



BIOGEOGRAPHICAL CONSTRAINT OF SOME INDO-SRI LANKAN SPECIES FROM THE TROPICAL DRY EVERGREEN FOREST OF TAMILNADU, INDIA

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ABSTRACT

The botanical survey was carried out in Hillocks, Reserve Forest, Sacred Groves and Unclassified Vegetations during 2006 to 2013 from three coastal districts of Tamilnadu viz. Chengalpet, Cuddalore, Villupuram and Union Territory of Pondicherry. This article have discussed about the disjunct nature of distribution, ecology, population status and conservation of 13 Indo-Sri Lankan species recorded in Tropical Dry Evergreen Forest from Tamilnadu, India. *Cadaba fruticosa* and *Dimorphicalyx glabellus* are recorded in red ferrallitic plains but it is not so along the Western Ghats; *Capparis rotundifolia* and *Eugenia bracteata* found to occur only from the coastal sandy soils; *Pleiospermium alatum* and *Vitex leucoxylon* from alluvial-clay soil; *Syzygium caryophyllatum* and *Vitex leucoxylon* in various soil types but only along water bodies. The remaining species have no boundaries to any edaphic and climatic factors. *Garcinia spicata*, *Miliusa eriocarpa*, *Suregada angustifolia* and *Walsura trifoliolata* shows wider range of distribution where as *Dimorphocalyx glabellus* and *Jasminum angustifolium* var. *hirsutum* shows narrow distribution. The present and published information shows *Cadaba trifoliolata*, *Polyalthia korinti*, *Syzygium caryophyllatum* and *Vitex leucoxylum* are under threat.

KEY WORDS: Disjunct Distribution, Tropical dry evergreen forest, Indo-Sri Lanka, Tamilnadu, Ecology, Population.

INTRODUCTION

Linnaeus was one of the first, to notice the relationship in the flora of the two continents during 1750. In the 18th century, Thunberg and Castialioni independently drew attention to the baffling pattern of certain plants that were common to East Asia and Eastern USA. However, Van Steens (1934) stated that no species is homogeneously distributed throughout the area where it occupies. According to Carlquist (1967) the two disjunctive areas are climatically and ecologically analogous. While studying the pattern of disjunction from north-south and east-west, there are eight outstanding discontinuities offered not by one species but several belonging to different genera and orders that gains real importance in plant-geography. Axelrod (1970), Thorne (1973) and Smith (1973) studied disjunctions between tropical countries prior to mid tertiary period of plants between tropical Africa, America and Asia. However, Carlquist (1967) ascribed that the distant dispersal occurred through birds and oceanic drift. The disjunctions are not confined to the higher plants only but also abound in lichens, mosses, liver-worts and ferns.

Important Disjunctions in India

Seshagiri Rao et al (1961) had studied the distribution of some useful tree species that are common to the tropical evergreen forest of western and eastern parts of India extending to Burma, Malaysia and Ceylon (Sri Lanka). Occurrence of Certain Himalayan taxa on the hills of South India and Ceylon, such as *Rhododendron*, *Mahonia* and *Gaultheria* is other curious disjunctions. Clarke (1898) found a possible route of Malayan species into India, notably Dipterocarpaceae, Ericaceae

(*Rhododendron*, *Gaultheria*) and *Podocarpus*; meanwhile Meher-Homji (1972; 1974) raised questions, the species of *Rhododendron* and *Mahonia* in southern India are differ with the Himalayan ones, however accepting the view of long distance dispersal during the present times.

The long discontinuity in distribution of *Acacia planifrons* that occurs in northern part of Ceylon, South India (Tamilnadu and Karnataka) and Gujarat (Meher-Homji 1970); *Capparis decidua* in Rajasthan, North Gujarat, Deccan and reappears in the extreme south-eastern part of Peninsula (Meher-Homji 1974); *Albizia amara* in southern part of peninsula and disappears over the black soils of Deccan and patchy distribution of *Hardwickia binata* in Peninsular India (Meher-Homji 1974) is a puzzle. This study aims to explore and discuss about the disjunct nature of distribution with respect to soil and climate; present population status and the conservation measures of 24 arboreal species from the Tropical Dry Evergreen Forest (TDEF) which were found along the Coromandel coastal districts. Owing to this Chengalpet, Villupuram, Cuddalore districts of Tamilnadu and Union Territory of Pondicherry were selected for the filed survey.

