

# *Tinospora mahajanii* (Menispermaceae), a new species from Khandwa district, Madhya Pradesh, India

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**Abstract:** *Tinospora mahajanii* (Menispermaceae), a new species from the Awalya forest range of Khandwa district, Madhya Pradesh, India, is described here along with colour photographs, micrographs of endocarp and comparison with its allied species *T. neocaledonica* Forman and *T. sinensis* (Lour.) Merr. The species is unique in having inflorescences with lateral branches, stems with a yellowish watery sap and sub-elliptic drupes. Comparison with its allied species, habitat and distribution are provided to aid identification.

**Keywords:** Awalya forest, India, Menispermaceae, New species, *Tinospora*.

## Introduction

The genus *Tinospora* Miers comprises about 32 species and is distributed throughout tropical Africa, Madagascar, Asia to Australia and the Pacific Islands (Forman, 1981; Kessler, 1993; Pramanik & Gangopadhyay, 1993; Mabberley, 2008; Udayan & Pradeep, 2009; Mujaffar *et al.*, 2014; Rajendran *et al.*, 2016). The genus *Tinospora* is represented by nine species in India *viz.*, *T. sinensis* (Lour.) Merr. (synonym *T. cordifolia* (Willd.) Hook.f. & Thomson), *T. crispa* (L.) Hook.f. & Thomson, *T. glabra* (Burm.f.) Merr., *T. formanii* Udayan & Pradeep, *T. maqsoodiana* Mujaffar, Moinudd. & Mustakim and *T. smilacina* Benth. from the southern Western Ghats (Rajendran *et al.*, 2016); *T. subcordata* Diels, *T.*

*neocaledonica* Forman and *T. baenzigeri* Forman (Mishra, 2020; Mishra & Mishra, 2020; Mishra *et al.*, 2020) from Madhya Pradesh.

During recent field explorations in various parts of the forests of Central India, the authors collected a species of *Tinospora* from the Awalya forest range of Khandwa district in Madhya Pradesh. Further studies showed that the specimens represented a new species which is described here. A comparison of morphological characters of closely similar species of *Tinospora* is provided in Table 1 to facilitate precise identification.

