

## Three new species of the genus *Terminalia* L. [Combretaceae]

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### Abstract

Three new species of the genus *Terminalia* L. (Combretaceae) are reported from Meghalaya and Gujarat states of India. These are *Terminalia kanchii* Dhabe (Saputara, Gujarat State), *T. maoui* Dhabe (Shillong, Meghalaya state) and *T. shankarraoi* Dhabe (Saputara, Gujarat State).

**Key words:** New species, *Terminalia* L., India

### INTRODUCTION

The genus *Terminalia* L. is the second largest pantropical genus of family Combretaceae (subfamily Cobretoideae Engl. & Diels, tribe Combreteae DC., subtribe Terminaliinae (DC.) Excell & Stace). It has about 150 species of trees and shrubs (Maurin & al., 2010; Gere, 2013; Shu, 2007). The name *Terminalia* L. (1767) is conserved against *Bucida* L. (1759) (Stace, 2010; Maurin & al., 2010), *Adamaram* Adanson (1763) (Wiersma & al., 2015). [*Bucida* is also a conserved genus name; it has been conserved over *Buceras* P. Browne (1756)]. *Terminalia* is characterized by tree or shrub habit, alternate or sub-opposite leaves crowded at the ends of the branches, presence of glands and/or domatia, inflorescence as spikes or racemes, apetalous flowers, fruits drupes or samara.

For the Indian subcontinent (Bangladesh, India, Myanmar, Nepal, Pakistan & Sri Lanka) Gangopadhyay and Chakrabarty (1997) reported 18 species of *Terminalia* (viz., [incl. *T. arjuna* (Roxb. ex DC.) Wight & Arn., nom. cons. Rec (as *T. cuneata* Roth)], *T. argyrophylla* King & Prain, *T. bellerica* (Gaertn.) Roxb., *T. bialata* (Roxb.) Steud., *T. calamansanai* (Blanco) Rolfe (incl. *T. pyrifolia* (C. Presl.) Kurz), *T. catappa* L., *T. chebula* Retz., *T. citrina* (Gaertn.) Roxb. (incl. *T. manii* King), *T. elliptica* Willd. (as *T. tomentosa* Wight & Arn.), *T. myriocarpa* Van Heurck & Mull. Arg., *T. oliveri* Brandis, *T. paniculata* Roth, *T. procera* Roxb., *T. sharmae* M. Gangop. & Chakrab., *T. travancorensis* Wight & Arn., *T. triaptera* Stapf and *T. vermae* M. Gangop. & Chakrab). In contrast for the then British India, Clarke (1878) recorded 12 species, whereas Blatter (1929) reported 20 species. Gangopadhyaya & Chakrabarty (1997), under the heading “Doubtful/imperfectly known taxa”, included *T. benghalensis* Roxb. ex DC. (as done by C.B. Clarke, 1878), *T. foetidissima* Griff., and *T. gella* Dalz. Although they treated *T. manii* King as conspecifics with *T. citrina*, both are considered as distinct taxa. Furthermore, the taxonomic status of *T. vermae* is considered doubtful by us (cf. The plant list, 2013).

