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Registered Office: 3A2 Varadarajulu Nagar, FCI Road, Ganapathy, Coimbatore, Tamil Nadu 641006, India  
Ph: +91 9385339863 | [www.threatenedtaxa.org](http://www.threatenedtaxa.org)  
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Cover: Golden-headed Lion Tamarin *Leontopithecus chrysomelas*. Watercolor and acrylics by P. Kritika.



## *Garcinia pedunculata* (Clusiaceae), a new record for Bhutan and its ethnopharmacological potential

Jigme Wangchuk<sup>1</sup> , Ugyen Dorji<sup>2</sup> , Sherab Dorji<sup>3</sup> , Yograj Chhetri<sup>4</sup> & Tsethup Tshering<sup>5</sup>

<sup>1,4,5</sup> Ugyen Wangchuck Institute for Forestry Research and Training, Lamai Goempa, Bumthang 34005, Bhutan.

<sup>2,3</sup> Panbang Forest Range, Divisional Forest Office, Zhemgang, 34103, Bhutan.

<sup>1</sup>jickmew@gmail.com (corresponding author), <sup>2</sup>ugyendorji551@gmail.com, <sup>3</sup>sgandhi6655@gmail.com, <sup>4</sup>chhetriy@gmail.com,

<sup>5</sup>tsethup2015@gmail.com

**Abstract:** *Garcinia pedunculata* Roxb. ex Buch.-Ham. is reported here for the first time in Bhutan, specifically from Zhemgang District. The species holds significant local value; its fruits are consumed as food and used as dye mordants, as well as in traditional remedies for various ailments. These uses exemplify the deep-rooted ethnobotanical knowledge maintained by local communities.

**Keywords:** Angiosperm, bioactive constituents, conservation status, digital herbaria, dioecy, eastern Himalaya, ethnobotanical uses, least concern, taxonomy, Taikor, Zhemgang District.

The genus *Garcinia* L. of the Angiosperm family Clusiaceae comprises over 416 species of trees and shrubs, occurring mainly in tropical and subtropical regions of Asia, Africa, Central & South America, Australia, and Polynesia (Lin et al. 2021; POWO 2025). Members of this genus are renowned for their economic and medicinal significance, notably providing edible fruits and phytochemicals with pharmaceutical potential (Santo et al. 2020; Kazmierczak et al. 2023). Species of *Garcinia* are ethnobotanically important and have been utilized in traditional medicine, culinary practices, dyeing, and cultural rituals since ancient times (Lin et al. 2021). Because of the ethnobotanical and phyto medicinal

properties, in regions such as Bangladesh, this species, though found in the wild, has also been occasionally cultivated by local communities for fruit, vegetables, and local therapy (Islam et al. 2015).

*Garcinia pedunculata* Roxb. ex Buch.-Ham., commonly known as ‘Amlavetasa’ in India and ‘Taikor’ in Bangladesh, is native to the Indo-Burma biodiversity hotspot. The species produces large, yellowish-green, acidic fruits. Local communities use these fruits in cooking and traditional medicine, particularly to ease gastrointestinal issues, as a cardi tonic, and as a skin softener (Santo et al. 2020; Bhattacharjee & Devi 2021). Phytochemical analysis has identified important compounds in ripe fruits, such as hydroxycitric acid, benzophenones, garcinol, and pedunculol. These compounds are known for their antioxidant, antimicrobial, anti-inflammatory, hepatoprotective, hypolipidemic, and antidiabetic activities (Santo et al. 2020). Despite its recognized value in ethnobotanical uses, which has led to its population decline elsewhere, the species has been listed as Least Concern on the IUCN Red List (IUCN SSC GTSG & BGCI 2025).

In Bhutan, three *Garcinia* species have been recorded

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so far, *G. stipulata* T.Anderson, *G. sopsopia* (Buch.-Ham.) Mabb., and *G. xanthochymus* Hook.f. ex T.Anderson (Grierson & Long 1984). The presence of *G. pedunculata* had long been recognized by local ancestral communities in the current study areas; however, it had not been documented in the literature until our study. This may be because the area was not covered in earlier studies (Wangchuk et al. 2023). The species was discovered during the biomass sample collection for the development of an allometric equation. The herbarium specimen was collected along with the photographic evidence. We compared our specimen to the previously documented genus *Garcinia* in Bhutan by Grierson & Long (1984) and found no match. We then examined digital herbaria, including GBIF (2025), POWO (2025), WFO (2025), eFlora of India (2025), Singh (1993), and Li et al (2007), and confirmed that the species is *G. pedunculata* based on morphological correspondence.

#### TAXONOMIC TREATMENT

*Garcinia pedunculata* Roxb. ex Buch.-Ham., Edinburgh J. Sci. 7:45. 1827 (Image 1).

Type (Lectotype: INDIA—Sylhet, Wallich Cat. 4860C (K-W [K001104084], designated by Ridsdale (1978), Blumea 24:141); Isolectotype: INDIA—Assam, Goalpara, 10.x.1808, Wallich Cat. 4860A (CAL, K-W[K001104082]); cultivated in H.B.C (Calcutta Botanical Garden), s.d., Wight s.n. (K [K000677592]); H.B.C., East Bengal, s.d., Herb. Griffith 853 (K [K000677593]).

