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Identity of *Ficus amplocarpa* and *F. guttata* (Moraceae), the two closely allied south Indian endemic species and their conservation status

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Abstract

Identity of two closely allied endemic *Ficus* species namely *F. amplocarpa* Govind. & Masil. and *F. guttata* (Wight) King from southern India are discussed here along with key, updated nomenclature, conservation status, and photographs. In addition, the placement of *F. guttata* in subgenus Synoecia, non-existence of *F. laevis* Blume in peninsular India and author attribution of *F. guttata* are clarified.

Keywords: Conservation, *Ficus amplocarpa*, *F. guttata*, *F. laevis*, Synoecia

Introduction

The genus *Ficus* L. (Moraceae) is distributed in the tropical and subtropical regions of the world, especially in Indo-malesia, Australia, Africa and Americas with *c*. 735 species in 6 subgenera, viz., Urostigma, Pharmacosycea, Sycomorus, Sycidium, Synoecia and Ficus (Berg & Corner, 2005). In India, it is represented by 91 species and 24 infra-specific taxa, distributed mainly in North-eastern states, peninsular region and Andaman and Nicobar Islands (Chaudhary *et al*., 2012), of which 10 taxa are endemic. *Ficus amplocarpa* Govind. & Masil. and *F. guttata* (Wight) King are scandent root climbers appearing morphologically very similar and distributed chiefly in Western Ghats of Kerala, Tamil Nadu rarely in Karnataka at above 800 m elevation.

Taxonomic Treatment

Miquel (1848) and Wight (1853) described Pogonotrophe *macrocarpa* Miq. and *Covellia guttata* Wight, respectively. King (1887–88) transferred both these names to the genus *Ficus* (*F. macrocarpa* and *F. guttata*). Corner (1960, 1965) reduced *F. macrocarpa* to a variety of *F. laevis* Blume and also synonymised *F. guttata* under this variety. Later, Govindarajalu & Masilamoney (1982) reinstated *F. macrocarpa* with a new name *F. amplocarpa* as the former was a later homonym of *F. macrocarpa* Blume (1823), and treated *F. guttata* as a distinct species. Eventhough, they differentiated these two species based on morphological and anatomical characters, yet there are confusions in their precise identification in the field as well as in herbarium specimens.

King (1887–88) placed *F. macrocarpa* and *F. guttata* in the section Neomorphe (now it is a subsection of subgenus Sycomorus) based on their dioecious and cauliflorous habit. Corner (1960) classified them under a subgenus Ficus section Rhizocladus. Govindarajalu & Masilamoney (1982) placed them under section Neomorphe without any note on their subgeneric status. More recently, Chaudhary *et al.* (2012) positioned *F. amplocarpa* (= *F. laevis var. macrocarpa*) under subgenus Synoecia and *F. guttata* under subgenus Sycomorus. However, the present micro- and macro-morphological studies strongly suggest to place both these species under the subgenus Synoecia (section Rhizocladus, subsection Pogonotrophe) as they exhibit the characteristic features of this subgenus: root climbers, plants dioecious, stipule amplexicaulis and basal bracts 3 in a whorl and absence of lateral bracts on fig.

Ficus laevis Blume, a root climber morphologically allied to *F. amplocarpa* and *F. guttata* but can be distinguished by axillary and long-peduncled figs. In India, it is confined to Northeastern states, West Bengal and Andaman and Nicobar Islands. Manilal (1988) erroneously reported *F. amplocarpa* as *F. laevis* based on the collections from Silent Valley, Walakkad, Kerala (*CRS–SV* 11149, 11150,