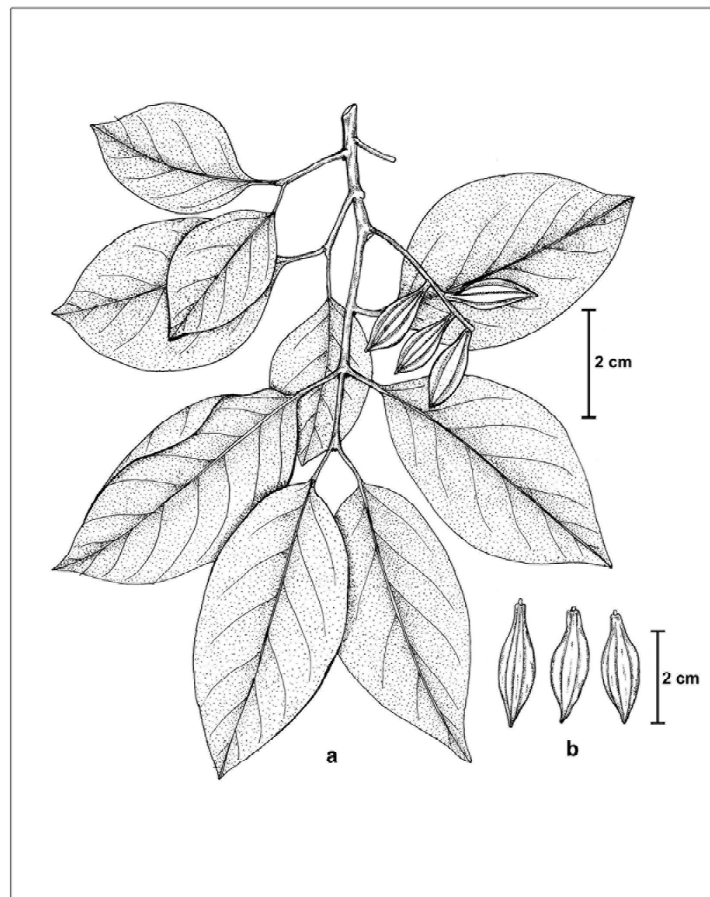
Since 1997, as a part of systematic studies on Indian taxa for *Terminalia*, field visits were undertaken in different parts of the country. The field trips to Meghalaya and Gujarat states led to the collection of some novel specimens, which could not be assigned to any

known species of *Terminalia*. A study of the protologues of *T. chebula* (Retzius 1779) and *T. citrina* Roxb. (Roxburgh 1832) and published literature and experts' comments on the identity of the relevant specimens revealed that, those represent three new species of *Terminalia*. Accordingly, three new *Terminalia* species names are presented here.

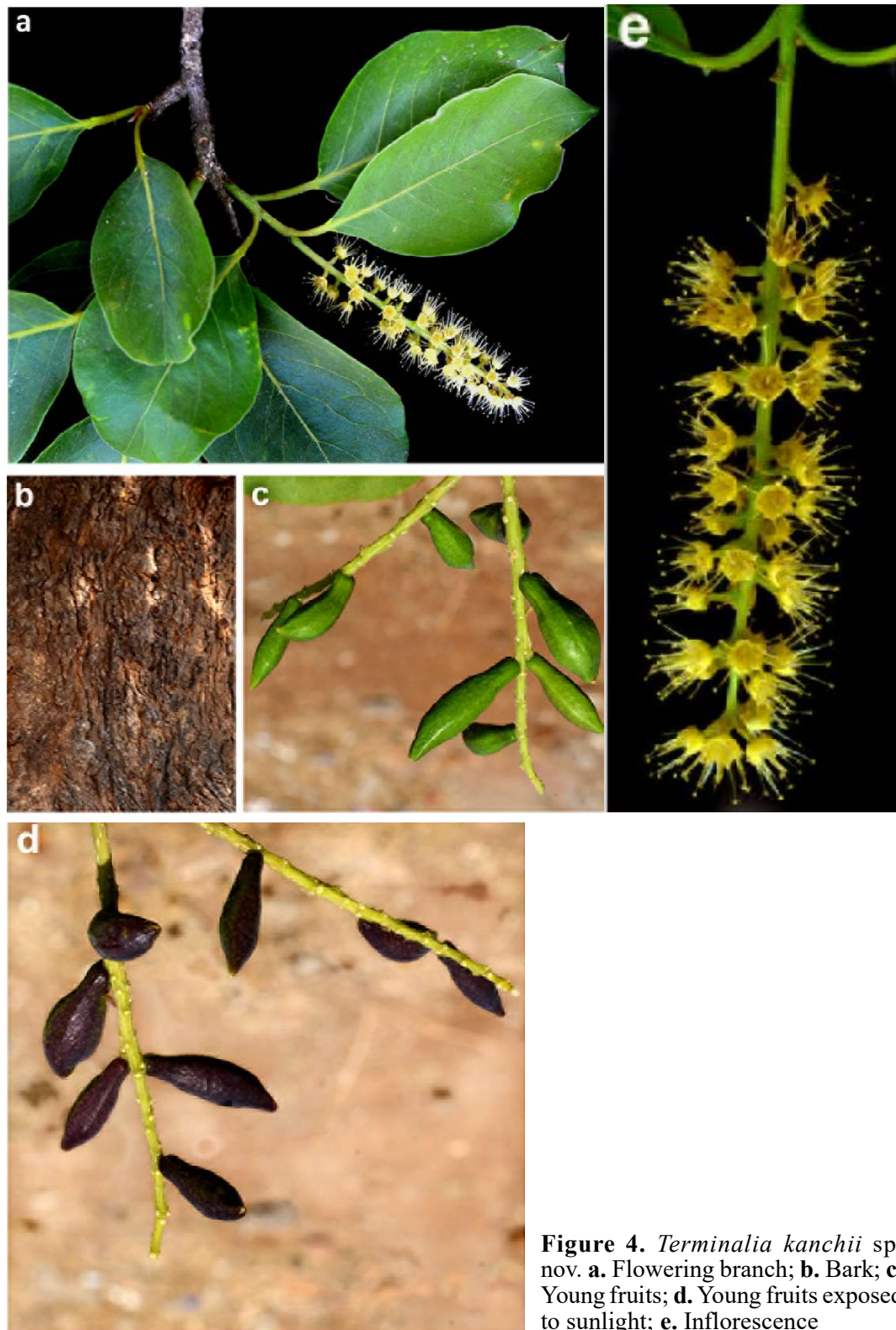
***Terminalia kanchii* Dhabe, sp. nov.**