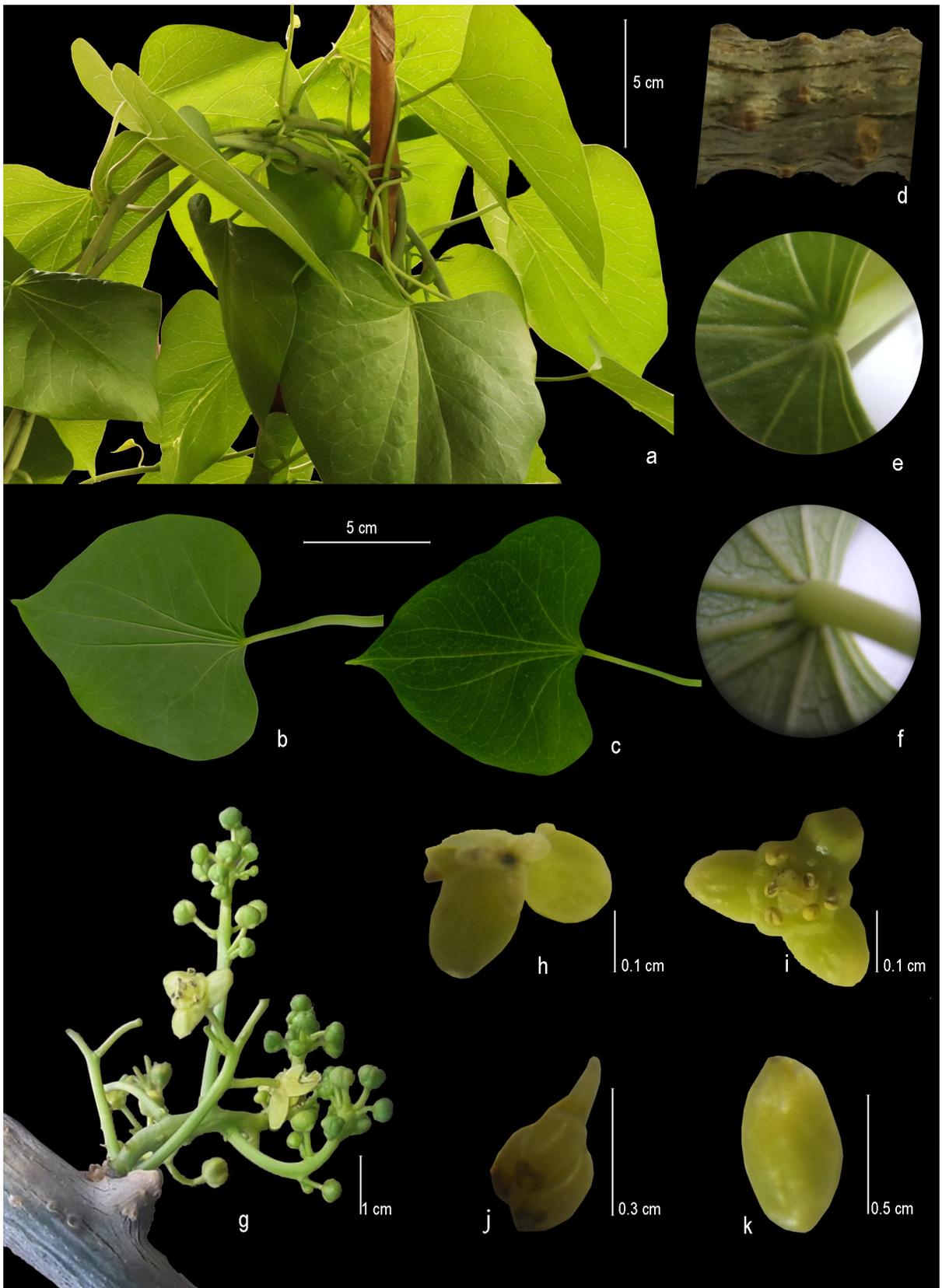
## Materials and Methods

Fresh specimens of *T. mahajanii* were collected from the Awalya forest range, Khandwa district, Madhya Pradesh during the month of December 2016. Detailed examination of all the materials available were done under a stereo zoom microscope. Morphology of the specimens was compared with allied species. Herbarium specimens were prepared as per Bridson and Forman (1991). The novelty of the taxon was confirmed by a critical morphological analysis of the specimens, comparison with the relevant literature and on discussion with experts.

