



TAXONOMY, IUCN ASSESSMENT AND *EX-SITU* CONSERVATION OF *GARCINIA DHANIKHARIENSIS* (CLUSIACEAE): AN ENDEMIC TREE SPECIES OF ANDAMAN AND NICOBAR ISLANDS, INDIA

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ABSTRACT: *Garcinia dhanikhariensis* S.K. Srivastava is an edible fruit yielding tree species native to the Andaman Islands. Its potential as a food crop has not been properly explored in the Islands due to a lack of proper studies. The species has been confined to the South Andaman Islands and known by limited number of individual plants in the wild and few herbarium collections. Considering the rarity and the probable cause of threats, this species has been assessed as Critically Endangered (CR) according to IUCN Guidelines. The species has been effectively propagated through the process of seed germination and reintroduced into its natural habitat as part of ex-situ conservation.

Keywords: *Garcinia dhanikhariensis*, Conservation Mapping, IUCN Red List Assessment.

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INTRODUCTION

Garcinia L. is a widely recognized genus in the family Clusiaceae, for it has significant economic importance as a source of edible fruits. The genus is represented by 250 species in the world (Rogers and Sweeney, 2007; Sweeney, 2008; Sharma *et al.* 2013; Nimanthika and Kaththriarchi, 2010), and in India by 43 species (Anderson, 1874; Maheshwari, 1964; Singh, 1993; Srivastava, 1994; Singh, 2020). In the Andaman and Nicobar Islands,

there are 17 species, including 7 endemics such as *G. andamanica* King, *G. cadelliana* King, *G. calycina* Kurz, *G. dhanikhariensis* S.K. Srivastava, *G. kingii* Pierre ex Vesque, *G. kurzii* Pierre, and *G. microstigma* Kurz (Hazra *et al.* 1999; Sinha, 1999; Pandey and Diwakar, 2008; Singh *et al.* 2014, 2021; Murugan *et al.* 2016; Purohit and Vivek, 2022; Purohit *et al.* 2023). However, in terms of taxonomy, population distribution and economic potential, the genus remains poorly studied in the

Andaman and Nicobar Islands.

Garcinia dhanikhariensis is an evergreen tree characterized by a thick upper canopy, and drooping lower branches. This species was first described by S.K. Srivastava in 1994, based on a single specimen [S.K. Srivastava 21068 (CAL and PBL)] collected from the Nayashahar forest in the Dhanikhari area of South Andaman Island. According to the author, single plant of the species was known to occur in the Islands. The specific epithet '*dhanikhariensis*' was given in reference to its type locality. Furthermore, the species has not been documented in any other part of the Islands nor has it been the subject of further research. Recently, two studies were published regarding seed germination and fatty acid content (Bohra *et al.* 2021) and leaf anatomy (Devi and Jayakumar, 2022). However, its taxonomy, distribution, population size, and economic potential remain poorly understood. The present authors identified 20 individual plants of this species while working on endemic plants of the Andaman and Nicobar Islands during the years 2019 to 2023. These plants were found distributed in and around the type locality at Nayashahar, with a few individuals cultivated in the Chouldhari area, nearly 12 km from the type locality. Considering the previous occurrence data and the present record, the Red List assessment was carried out using the IUCN Guidelines (2012; 2024).

TAXONOMIC TREATMENT

Garcinia dhanikhariensis S.K. Srivast. Nordic J. Bot. 14: 51. 1994 (Fig. 1 and 2).

Type: India, Andaman and Nicobar Islands, South Andaman, Nayashahar Forest, ± 30 m, 18.01.1992, S.K. Srivastava 21068 (holo CAL0000005835!, iso PBL0000000016!).

Evergreen tree, c. 8 m high. Bark greyish to black, old ones flaked; exudation milky; crown

pyramidal with horizontal spreading branches. Branchlets warty at nodes, brown when dry, glabrous. Leaves 9 – 14 × 3 – 5 cm, opposite, elliptic or elliptic-lanceolate, apex acuminate, base cuneate, margin entire, thinly coriaceous, upper surface slightly glossy, lower rather dull; midrib prominent beneath; lateral nerves 9 – 12 pairs, obscure above, visible beneath; petiole c. 5 mm long, channelled. Male flowers 1.2 cm across, solitary or in fascicles of three, actinomorphic, red in colour, bracteolate; bracteoles 2, ovate, mucronate, attached at the base of the sepal; pedicel 5 – 6 mm long. Sepals 4, 3 – 4 mm long, jointed at the base, imbricate, persistent, fleshy, glabrous. Petals 4, 5 – 7 × 4 – 5 mm, oblong, broadly ovate, obtuse, crimson-red, glabrous. Stamens 12 in 4 bundles of 3 stamens each, 3 – 4 mm long, staminal bundles opposite to sepals, anthers dithecos, introse, unilocular, dorsifixed; filament 2 – 3 mm long. Ovary globose, c. 5 mm diam., 5-locular; style sessile; stigma of the rudimentary pistil with 6 – 7 radiating lobes. Berry subglobose, 2.5 – 5 cm in diam., reddish to purplish when ripe, sepals persistent, pulp is yellowish.

