN [Turland et al. (13)].

Terminalia vermae M.Gangop. & Chakrab. in J. Econ. Taxon. Bot. 16(1): 239, f. 2. 1992. **Fig. 5.**

– **Type** (holotype): INDIA. Andaman and Nicobar Islands, Baratang Island, South Creek, Extraction area, 30 Oct. 1979, P. Basu 7613 (CAL0000015982!; isotype PBL!).

Note: Allied to the Malesian *Terminalia microcarpa* Decne., differing mainly in the acute, obtuse to rounded base of the leaves and the subglobose fruits, rounded at the apex.

Excluded species

Elaeocarpus rugosus Roxb. [Hort. Bengal. 42. 1814, *nom. nud.*] ex G. Don, Gen. Hist. 1: 559. 1831; Roxb., Fl. Ind., ed. Carey 2: 596. 1832.

– **Type** (lectotype, designated here): INDIA ORIENTALIS. 1811, *Roxburgh s.n.* (BM000795190: image!).

= *Terminalia sharmae* M.Gangop. in J. Econ. Taxon. Bot. 16(1): 237, f. 1. 1992, **syn. nov.** **Fig. 4.**

Type (holotype): INDIA. Andaman and Nicobar Islands, South Andaman Island, Mount Harriet, 16 Jan. 1974, N.G. Nair 801 (CAL0000015980!; isotypes: CAL0000015981!, PBL!).

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Conflict of Interest

The authors declared that they have no conflict of interest.

Author's Contribution

All the authors contributed equally to the work presented in this paper.

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