METHODS

Botanical enumeration was made regularly with an interval of four months to each and every site (three times in a year). During the survey species enumeration, recording flowering and fruiting period, collection of voucher samples were done systematically and the prepared herbarium sheets deposited in AURO Herbarium for future reference. Based on the published sources (Nair and Henry 1983; Henry et al 1987; Henry et al., 1989) the

distribution map (district wise) was prepared by using orange colour for the existing districts and extended distribution has shaded with green colour. All the species are provided with phenology, global and regional distribution, district wise distribution map, plant part photos and notes if any for easy understanding.

Study Area

The botanical enumeration was carried out in Hillocks (HL), Reserve Forest (RF), Sacred Groves (SG) and Unclassified Vegetations (UV) during 2006 to 2013 from three coastal districts of Tamilnadu viz. Chengalpeta, Cuddalore, Villupuram district and Union Territory of

Pondicherry (Map 1). The terrain is generally plain with eruption of hillocks in Chengalpeta district and sand stone plateau in Cuddalore district with four major rivers running through the districts and finally reaching the Bay of Bengal. Generally, the soil along the east coast is sandy loam or red ferrallitic sometimes covered with alluvial deposits. It becomes clayey in the interiors (Meher-Homji 1974; 1986). The sandy coastal plains extend up to 40-60 km (Mani 1974). Major parts of the study area (Fig. 1) lies on Cuddalore sandstone formations of Miocene period. It is overlaid by a thin layer of soil, pebbles and amorphous gravels.

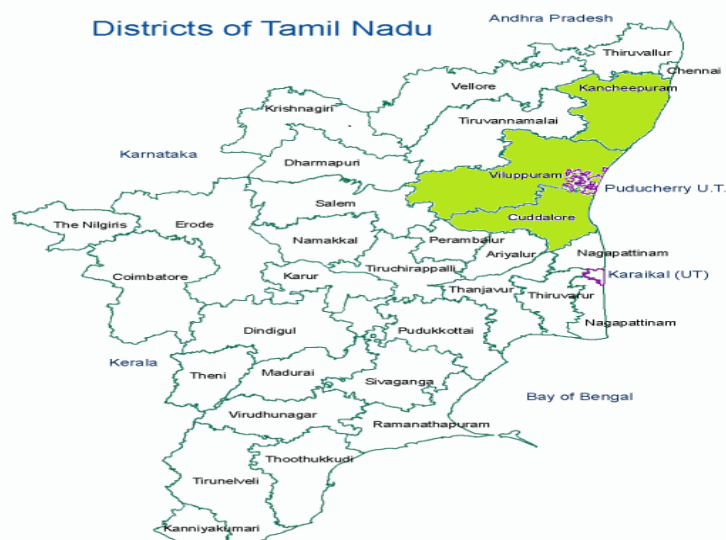


FIGURE 1. Enlarged political map of Tamilnadu state and three districts studied are shaded with green colour

Climate

A typical maritime tropical climate with a dissymmetric rainfall regime prevails in the study area. The weather is generally humid and hot for most part of the year with only minor variations. North-East monsoon constitute the principal rainy season accounting 60-80 % of the total rain fall and south-west monsoon contributes 20 %. The mean annual rainfall during 1990-2010 periods was 1428 mm with mean rainy days of 57.5 per year. The minimum temperature was 17.7 °C in January and the maximum was 40.5 °C in May. The average relative humidity is 74 %. The weather is generally cool during December-February and the late nights are dewy. Dry weather prevails during March-June. Wind speed ranges from 5.0 km/hour in June-July and 9 km/hour in August-September but not during the cyclonic days.

ENUMERATION

Cadaba trifoliata (Roxb.) Wight & Arn. Prodr. Fl. Ind. Orient. 24. 1834; Hook. f. Fl. Brit. India 1: 1872; Gamble, Fl. Madras 1: 42 (31), 1915; Matthew Fl. Tamilnadu Carnatic, part 1: 37, 1983. *Stroemia trifoliata* Roxb. Fl. Ind. 2: 79, 1832. *Cadaba triphylla* Wight in Hook. Bot. Misc. 3: 296, suppl. t. 37. 1833. CAPPARACEAE. Tamil name: Purna, Viluti. (Fig. 2).