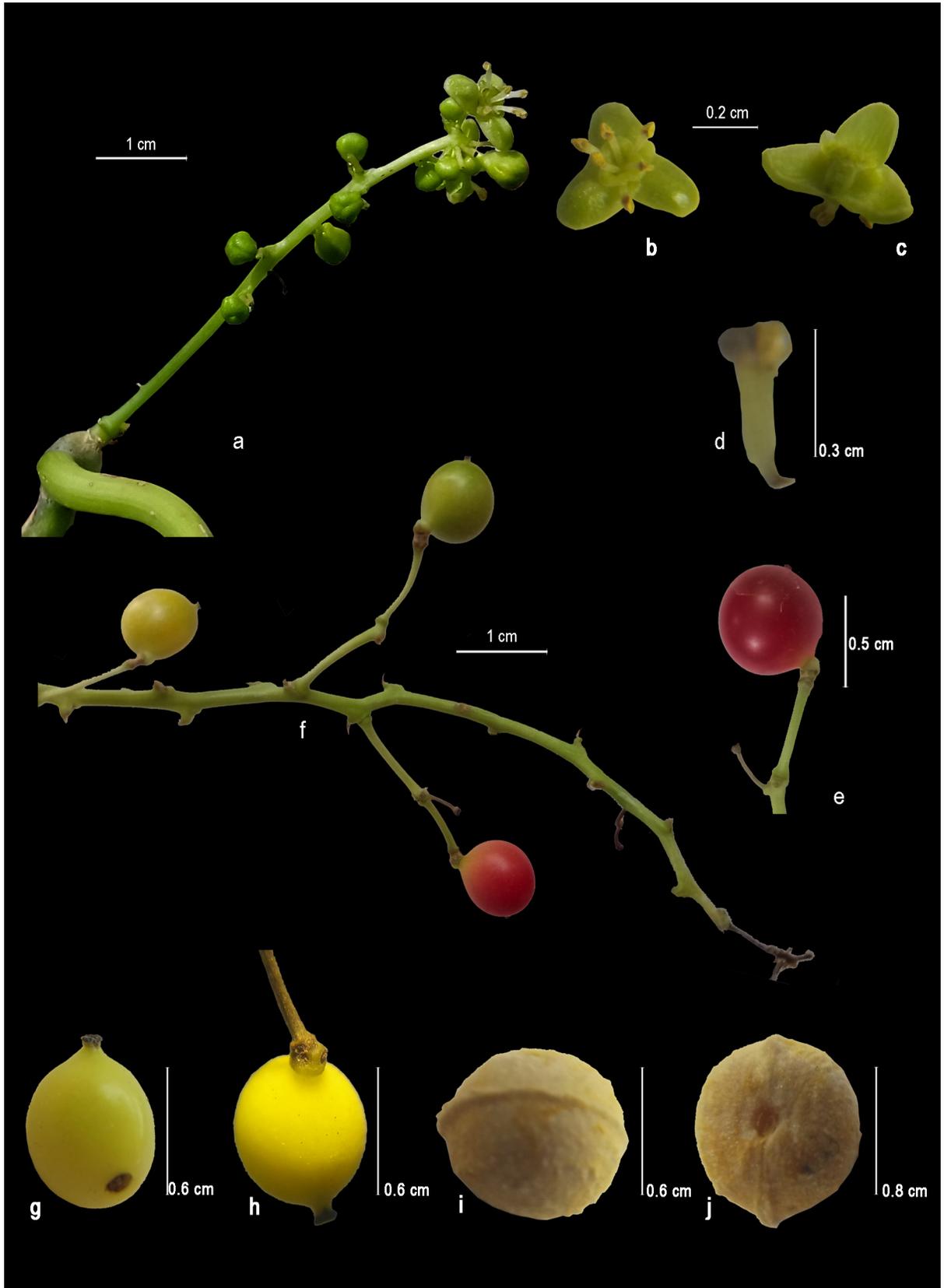
## Taxonomic treatment

***Tinospora mahajanii* Mishra, Khristi & Solanki, sp. nov.** Figs. 1 & 2

*Tinospora mahajanii* is morphologically allied to *T. neocaledonica* and *T. sinensis* but differs by having stems



**Fig. 1.** *Tinospora mahajanii* Mishra, Khristi & Solanki: **a.** Branch; **b.** Leaf—dorsal view; **c.** Leaf—ventral view; **d.** Segment of stem; **e.** Ventral leaf base showing glandular-papillose patches; **f.** Dorsal leaf base showing nine veins; **g.** Female inflorescence; **h.** Female flower—back view; **i.** Female flower—front view; **j.** Carpophore; **k.** Sepal (**a–k** from Mishra 201262; photos by D. Mishra).



**Fig. 2.** *Tinospora mahajanii* Mishra, Khristi & Solanki: **a.** Male inflorescence; **b.** Male flower – front view; **c.** Back view; **d.** Stamen; **e.** Drupe; **f.** Inflorescences; **g. & h.** Drupes; **i.** Endocarp–dorsal view **j.** Endocarp–ventral view (**a–j** from Mishra 201262; photos by D. Mishra).

verruculose; scattered lenticels with a yellow sap; petioles slightly swollen and geniculate at base; male inflorescence coetaneous with the leaves and axillary to branch-scars; female inflorescence a cluster of elongated panicles on branch scars; petals unguiculate and drupes sub-elliptic, become orange-red when ripe.