Similar to *Terminalia chebula* Retz. But differs in possessing thick ovate elliptic leaves; ovate elliptic drupes, with short stalk tapering towards base, tip beaked; oblong lanceolate nuts.

Medium sized trees, 6 to 9 m tall; bark rough, greyish-brownish-blackish, splits irregularly. Tender branches green, pubescent, mature branches brownish creamish, glabrous, lenticular. Leaves opposite or sub opposite; lamina thick, ovate, ovate-elliptic or elliptic-oblong, 4.0 – 8.0 × 8.0 – 18.0 cm, entire, acute or acuminate, base rounded, obtuse, acute or cuneate; lateral veins 6 – 10 paired, both surfaces pubescent when young, glabrous at maturity; petioles 1.5 to 2.5 cm long, 1.0 to 2.0 mm thick, striated; glands 2 or 1 or absent, situated on petiole below the lamina or at the junction of petiole and lamina, circular to elliptic, green, creamish or yellow, 1 – 3 mm. Spikes terminal, simple, 3 to 10 cm long or paniced, 7 to 15 cm long, axis pubescent, green, 20 – 35 flowered. Flowers sessile, bracteate, bracts linear, 1.5 – 2.0 mm long, pubescent; all bisexual, actinomorphic, epigynous, 4 – 6 mm across. Calyx cup green,



**Figure 1.** *Terminalia kanchii* sp. nov. **a.** Fruiting branch; **b.** Fruits



**Figure 4.** *Terminalia kanchii* sp. nov. **a.** Flowering branch; **b.** Bark; **c.** Young fruits; **d.** Young fruits exposed to sunlight; **e.** Inflorescence

glabrous outside, silky villous inside, creamish at center, 2 – 3 mm long; lobes 5, broadly triangular, 1.5 – 2.0 mm long. Stamens 10; filaments glabrous, creamish yellow; anther lobes dorsifixed, ditheous, ovate, yellow. Ovary 2.0 – 2.5 mm long, 1.0 – 1.5 mm across, swollen at the middle, slightly tapering at the ends, pubescent, green; style shorter than stamens, glabrous, greenish yellow, stigma pointed. Drupes elliptic oblong with short stalk tapering towards base, tip beaked, 2.5 – 4.5 cm long, 1.2 – 1.7 cm across, green when young, purple on exposure to sunlight, yellowish brown at maturity. Nuts 1.5 – 2.2 cm long, 8 – 12 mm across, oblong lanceolate to ovate lanceolate, tapering to both ends, with 5 ridges, surface rough, outline of cross section rounded with 5 obscure angles. Seeds ovate elliptic, 8 – 14 mm long, 2 – 3 mm wide, reddish brown, tip blackish.

**Phenology:** *Terminalia kanchii* blooms in March – April and fruiting during August – December.

**Type:** INDIA, Gujarat, Saputara, N20° 35' 11.5"; E073° 45' 44.7"; Alt.: 904 m, dated 20.12.2015, *A. S. Dhabe- 007203*, (Holotypus: CAL; Isotypus: BAMU); Gujarat, Saputara, dated 05.10.2003, *A. S. Dhabe*, 002503 (Paratypus: BAMU!).