Gregarious shrub to 2 (3) m. Leaves trifoliate; leaflets obovate, 3-6 x 1-3 cm, base cuneate, margin entire, apex acuminate; petiole 1.5-3 cm; petiolule 3 mm. Corymbs

terminal and /or axillary, to 6 cm; pedicel 2-4 cm. Flowers 4 cm across; sepals 4, 2-3 x 1-1.5 cm; petals 2, greenish to cream, suborbicular, 5.5 x 3 cm; claw 2.5 cm; disc spathulate, to 1.5 cm; androphore 0; stamens 2+4, filaments reflexed, to 2.5 cm, anthers linear, 4-6 mg; gynophore to 4.5 cm. Berry red, 7 x 0.5 cm.

Phenology: Flowers: February – March; Fruits: March – April.

Distribution: Peninsular India and Sri Lanka (Hook.f. *l.c.*). In Tamilnadu: Coimbatore, Cuddalore, Kanniyakumari, Madurai, Pudukkottai, Ramanathapuram, Salem, Tiruchi and Tirunelveli.

Specimen examined: Cuddalore District: Pudur, 35 m, 17.07.2002, WFG 3644 (flower & fruit); Kapper Hill, 12.12.2001, WFG & KMM 3399 (flower); T. Pudhupalaaym, 24.06.1999, PB & WFG 12360 (flower & fruit); 20.08.1997, NB, PB & WFG 0455 (flower & fruit); Kulanthaikuppam, 11.06.1997, NB, PB & WFG 0455 (flower & fruit)

Note: Only two isolated populations seen: one at Tiruchi and another at Capper hill, Cuddalore, near the Coast (Matthew *l.c.*). Though this Indo-Sri Lankan element shows wider distribution in Tamilnadu but very few individuals was recorded from the study site. In addition younger generation has not recorded during the survey for the last 2 decades; the estimated range of distribution is 2000 km² and the area of occupancy 20 km². This information implies that the species is under the verge of extinction.