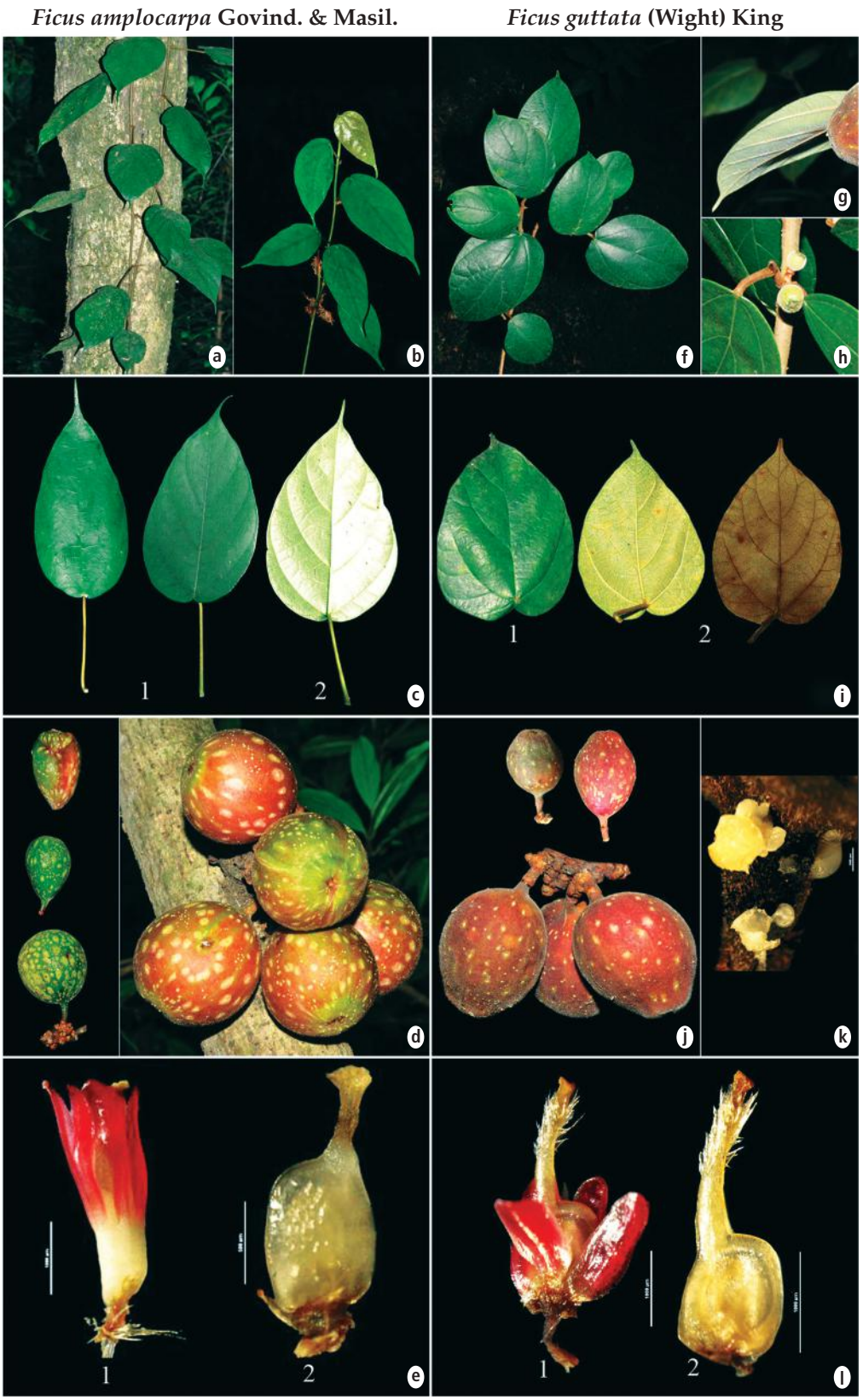

Fig. 1. a–e. *Ficus amplocarpa* Govind. & Masil.: a. Habit; b. Twig; c. Leaves (1. Adaxial surface, 2. Abaxial surface); d. Different stages of receptacles (figs); e. Female flower: 1. An entire flower; 2. Ovary with glabrous style; f–l. *Ficus guttata* (Wight) King: f & g. Twigs; h. Twig with sterile figs; i. Leaves (1. Adaxial surface, 2. Abaxial surface); j. Different stages of receptacles (figs); k. Ooze from mature figs; l. Female flower: 1. An entire flower; 2. Ovary with hairy style.

CALI!) in his *Flora of Silent Valley*. Later, Sasidharan (2004), Nayar *et al.* (2006) and Chaudhary *et al.* (2012) reported the the occurrence of *F. laevis* in Kerala. *Ficus amplocarpa* and *F. guttata* are cauliflorous species, even though they can rarely produce small, sterile receptacles on the axils of leaves (**Fig. 1h**), which often leads to misidentify it as *F. laevis*. The earlier reports of occurrence of *F. laevis* in the gardens of Bombay are incorrect, in fact, the ficus grown in the gardens is *F. hederacea* Roxb. (Lakshminarasimhan & Venkanna, 2001). Therefore, it is evident from these that *F. laevis* is not occurring in peninsular India.