**Distribution:** Distributed in Ahwa forest, Gujarat state, India.

**Status:** Critically endangered.

**Etymology:** The species is named in honor of Dr. Kanchi N. Gandhi, Senior Nomenclature Registrar, Harvard University Herbaria, Cambridge, MA, USA for his dedicated services in plant nomenclature.

*Terminalia maoui* Dhabe, *sp. nov.*

Similar to *T. citrina* (Gaertn.) Roxb. ex Fleming, but differs with elliptic lanceolate fruits, tapering towards ends; elliptic lanceolate nuts, with sharp 5 wings.

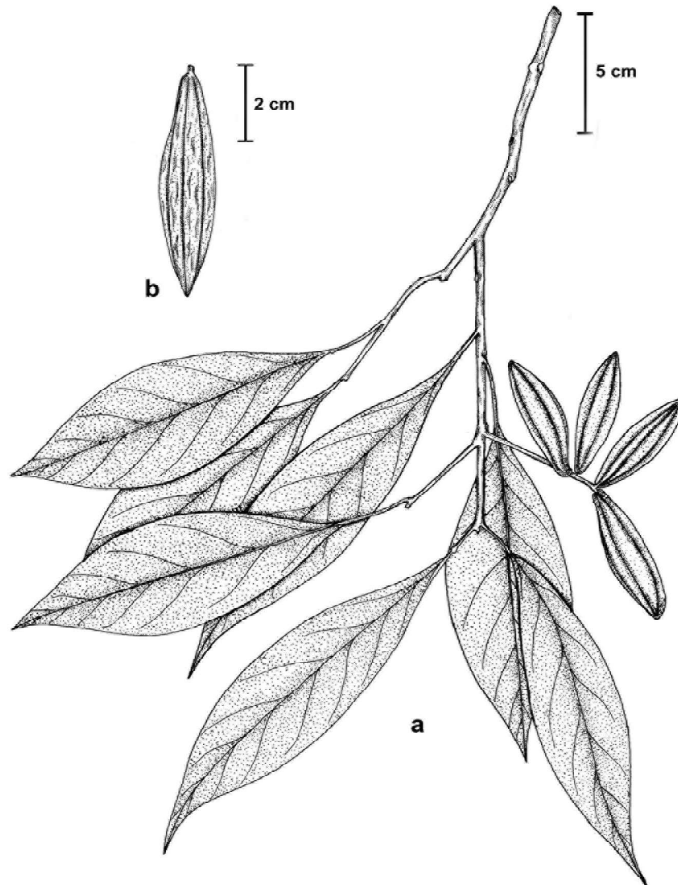
Trees, about 18.5 m tall, bark smooth, reddish – brownish. Young branches smooth, reddish brown. Leaves sub-opposite; lamina elliptic to elliptic-lanceolate, 3.0 – 5.0 × 14.0 – 18.0 cm, entire, acuminate with a long acumina, base cuneate, tapering; lateral veins 7 – 10 paired, both surfaces glabrous at maturity; petiole 1.5 to 3.0 cm long, 1.5 to 2.0 mm thick; glands 2, situated on petiole below the lamina, circular, brown, 1 mm in diameter. Spikes axillary and terminal, simple, 3 to 6 cm long, rachis brown, glabrous. Flowers not seen. Drupes elliptic lanceolate, tapering towards ends, 4.0 – 6.5 cm long, c 1.5 cm across, green when young, yellowish brown at maturity. Nuts 3.0 – 4.0 cm long, 8 – 12 mm across, elliptic lanceolate, tapering towards ends, 5 winged, wings sharp, outline of cross section star shaped. Seeds elliptic oblong, compressed, 17 – 24 mm long, 2 – 3 mm wide, yellowish brown, tip blackish.

**Phenology:** *Terminalia maoui* flowers during November to December and fruiting during February to March.

**Type:** INDIA, Meghalaya, Shillong, Barapani, N25° 40' 8517"; E091° 54' 1147"; Alt.: 876.7 m, dated 11.03.2016, *A. S. Dhabe*, 007264, (Holotypus: CAL; Isotypus: BAMU).