Synonym: *Garcinia planchonii* Pierre in Fl. Forest. Cochinch.: t. 61 (1882).

Dioecious trees 10–20 m height. Stem trunk fluted, bark thick, corky, dark greyish-brown; branchlets glabrous, subterete with fine longitudinal striations and lenticels. Leaves opposite, glabrous on both surfaces; petiole 2–2.5 cm long; leaf blade oblong to oblong-lanceolate, occasionally ovate, chartaceous, (12–) 15–25 (–30) × 7–12 (–17) cm; base cuneate, margin narrowly revolute, apex usually rounded, midvein stout, raised abaxially, slightly impressed adaxially; secondary veins regular, oblique, 9–14 pairs, near margin arching and joining together forming loops; tertiary veins nearly parallel and inconspicuous. Flowers 4-merous; male flowers in panicle-like cymes bearing 8–15 flowers, subtended by 3–6 cm long peduncles; pedicels robust, 3–7 cm long; sepals fleshy, broadly ovate or suborbicular, thick, with membranous margins; petals yellow, oblong-lanceolate, 7–8 mm long; stamens arranged in capitate ring ca. 3 mm high, sometimes pistillode bears short filaments, anthers sessile, 2-celled, dehiscent longitudinally; pistillode columnar-cuneate, slightly angular with a peltate stigma,

inconspicuously tuberculate. Female flowers usually in pairs or solitary at the apex of branchlets; pedicels stout, slightly tetragonous, with two suborbicular bracts at the base; staminodes 80–100 and encircling the ovary with 8–10 subglobose locules, and the stigma radiate with 8–10 lobed and papillate. Fruits yellow, oblate, concave on both ends when mature, 10–18 × 11–20 cm, smooth, pedicel 5–6 cm long; seeds 8–10, reniform.

Flowering: August to December.

Fruiting: December to January.

The species most closely resembling *G. pedunculata* is *G. lanceifolia* Roxb. *Garcinia pedunculata* shares several characters with *G. lanceifolia*. Both are small to medium-sized trees with simple, opposite, leathery leaves that are elliptic to lanceolate with prominent veins. Their flowers are unisexual, small, and arranged in axillary clusters, and their fruits are globose to ovoid with a thick rind, a sour taste, edible, and widely used in traditional medicine. Both species are found in tropical and subtropical Asia. They can, however, be distinguished as follows: *G. pedunculata* has large, broad leaves (13–30 cm long and ca. 8–18 cm wide) and large, yellow to yellowish-orange fruits, whereas *G. lanceifolia* has smaller, narrow leaves (6–12.5 cm long by 2–3 cm wide) and smaller, yellow to yellowish-orange fruits.

**Distribution:** Assam, Arunachal Pradesh, Manipur, Meghalaya, Nagaland, West Bengal in northeastern India, Southwest China, Bangladesh (sometimes cultivated), Laos, Myanmar, Thailand, Vietnam, and Bhutan. Usually grown in dense forests on hills 200–400 m, and exceptionally, up to 1,500 m.

**Specimen examined:** Bhutan. Zhemgang District, Nangla, Panbang along the Yumdang farm road, 26.862° N, 90.985° E, 219 m, 12.iv.2025, collected by Tshethup Tshering TT016 (UWIFoRT); voucher specimen deposited at the Bhutan National Herbarium, National Biodiversity Centre, Serbithang (THIM22423) (Image 2).

Note: It is also observed within the same District at several locations along the forest-farmland edges at Thinleygang 26.854° N, 90.980° E; Chakchawa, between Madulung and Prigchang along the footpath 26.890° N, 91.005° E; Amalagang, Labir at the edge of the agricultural land (26.933° N, 90.956° E), Bjoka, Zarkapla 26.882° N, 91.009° E.

**Conservation status:** *G. pedunculata* has been evaluated as Least Concern on the IUCN Red List despite its extensive ethnopharmacological pressure. The baseline surveys in Bhutan to assess current distribution and abundance are crucial. In Arunachal Pradesh, the species occurs at low population densities, frequently limited to a single tree or only a few individuals per