*Type:* INDIA, **Madhya Pradesh**, Khandwa district, Awalya forest range, N 21° 48' 53.0", E 76° 21' 34.4", 318 m, 20.12.2016, *Mishra* 201262 (holo CAL; iso BSI!).

Perennial, woody, dioecious climbers, with yellowish watery sap when cut; the bark rough and exfoliates in papery flakes and entirely glabrous often with short filiform aerial roots. Stems 0.2–4 cm in diam., slightly fleshy, green when young, later becoming prominently verruculose and bearing scattered, lenticels first lens-shaped, 2-dehiscent, then rounded, 4-dehiscent, branch scars prominent. Leaves simple, alternate; petioles 2–5(–10) cm long, 0.1–0.3 mm diam., slightly swollen and geniculate at base; lamina broadly ovate, 6–14 × 5–13 cm, base broadly cordate to sub-truncate, apex acuminate, palmately 7–9-nerved at the base, three running up to apex, distinctly looping along margins; reticulation raised on both surfaces, finely glandular-papillose patches present in axils of mature leaves in the adaxial part. Male inflorescences elongated panicles, coetaneous with the leaves, axillary on old branch scars; peduncles slender, (5–)9–14 cm long, with hook-like appendages on surface; bract solitary, subulate, 0.8–1.0 cm long. Male flowers greenish-yellow; pedicels 0.1–0.3 cm long; sepals 6 in 2 whorls, free, imbricate, pale green, outer 3 ovate, *c.* 0.1–0.15 cm long, inner 3 ovate-elliptic to broadly elliptic, *c.* 0.3–0.5 cm long; petals 6, unguiculate with ± oblate limb, 0.18–0.2 cm long. Stamens 6, yellow; filaments free, clavate, latrorse, *c.* 0.3 cm long. Female inflorescences panicles with lateral branches, on branch-scars, not coetaneous with the leaves; peduncles 5.8–11 cm long, flowers clustered. Female flowers greenish yellow, sepals and petals as in male; staminodes 6, subulate, *c.* 0.3 cm long;

carpels 3, curved ellipsoidal, *c.* 0.3 cm long, style terminal, stout, stigma sessile, flat, 3-cleft; gynophore *c.* 0.06–0.1 cm long. Infructescences up to 14 cm long, lateral branches *c.* 3 cm long; drupes 1–2, sub-elliptic, borne on carpophore 1.5–2.0 cm long, dark yellow when young, orange-red when ripe, pericarp mucilaginous, pulpy; endocarp thinly bony, navicular, *c.* 0.8 × 0.6 cm, pointed at base, keeled at apex, dorsally convex with a prominent median ridge at both ends, irregularly tuberculate, 0.15–0.2 cm long from aperture to condyle, endosperm adaxially ruminant.

*Vernacular names:* Gulvel/Gudvel (Korku); Karial/Usnaide Veli/Giloya de Veli (Gond); Gahutakli (Nihal).

*Flowering & fruiting:* Flowering from October to January and fruiting from January to May.

*Habitat:* This species grows in loamy soil along with hedges of a cultivated field at an altitude of 318 m. It is rare and sparsely distributed in the Awalya forest range along with *T. sinensis*. The associated species in the locality are *Calotropis gigantea* L. (Asclepiadaceae), *Acacia eburnea* (L.f.) Willd. (Fabaceae) and *Azadirachta indica* Juss. (Meliaceae).

*Etymology:* The specific epithet 'mahajanii' is in honour of Dr. Shrikrishna Mahajan, retired Professor of Botany, Government College, Rajpur, Madhya Pradesh for his valuable contribution in the field of plant taxonomy.