**Specimens examined:** INDIA, Assam, Goalpara, 11.06.1919, *Upendranath Kanjilal* - 7565, Accession no. 10570 (ASSAM!); INDIA, Assam, Borengajuli, Bornadi Wildlife Sanctuary, 20.09.2010, *C. Deori & D. K. Roy*, 49290, Accession no. 83873 & 83874 (ASSAM!).

**Distribution:** Distributed in Udulguri, Baksa and Goalpara districts of Assam state and Ribhoi and East Khasi districts of Meghalaya state. Critically endangered.



**Figure 2.** *Terminalia maoi* sp. nov. **a.** Fruiting branch; **b.** Fruit

**Etymology:** The species is named in honor of Dr. A. A. Mao, Scientist F, Botanical Survey of India (BSI), for his dedicated works in North Eastern India.

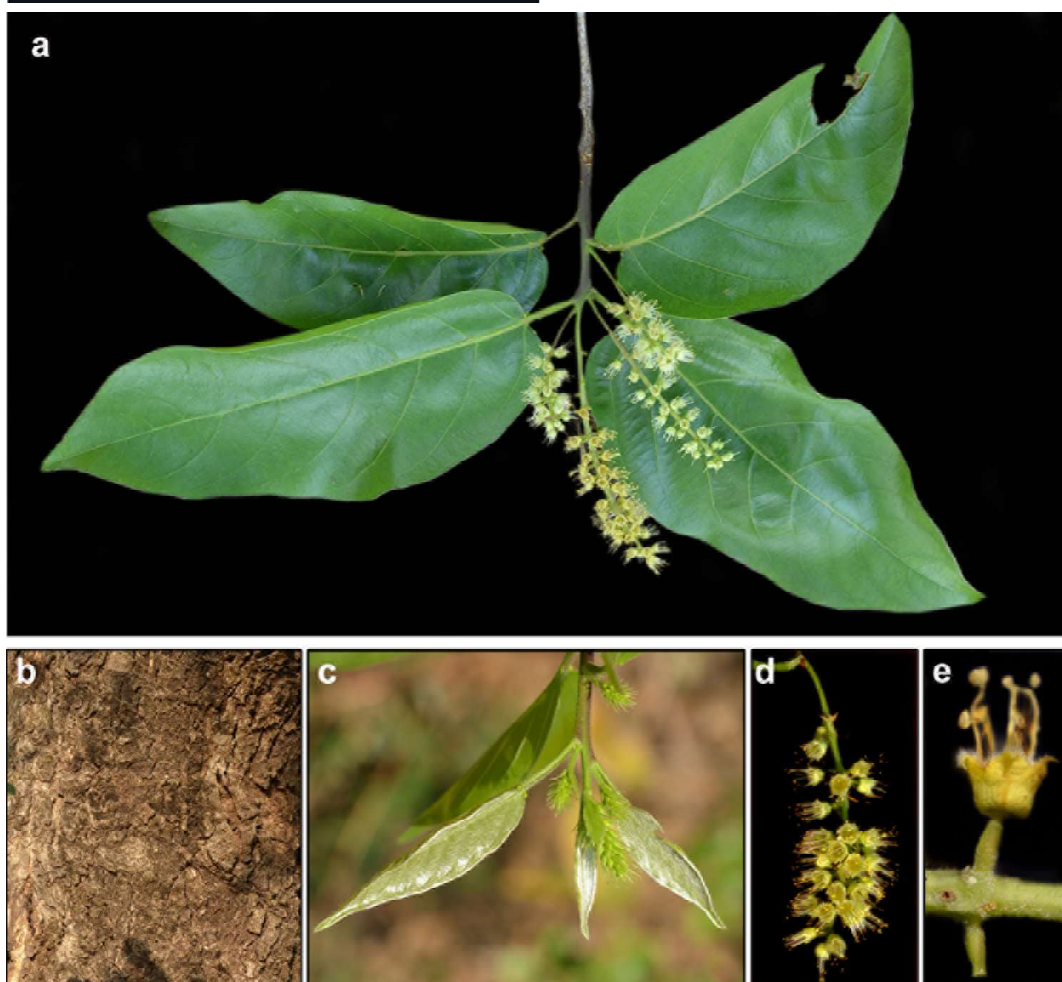
***Terminalia shankarraoi* Dhabe, sp. nov.**

Similar to *T. chebula* Retz. differs in possessing ovate elliptic leaves; elliptic lanceolate fruits with long stalk tapering towards the base; oblong lanceolate nuts and seeds with long stalk tapering towards base.