FLOWERING AND FRUITING

January–April.

SPECIMENS EXAMINED

Andaman and Nicobar Islands: South Andaman, Nayashahar Forest, Dhanikhari Experimental Garden, South Andaman,

January 01, 1992, S.K. Srivastava 21068A, 21068B and 21068C (PBL).

HABITAT

Growing in the mixed evergreen forest, between 10 – 30 m elevations, associated with *Dillenia andamanica* C.E. Parkinson, *Pterocarpus dalbergioides* Roxb. ex DC., *Garcinia cowa* Roxb. ex DC., *Bauhinia* sp., *Melastoma malabathricum* L., *Dillenia pentagyna* Roxb., *Knema andamanica* (Warb.) W.J. de Wilde, *Ixora* sp., *Grewia calophylla* Kurz ex Mast., etc.

DISTRIBUTION

India; Andaman and Nicobar Islands: South Andaman, Nayasarah, Chouldhari. Endemic.

RED LIST ASSESSMENT

Garcinia dhanikhariensis is endemic to Andaman and Nicobar Islands where it has been confined into two localities in South Andaman. The species has been observed in profuse flowering and fruiting in its natural habitats as well as in *ex-situ* condition. It has a high seed setting rate, with all fallen fruits germinating under the mother tree. However, the seedlings that grow under the mother plants do not survive once they reach a height of 15 to 30 cm. The fruit is edible and have a sour-sweet taste. We did not observe any mammals or birds involved in seed dispersal. The tree is characterised by a straight and robust trunk, which is often cut down for the construction of huts and various other uses. These activities pose significant threats to its

population expansion. Presently, the species is surviving with a total of 20 individual plants located in the Nayasarah forest at Dhanikhari area, as well as at Chouldhari area which are adjacent to each other in South Andaman. Considering this narrow distribution, both of its distribution ranges are considered as a single location. The EOO and AOO have been calculated using the Geocat online software as 100 km² and 50 km² respectively (Fig. 3, 4). The Criteria B and C of the IUCN Guidelines (2012; 2024), have been applied and the threat status of the species has been assessed as 'Critically Endangered' [CR B1ab (ii,v); C2a (i)].

CONSERVATION STRATEGIES

Garcinia dhanikhariensis has significant potential for domestication and commercialization as a fruit crop in the Andaman and Nicobar Islands. However, its natural habitat is highly confined and under various threats which required proper conservation management. The species survives in shallow soils at lower altitudes and prefers shaded habitat. Despite its profuse flowering and fruiting, the population multiplication rate is slow due to the absence of effective seed dispersers and a low survival rate of germinated seeds in their natural habitat. Therefore, the authors attempted an effective approach for mass propagation of seedlings in polybags. Seeds were collected from fully ripened fruits. Approximately 500 seeds of this species were sown in polybags,



Fig. 1. *Garcinia dhanikhariensis*: (A) habit; (B) Flower; (C) Leaf; (D) Buds; (E) Fruits; (F) Seeds; (G) to (J) saplings developed in Garden through seeds germination (photos: C.S. Purohit).