*Distribution:* Known only from the type locality.

*Notes:* *Tinospora mahajanii* is distinct by its broadly ovate, 7–9-nerved lamina; slightly swollen, basally geniculate petioles; male inflorescence coetaneous with the leaves; female inflorescence a panicle with lateral branches, on branch-scars showing presence of unguiculate petals; latrorse stamens and 3, curved, ellipsoidal carpels, terminal style; sub-elliptic and sub-navicular drupes and mucilaginous pericarp. The important distinguished characters with its morphologically allied species, *viz.*, *T. neocaledonica* and *T. sinensis* are provided in Table 1.

**Table 1.** Comparison of diagnostic characters of *T. mahajanii* with its two allied species, *T. neocaledonica* and *T. sinensis*.

Characters	<i>T. mahajanii</i> Mishra, Khristi & Solanki	<i>T. neocaledonica</i> Forman	<i>T. sinensis</i> (Lour.) Merr.
Stems	Verruculose, scattered lenticels	Scattered lenticels	Scattered lenticels
Petioles	Slightly swollen and geniculate at base	Not swollen at base	Twisted and puberulous
Lamina	Broadly ovate, 7–9-nerved	Broadly ovate, 5–7-nerved	Ovate, 5–7-nerved
Male inflorescence	Coetaneous with the leaves, axillary to branch-scars	Coetaneous with the leaves, axillary to leaf-scars	Without leaves, axil of protruding leaf-scars
Female inflorescence	On branch-scars, cluster of elongated paniculate	Not seen	Arising singly along the axis
Petals	Unguiculate	Rhomboid-obovate	Rhomboidal-ovate
Stamens	Latrorse	Latrorse	Sub-extrorse
Drupes	Orange-red when ripe; pericarp mucilaginous, pulpy; endocarp thinly bony, keeled at apex, dorsally sub-convex with a median ridge prominent at both ends, surface irregularly tuberculate	Red when ripe; pericarp thin; endocarp bony pointed at both ends, acutely at base, dorsal median ridge prominent at ends, surface irregularly tuberculate	Bright orange or scarlet red when ripe; pericarp thin; endocarp bony, broadly elliptic to subrotund in outline, obtusely pointed at base, broadly keeled at apex, weak dorsal ridge, surface slightly papillose

**Key to the species of *Tinospora* in India**

- 1. Climbers producing very long filiform aerial roots ..... 2
- 1. Climbers without aerial roots or thin small aerial roots ..... 5
- 2. Leaves broadly sinuate ..... *T. sinensis*
- 2. Leaves triangular ..... 3
- 3. Stems strongly tuberculate; petals usually 3... ..... *T. crispa*
- 3. Stems not tuberculate; petals usually 6 ..... 4
- 4. Leaves with a pair of hollow domatia in abaxial axils of basal veins ..... *T. baenzigeri*
- 4. Leaves with papillose-glandular patches in abaxial axils of basal veins ..... *T. maqsoodiana*
- 5. Inflorescences with lateral branches, at least towards base ..... *T. mahajanii*
- 5. Inflorescences unbranched ..... 6
- 6. Outer and inner sepals equal ..... *T. formanii*

- 6. Outer sepals much smaller than inner sepals..... 7
- 7. Leaves with domatia present on abaxial in axils of basal nerve ..... *T. glabra*
- 7. Leaves with glandular patches present on abaxial in basal nerve axils ..... 8
- 8. Leaves ± ovate with sides convexly curved ... ..... *T. neocaledonica*
- 8. Leaves ± triangular to broadly triangular with sides straight or sometimes concave ..... 9
- 9. Drupes borne on columnar carpophore, 4–5 mm long ..... *T. subcordata*
- 9. Drupes borne on sub-globose carpophore, 1.5–2 mm long ..... *T. smilacina*

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