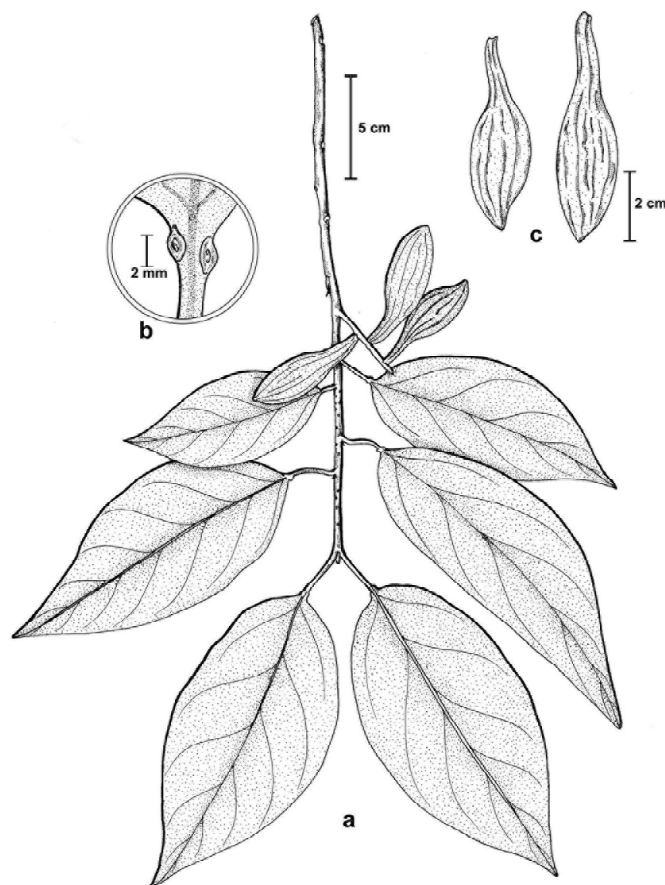
Trees about 15 m tall, bark rough, greyish-brownish-blackish, splits irregularly. Tender branches green, silky pubescent; matured yellow brown, rough, lenticular. Leaves alternate or sub opposite; lamina ovate to ovate-elliptic, 4.0 – 8.0 × 8.0 – 20.0 cm, entire, acuminate, base rounded, lateral veins 5 – 7 paired, both surfaces silver villous when young, glabrous at maturity; petioles 1.5 to 3.0 cm long, 2.0 to 2.5 mm thick, striated; glands 2, situated on petiole below the lamina or at the junction of petiole and lamina, circular to elliptic, green or creamy or yellow with black spot at center in young leaves, brown in matured leaves, 2-3 mm in diameter. Inflorescence terminal simple spikes simple, terminal, rarely axillary and branched, 3 to 8 cm long, lateral spikes short; rachis pubescent, green, 14 – 35-flowered; bracts linear, 1.5 – 3.0 mm long, pubescent. Flowers sessile, all bisexual, actinomorphic, epigynous, 5 – 7 mm across. Calyx cup green, glabrous outside, silky villous inside, yellowish



**Figure 5.** *Terminalia maoi* sp. nov. **a.** Fruiting branch



**Figure 6.** *Terminalia shankarraoi* sp. nov. **a.** flowering branch; **b.** Bark; **c.** Tender branch; **d.** Inflorescence; **e.** Fertilized ovary with rim at tip