Govindarajalu and Masilamoney (1982) differentiated *F. amplocarpa* and *F. guttata* based on the size of receptacles, nature of basal bracts, white blotches and hispid hairs on fig, shape of anthers, number of tepals in female flower and shape of ovary. However, the present study based on fresh and herbarium specimens housed at BSI, CAL, CALI, KFRI, MH, RHT, TBGT and XCH shows that these characters are very variable and overlapping. Therefore, a key based on unambiguous characters is provided here along with updated nomenclature and field and micro-morphological photographs for an accurate identification.

To assess the Extent of Occurrence (EOO), Area of Occupancy (AOO), and populations of these two species, extensive field surveys have been conducted from 2006 to 2015 in different hill ranges in Tamil Nadu, Kerala and Karnataka. Besides, consulted relevant literature and the aforementioned herbaria to study earlier collections. EOO and AOO were calculated using GIS software (Version 10.1). The collected data have been analysed to determine the conservation status, and necessary conservation strategies have been recommended for each species.

Key to the species

Leaves glabrous or puberulous below; style of female flowers glabrous; figs without ooze of resin at maturity. . . . . **1. F. amplocarpa**

Leaves densely to thinly tomentose or pubescent below; style of female flowers with apical hairs; figs with ooze of resin at maturity. . . . . **2. F. guttata**

1. Ficus amplocarpa Govind. & Masil., Proc. Indian Acad. Sci. (Pl. Sci.) 91: 117. 1982; Chithra in A.N. Henry *et al.*, Fl. Tamil Nadu 2: 251. 1987; T.S. Nayar *et al.*, Fl. Pl. Kerala: 433. 2006. Pogonotrophe *macrocarpa* Miq., London J. Bot. 7: 74. 1848; Wight, Icon. Pl. Ind. Orient. 6: 8, t. 1965. 1853. *F. macrocarpa* (Miq.) King, Ann. Roy. Bot. Gard. Calcutta 1: 166, t. 208. 1888 & in Hook.f., Fl. Brit. India 5: 534. 1888, non Blume (1823); Brandis, Indian Trees: 610. 1906; Rama Rao, Fl. Pl. Travancore: 384. 1914; C.E.C. Fisch. in Gamble, Fl. Madras: 1365. 1928; Vajr., Fl. Palghat: 447. 1990. *Ficus vagans* Roxb. var. *macrocarpa* Miq., Ann. Mus. Bot. Lugd.-Bat. 3: 293. 1867. *Ficus laevis* Blume var. *macrocarpa* (Miq.) Corner, Gard. Bull. Singapore 18: 7. 1960 & 21(1): 53. 1965; B.D. Sharma *et al.,* Fl. Karnataka 2: 259. 1984; C.J. Saldanha, Fl. Karnataka 1: 117. 1984; Ahmedullah & M.P. Nayar, Endemic Pl. Indian Region 2: 71. 1987; K.M. Matthew, Fl. Palni Hills 2: 1181. 1999; Sasidh., Biodiv. Doc. Kerala 6: Fl. Pl.: 440. 2004; L.B. Chaudhary *et al.,* Taiwania 57: 199. 2012; P. Singh *et al.,* Endemic Vasc. Pl. India: 207. 2015. *Ficus laevis* sensu Manilal, Fl. Silent Valley: 260. 1988, non Blume 1823.

Flowering & fruiting: September–July.

Habitat: Evergreen, semi-evergreen and shola forests, usually at elevations between 800 and 2300 m.