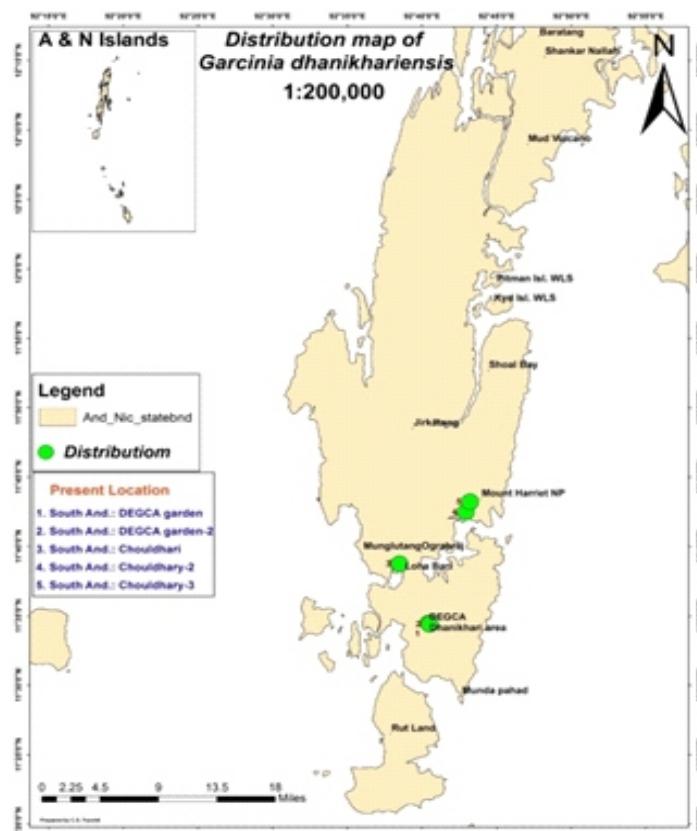


Fig. 2. Map showing the occurrence and distribution of *Garcinia dhanikhariensis* in Andaman & Nicobar Islands (prepared @C.S. Purohit).

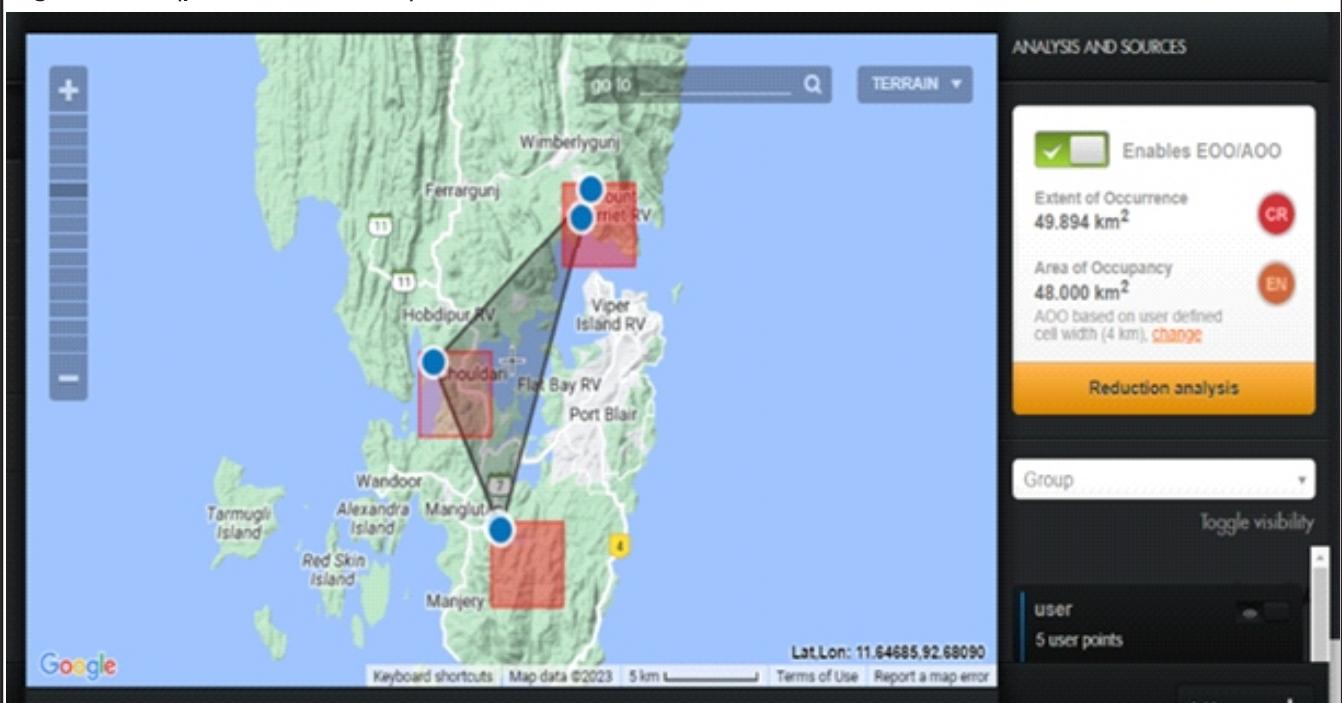


Fig. 3. Convex hull of occurrence points for analysis of EOO and AOO using GeoCat.