**Figure 3.** *Terminalia shankarraoi* sp. nov. **a.** Fruiting branch; **b.** Glands; **c.** Fruits

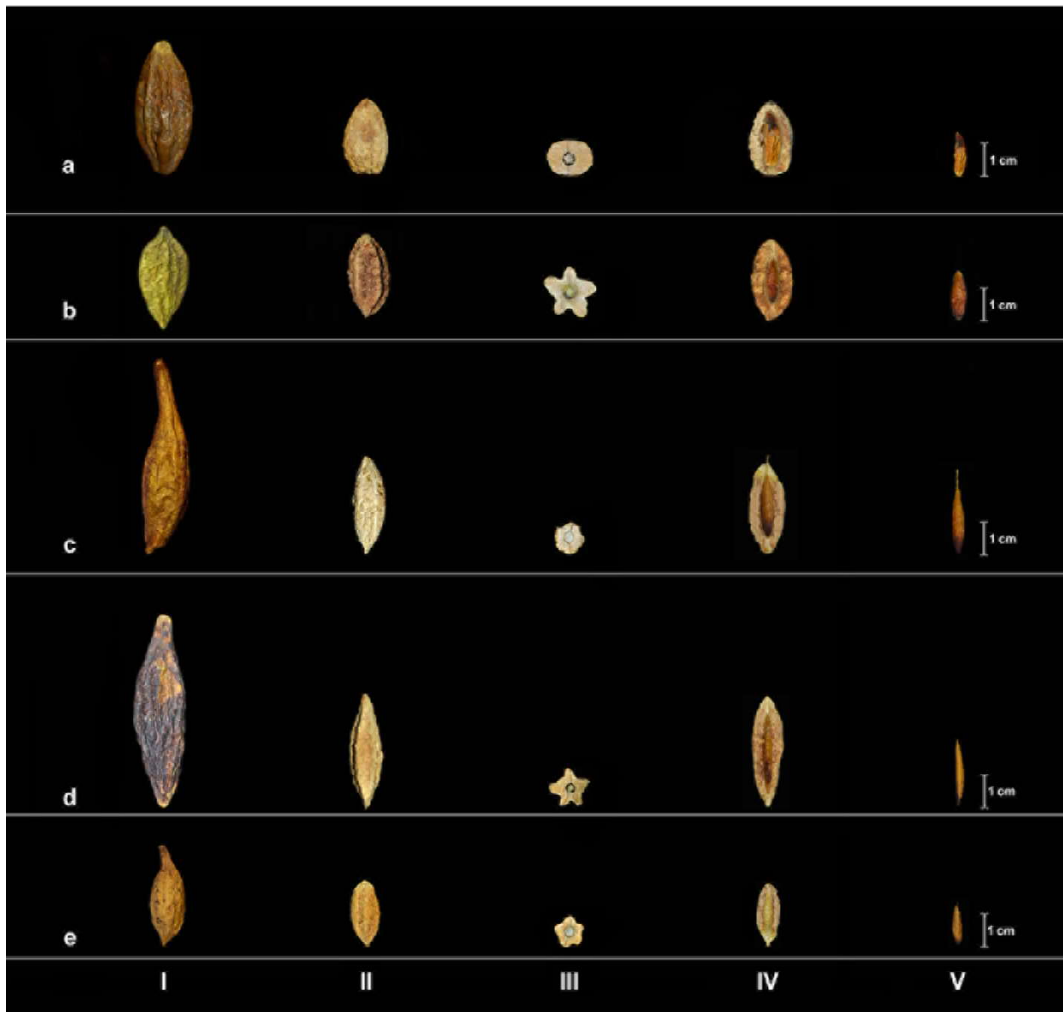
at center, 2 – 3 mm long; lobes 5, 2.5 – 3.5 mm long, reflexed outside. Stamens 10; filaments glabrous, cream yellow, 5 – 8 mm long; anthers dorsifixed, ditheous, ovate, yellow. Style glabrous, cream-coloured, shorter than filaments, stigma pointed. Drupes elliptic lanceolate with long stalk tapering towards base, 4.5 – 7.0 cm long, 1.5 – 2.0 cm across, green when young, yellowish brown at maturity. Nuts 2.5 – 3.5 cm long, 8 – 14 mm across, oblong lanceolate, tapering toward the ends, surface rough, outline of cross section rounded with 5 obscure angles. Seeds elliptic-lanceolate, 15 – 22 mm long, with long stalk tapering towards base, 2.5 – 4.0 mm wide, yellowish brown, tip blackish.