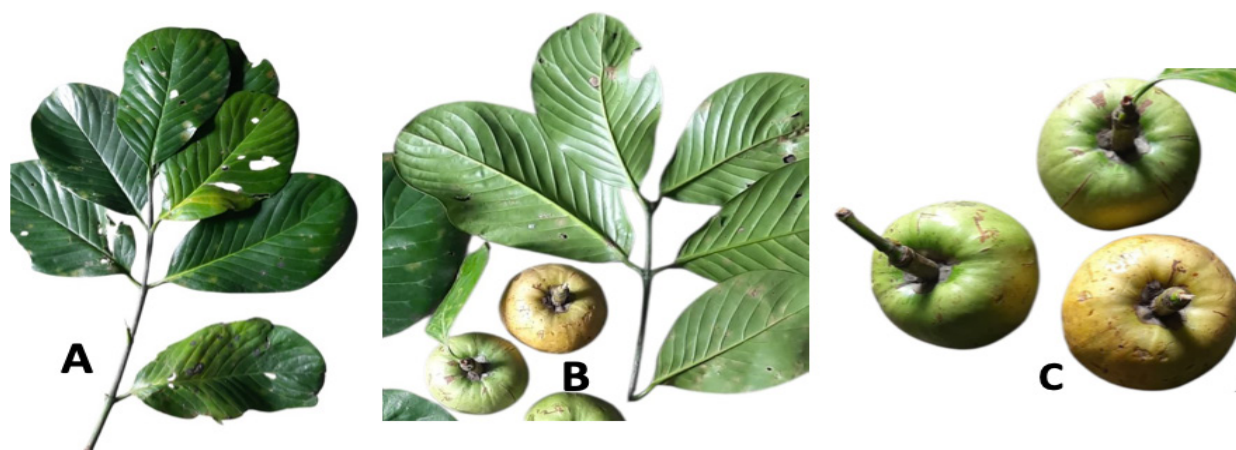


Image 1. *Garcinia pedunculata* Roxb. ex Buch.–Ham: A—Adaxial surface of leaf blade | B—Abaxial surface of leaf | C—Fruits. © Tshethup Tshering.

survey site, raising concerns about its continued survival (Gogoi & Das 2016). To maintain its population while reaping its benefits, the species should be incorporated into agroforestry and afforestation programs, not only for its conservation but also to enhance livelihoods through the sustainable harvest and sale of its products.

#### Ethnobotanical uses and therapeutic potentials

*Garcinia pedunculata* is traditionally known for culinary purposes and has been used as an ascorbic, astringent, cardiogenic, and emollient (Paul et al. 2017), while also being used to treat chronic catarrh, asthma, cough, bronchitis, dysentery, digestive disorder, and fever (Kagyung et al. 2010). In Bangladesh, the plant is cultivated for its fruit. In Assam, it is used in folk medicine to treat gastrointestinal disorders and is also part of ethnic cuisine. The ripe fruit, seldom consumed fresh, is cut into thin slices and sun-dried for preservation (Bhattacharjee & Devi 2021). Many therapeutic values have been scientifically established, including antioxidant (Islam et al. 2015), antimicrobial (Negi et al. 2008), antibacterial, antifungal, anthelmintic, hypolipidemic, antidiabetic, hepatoprotective (Mundugaru et al. 2014), cardioprotective (Mundugaru et al. 2016), neuroprotective, and nephroprotective properties (Bhattacharjee & Devi 2021). Additionally, research has identified polyphenols and flavonoids, along with bioactive compounds such as hydroxycitric acid, garcinol, and cambogin (Bhattacharjee & Devi 2021).

Studies on the nutritional, phytochemical, and antioxidant properties of mature fresh fruits found that the fruit contains significant levels of phenolics and flavonoids, contributing to its antioxidant activity (Devi et al. 2025). Similarly, fruit extract exhibits significant



Image 2. Herbarium sheet of *Garcinia pedunculata* Roxb. ex Buch.–Ham: [# THIM22423].

antihyperglycemic, antidiabetic, and antioxidant effects in rats, suggesting that fruit extract effectively reduces blood glucose levels and enhances antioxidant defenses (Ali et al. 2017). An aqueous extract tested on rats for 14 days protects their hearts from damage caused by a heart attack, harmful blood enzymes, and improves

heart tissue structure, suggesting the fruit's potential as a natural remedy for heart health (Mundugaru et al. 2016). Methanol and ethanol extracts of the fruits demonstrated potent antibacterial activity against multiple clinical bacterial strains, attributed to bioactive constituents such as hydroxycitric acid lactone, garcinone-E, and mangostins (Zoliansanga & Lalfakzuala 2021).

In Bhutan, mature fruits have been used as a dyeing mordant for silk threads from ancestral times until silk became readily available from the Indian market. The ripe fruit has a strong sour taste and is also edible; however, it must be swallowed or chewed without contact with the teeth to avoid enamel erosion. Local people prepare juice from fruits and sell them at markets. Communities have also observed that wildlife, such as ungulates, feed on these fruits, and the area around the base of the trees shows heavy signs of foraging. Enhancing the population of this species in forest is expected to promote human-wildlife co-existence (Tshering, pers. comm. viii.2025). Although a survey of subtropical medicinal plants near the location of this newly recorded species lists 61 species (Wangchuk et al. 2017), this species has not been formally documented in any ethnobotanical study from Bhutan, despite its well-known uses in local medicine. Thus, we report its presence and local medicinal uses in this paper.

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c/o Wildlife Information Liaison Development Society,  
3A2 Varadarajulu Nagar, FCI Road, Ganapathy, Coimbatore,  
Tamil Nadu 641006, India  
ravi@threatenedtaxa.org & ravi@zooreach.org

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