Specimens examined: INDIA, **Karnataka**, Chikmagalur district, Bababoodans, Kulhutty, 6000 ft, October 1908, *A. Meebold* 9379 (CAL); Ballalrayanadurga top, 8.2.1963, *A.S. Rao* 85332 (BSI). **Kerala**, Idukki district, Periyar Tiger Reserve, Uppupara, 1100 m, 20.11.1993, *J. Augustine* 12708 (CALI); Rajamalai, 22.2.1995, *K.S. Kalesh* 21226 (TBGT); Palakkad district, Silent Valley R.F., 950 m, 11.10.1965, *E. Vajravelu* 26131 (MH); Walakkad, 27.2.1983, *C.R. Suresh* 11149, 11150 (CALI); Thiruvananthapuram district, Agasthyamala, Athirumala, *c*. 1000 m, 20.10.1992, *N. Mohanan* 10778 (TBGT & CALI). **Tamil Nadu**, Coimbatore district, Vellingiri, 7th hill-top, 1700 m, 27.4.1969, *S. Karthikeyan* & *M. Chandrabose* 31802; Attakatti to Valparai way, near bend road, 1100 m, 2.12.2012, *J.V. Sudhakar* 126363 (MH); Dindigul district, Kodai hills, Pesul Malai (Perumalmalai), ±1700 m, 27.7.1965, *K.M. Sebastine (*MH); Kodaikanal taluk, 1710 m, 23.7.1984, *K.M. Matthew* 40448 (RHT); Kanyakumari district, Agasthyamalai Biosphere Reserve, Alagiapandipuram taluk, Mahendragiri, forest below Parvatham, 26.3.1999, *V.S. Manickam* 18590 (XCH); Nilgiris district, Coonoor, 6000 ft, April 1883, *J.S. Gamble* 11295; Lamb's rock shola, 5000 ft, May 1883, *J.S. Gamble* 11500; Coonoor, 6000 ft, September 1883, *J.S. Gamble* 12361 (CAL); Sispara, April 1884, *s. coll.* s.n.; Naduvattam, 6000 ft, May 1889, *J.S. Gamble* 20534; Konakarai R.F., 1800 m, 19.11.1970, *E. Vajravelu* 37026; Lamb's rock–Coonoor, 1700 m, 27.2.1972, *B.D. Sharma* 40324 (MH); Avalanchi, 4.6.1987, *N. Mohanan* 8362 (TBGT); Avalanche, near Ecotourism check post & way to Forest guest house, 2300 m, 14.7.2012, *J.V. Sudhakar* 126325, 126326; Avalanchi Ecotourism

check post to trekking shed by pass way, 2150 m, 28.8.2012, *J.V. Sudhakar* 126332; Coonoor, on the way to Lamb's rock, back of Masaniamman Kovil, 1400 m & Lamb's rock surroundings, along the stream, 1500 m, 21.9.2012, *J.V. Sudhakar* 126347, 126349; Avalanche, near fishing hut, 2036 m, 1.12.2012, *J.V. Sudhakar* 126361 (MH); Tirunelveli district, way to Naterikal, 22.9.1967, 1250 m, *E. Vajravelu* 29233 (MH); Sengaltheri–Naterikal path, 1100 m, 11.2.1983, *E. Vajravelu* 76550 (CAL & MH); Agasthyamalai Biosphere Reserve, Tirunelveli taluk, Manjolai hills, Ayyappankadu, 800 m, 10.2.1997, *V.S. Manickam* 12157; Sivagiri taluk, Sivagiri hills, Kallimalai–VIII block, 850–1100 m, 1.7.1999, *V.S. Manickam* 12157 (XCH).

Distribution: INDIA, Karnataka, Kerala and Tamil Nadu. **Endemic.**

Conservation status: This species is evaluated here as **Near Threatened (NT)** according to the IUCN Red List Categories and Criteria Version 3.1 (IUCN, 2012).

2. Ficus guttata (Wight) Wight ex King, Ann. Roy. Bot. Gard. Calcutta 1: 167, t. 209. 1888 & in Hook.f., Fl. Brit. India 5: 534. 1888, "(Wight) Kurz ex King"; Brandis, Indian Trees: 610. 1906; Rama Rao, Fl. Pl. Travancore: 384. 1914; C.E.C. Fisch. in Gamble, Fl. Madras: 1365. 1928; Fyson, Fl. South Ind. Hill Stat. 1: 542. 1932; Govind. & Masil., Proc. Indian Acad. Sci. (Pl. Sci.) 91: 118. 1982; Chithra in A.N. Henry *et al.*, Fl. Tamil Nadu 2: 254. 1987; Kesh.Murthy & Yogan., Fl. Coorg: 422. 1990; N. Mohanan, Fl. Agasthyamala: 633. 2002; Sasidh., Biodiv. Doc. Kerala 6: Fl. Pl.: 439. 2004; T.S. Nayar *et al.*, Fl. Pl. Kerala: 435. 2006; L.B. Chaudhary *et al.*, Taiwania 57: 204. 2012; P. Singh *et al.*, Endemic Vasc. Pl. India: 207. 2015. *Covellia guttata* Wight, Icon. Pl. Ind. Orient. 6: 8, t. 1966. 1853.

Flowering & fruiting: August–January.

Habitat: Evergreen, semi-evergreen and shola forests, usually at elevation ranges from 900 to 2200 m.