**Phenology:** *Terminalia shankarraoi* blooms between March to April and fruiting during August to December.

**Type:** INDIA, Gujarat, Saputara, 20° 35' 115" N & 073° 45' 4473 E, Alt. 904 m, dated 20.12.2015, *A. S. Dhabe* - 007202, (Holotypus: CAL; Isotypus: BAMU); *A. S. Dhabe*, 006085, Saputara, 29.10.2013 (Paratypus: BAMU)

**Specimens examined:** V. N. Singh & Bikarma Singh, Field no. 115994, Accession no. 75967, Nokrek Biosphere Reserve, West Garo Hills, Meghalaya, 13.10.2007 (ASSAM).

**Etymology:** The species is named in honor of famous traditional Ayurvedic practitioner of Parbhani district, Vd. Shankarrao Govindrao Dhabe who has been using almost all *Terminalia*



**Figure 7.** Fruit, nut and seed morphology: **a.** *Terminalia chebula*; **b.** *Terminalia citrina*; **c.** *Terminalia shankarraoi* sp. nov.; **d.** *Terminalia maoi* sp. nov.; **e.** *Terminalia kanchii* sp. nov.: (i) fruit, (ii) nut, (iii) cross section of nut, (iv) vertically splitted nut, and (v) seed

species in his medicines and because of his association and guidance, author was attracted towards the genus *Terminalia*.

**Distribution:** Distributed in Ahwa forest Gujarat and West Garo Hills district of Meghalaya State. Critically endangered.

**Key to the identification of *Terminalia* L. (Combretaceae) species from India**

- |  |                     |
|--|---------------------|
| 1a. Fruits drupes .....                                    | 2                   |
| 1b. Fruits samara .....                                    | 13                  |
| 2a. Drupes globose or ovoid, densely brown tomentose ..... | <i>T. bellirica</i> |
| 2b. Drupes otherwise .....                                 | 3                   |
| 3a. Drupes prominently stipitate or stalked .....          | 4                   |
| 3b. Drupes without prominent stipe or stalk .....          | 5                   |



- 4a. Drupes elliptic lanceolate, stipe 10 – 15 mm long, Seeds elliptic lanceolate, 15–22 mm long, with long stalk tapering towards base ..... *T. shankarraoi*
- 4b. Drupes ovate elliptic, stipe 3 – 7 mm long, Seeds ovate elliptic, 8 – 14 mm long without stalk ..... *T. kanchii*
- 5a. Nuts, 5 winged ..... 6
- 5b. Nuts not winged ..... 7
- 6a. Drupes elliptic lanceolate; mesocarp hard, dark brownish black; nuts elliptic lanceolate; seeds 17 – 24 mm long ..... *T. maoi*
- 6b. Drupes ellipsoidal or oblong lanceolate; mesocarp soft, yellow; nuts elliptic oblong, seeds 12 – 15 mm long ..... *T. citrina*
- 7a. Drupes warted ..... *T. travancorensis*
- 7b. Drupes not warted ..... 8
- 8a. Nuts emarginated or broad at apex ..... *T. chebula*
- 8b. Nuts not emarginated or broad at apex ..... 9
- 9a. Mesocarp pulpy, edible, sweet and sour ..... 10
- 9b. Mesocarp not pulpy, non-edible, astringent ..... 11
- 10a. Drupes broadly ellipsoid to ovoid, laterally compressed, with stiff narrow ridge, ridges 2 – 3 mm broad ..... *T. catappa*
- 10b. Drupes ellipsoid to oblong ellipsoid, not compressed, without ridges .... *T. procera*
- 11a. Drupes ovate lanceolate; nuts elliptic oblong, 5 ridged; leaves elliptic lanceolate or ovate elliptic ..... *T. manii*
- 11b. Drupes globose-ovoid to ovoid elliptic, nuts ovate oblong, 5 angled; leaves broadly obovate to rounded ..... *T. pallida*
- 12a. Samara 2 winged ..... *T. bialata*
- 12b. Samara 3 – 5 winged ..... 13
- 13a. Samara 3 winged ..... 14
- 13b. Samara 5 winged ..... 15
- 14a. 2 lateral wings well developed, 1 central wing rudimentary .... *T. myriocarpa*
- 14b. 2 lateral wings rudimentary, 1 central wing well developed .... *T. paniculata*
- 15a. Striations curved on wings ..... *T. arjuna*
- 15b. Striations horizontal on wings ..... *T. tomentosa*

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