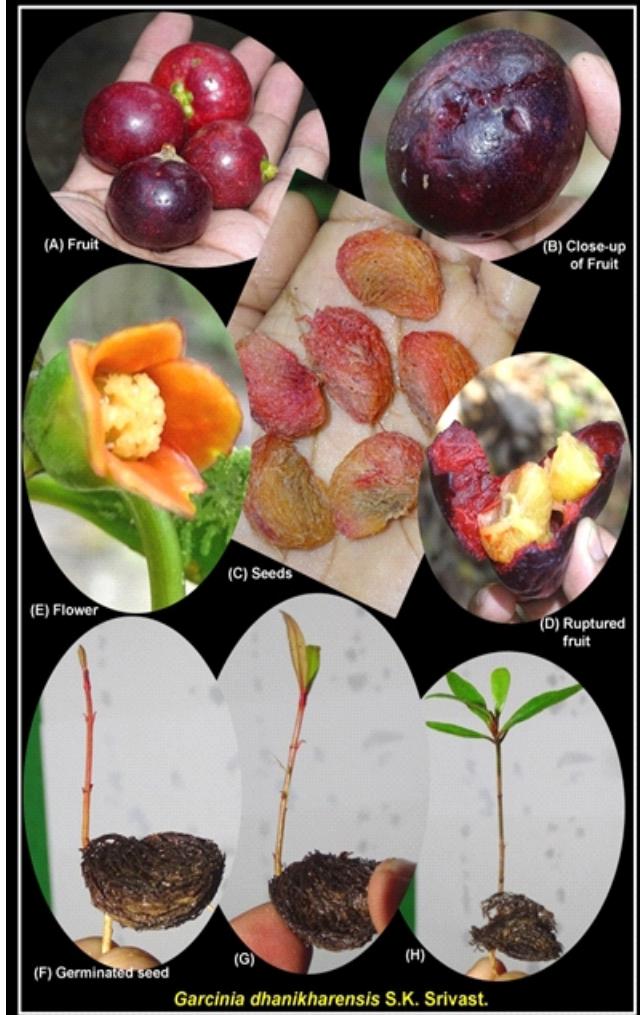


Fig. 6. Flower, Fruits and young seedlings of *Garcinia dhanikhariensis* at DhanikhariBotanical garden, Port Blair (Photo: C.S. Purohit)

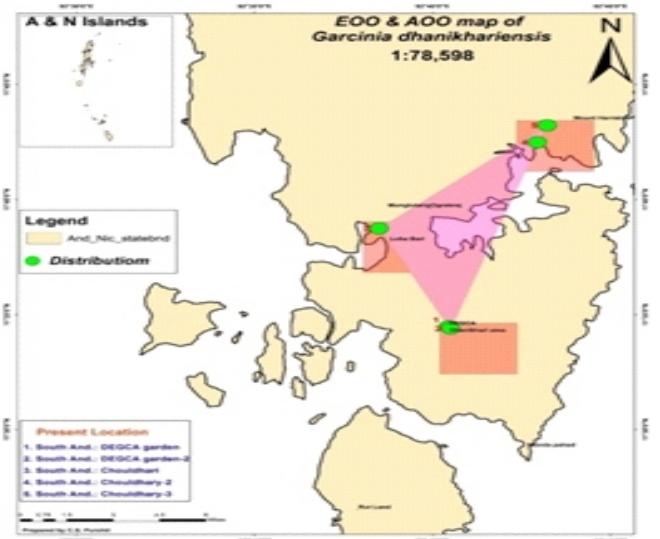


Fig. 4. Map showing EOO (Extent of occurrence) and AOO (Area of Occurrence) of *Garcinia dhanikhariensis* in Andaman Islands (Prepared@C.S. Purohit).



Fig. 5. Ex-situ conservation of *Garcinia dhanikhariensis* at Dhanikhari Botanical garden, Port Blair (Photo: C.S. Purohit).

Table 1. Locations of *Garcinia dhanikhariensis* (based on present survey)

SN	Location	Collection place	GPS coordinates	Date
1.	South Andaman	DEGCA, Nayasarah	92.6740555; 11.5748000;	19.02.2021
2	South Andaman	Chouldhary-1	92.715622; 11.70811;	12.12.2021
3	South Andaman	Chouldhary-2	92.885622; 11.77811;	12.12.2021

Table 2. Locations of *Garcinia dhanikhariensis* (based on previous herbarium collections/literature)

SN	Location	Collection place	Date	Collection/Col. No.	Herbarium
1	South Andaman	DEGCA, Nayasarah	18.01.1992	S.K. Srivastava 21068A	PBL-19802
2	South Andaman	DEGCA, Nayasarah	18.01.1992	S.K. Srivastava 21068B	PBL-19803

and the germination rate was monitored at the Dhanikhari Experimental Garden cum Arboretum of the Botanical Survey of India, Andaman and Nicobar Regional Centre (see Fig. 1, 5 and 6). By this method, over 450 seedlings of the species have been successfully germinated in the Garden. Some of these seedlings have been transplanted in the Garden itself and rest have been distributed to the different research organisations, forest department and farmers of Andaman and Nicobar Islands.

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