Specimens examined: INDIA, **Karanataka**, Chikmagalur district, Bababuden hills, Kulhutty, 6000 ft, 24.12.1893, *W.A. Talbot* 3123 (CAL & BSI). **Kerala**, Idukki district, Munnar to Bodi road, 1800 m, 25.3.1980, *K. Ramamurthy* 66373 (CAL & MH); Kottayam district, Devicolam, 5000 ft, December 1909, *A. Meebold* 13369 (CAL); Lockhert gap, 1700 m, 20.4.1964, *K.M. Sebastine* 18343; Lower Vaguvarai–Devicolam, 1875 m, 5.2.1970, *B.V. Shetty* 33421 (MH). **Tamil Nadu**, Coimbatore district, surrounding Waverly estate–Anamalais, 1333 m, 10.3.1961, *J. Joseph* 12312 (MH); Vellingiri hills, 1500 m, 20.12.2004, *M. Murugesan* 1092 (Kongunadu Arts and Science College Herbarium, Coimbatore) Dindigul district, Pulneys, Makkalampatti shola, 7.6.1897, *A.G. Bourne* 327 (MH); Kodaikanal taluk, Shembaganur, Prakasapuram, Monica's forest, Moon-lit bar, 1650 m, 6.5.1985, *K.M. Matthew* 41306 (RHT); Kanyakumari district, way to Nalumukku, Upper Kodayar, 1300 m, 18.3.1981, *A.N. Henry* 70325 (MH & CAL); Left flank Saddle No. 2, Upper Kodayar, ±1300 m, 16.2.1983, *A.N. Henry* 77008 (MH); Nilgiris district, Naduvattam, Gudaluru ghat, September 1883, *s. coll.* s.n.; Coonoor ghat, May 1884, *s. coll.* s.n.; Pykara falls, May 1885, *s. coll.* s.n. (MH); Coonoor ghat, November 1889, 5000 ft, *J.S. Gamble* 22541 (MH & CAL); Coonoor, 10.7.1896, *Bourne* s.n.; Konakarai, 1600 m, 15.5.1970, *E. Vajravelu* 38400; Shola near Curzon estate, 1925 m, 22.7.1970, *E. Vajravelu* 35010; Kukal shola, 1500 m, 3.12.1970, *G.V. Subba Rao* 37442; Avalanche trout, 2000 m, 27.12.1970, *B.V. Shetty* 37613; Carrington, 1975 m, 3.1.1971, *B.V. Shetty* 37690; Kodanad, 1850 m, 27.1.1972, *E. Vajravelu* 39645; Coonoor, on the way to Lamb's rock, right side of 2 km away from Masaniamman kovil, 1800 m 21.9.2012, *J.V. Sudhakar* 126350; Naduvattam to Gudaluru way, 2 km from the Naduvattam centre, 1500 m, 21.9.2012, *J.V. Sudhakar* 126351; Naduvattam, T.R. Bazar to Terras estate, 900 m, 30.11.2012, *J.V. Sudhakar* 126359; on the way to Lamb's rock, 2 km from Koil, 1800 m, 16.12.2012 & 14.8.2013, *J.V. Sudhakar* 126378 & 120013 (MH); Tirunelveli district, Mahendragiri, 17.9.1916, *s.coll.* 13154; Naterikal, 23.9.1916, *s.coll.* 13154; Naterikal to Sengalteri, 26.9.1916, *s.coll.* 13648; Valayar forest, 13.7.1976, 1000 m, *P. Bhargavan* 47487 (MH).

Distribution: INDIA (Karnataka, Kerala and Tamil Nadu) **Endemic.**

Conservation status: This species is categorized here as **Endangered [EN B2ab (i,ii,iv)]** according to the IUCN Red List Categories and Criteria Version 3.1 (IUCN, 2012). Distribution of this species is restricted to limited habitats with a few mature individuals. An attempt to locate this species from some of its earlier collections was futile. Primarily this species is threatened due to habitat conversion for the cultivation of tea, coffee and vegetables. Hence, a focused conservation programme is essential.

Conservation steps

As part of *ex-situ* conservation, these two species have been introduced in Tamil Nadu Forest Department's Ficatorium, Sirkarpathy in Anamalais, and in Brookhampton Medicinal Plant

Garden, Ooty. The biological significance and need for conservation of these species have also been explained to local communities and forest personnel.

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