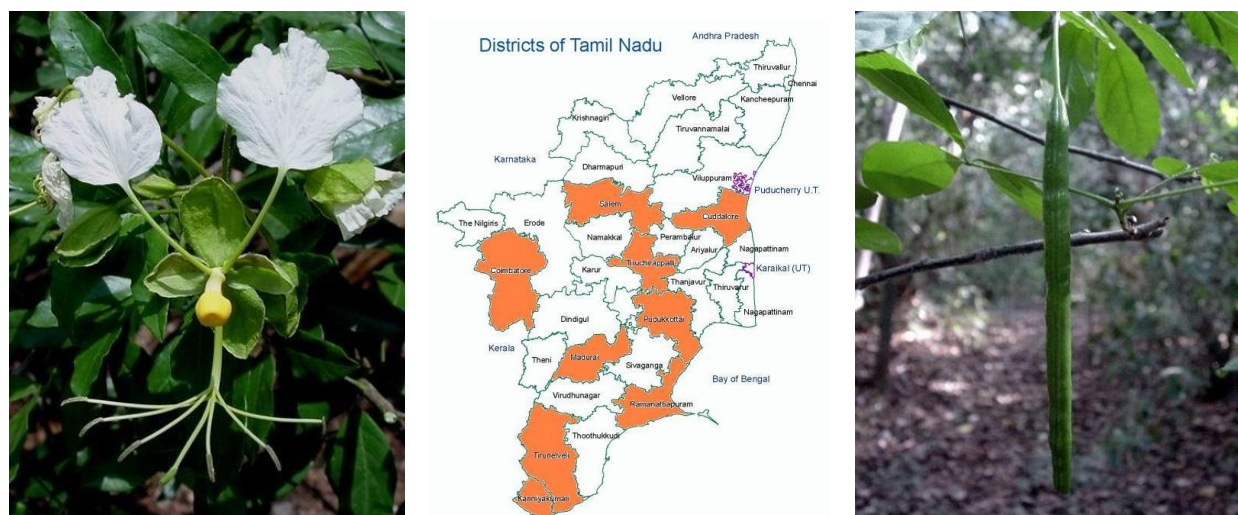


FIGURE 2. *Cadaba trifoliata* flowering branch, distribution map and young fruit

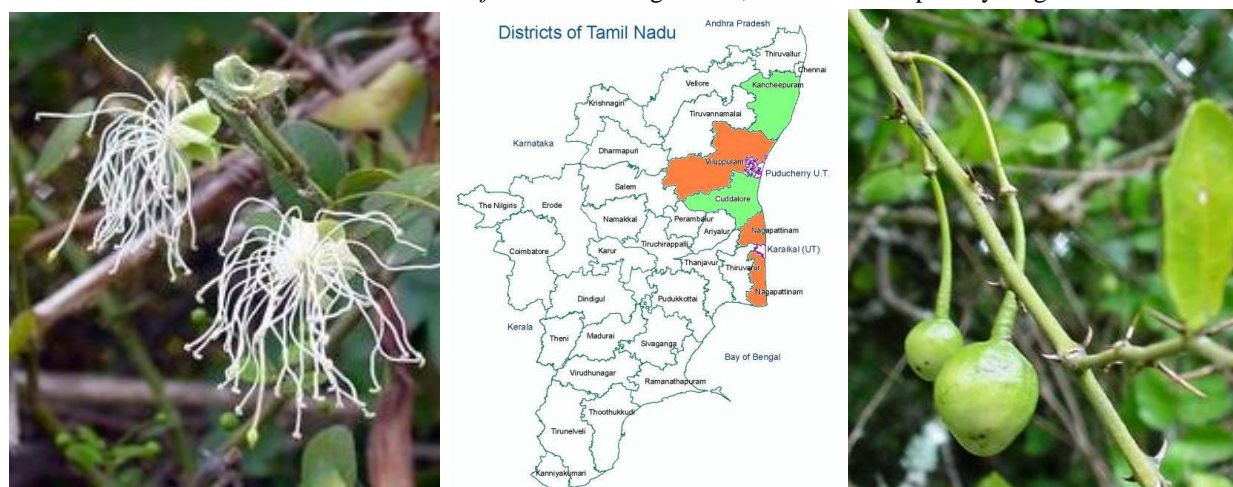


FIGURE 3. *Capparis rotundifolia* flower, distribution map and young fruiting branch

Capparis rotundifolia Rottler, Neue. Schr. Ges. Naturf. Fr. Berl. 4: 185. 1803. *C. pedunculosa* Wallich ex Wight & Arn., Prodr. 27. 1834; Hook.f. & Thomson in Fl. Brit. India 1: 176. 1872. *C. longispina* Hook.f. & Thomson, l.c. 1: 176. *C. orbiculata* Hook.f. & Thomson, l.c. 176. CAPPARACEAE. Tamil name: Thoratti. (Fig. 3).

Shrubs, erect or scandent, 2-5 m tall, with dense rounded crown; twigs pubescent, early glabrescent; stipular thorns reddish, dimorphic. Leaves bifarious, closely placed, suborbicular to ovate-rotundate, cordate at base, acute, obtuse, retuse, mucronate at apex, 1-4.5 x 0.8-3 cm, subcoriaceous, glabrous above, pubescent beneath; lateral nerves 3-6 pairs, obscure. Flowers white or greenish white, 8-12 mm across, in few flowered umbels or sub-umbels on lateral 4-15 mm long peduncles. Sepals imbricate, reflexed, glabrous or puberulous. Petals very thin, Stamens 28-40, exserted; gynophore filiform, slightly thickened near tips. Fruits ovoid-globose, smooth, stripe slender; seeds solitary.

The stipular thorns and leaves are highly variable, short or recurved or long, straight and acicular with small subsessile, cordate and mucronate-tipped leaves (Jacob 1965)

Phenology: Flowers: January-February; Fruit: February-May.

Distribution: India (Maharashtra, Andhra Pradesh, Goa, Karnataka, Tamilnadu and Pondicherry) and Sri Lanka. In

Tamilnadu: Point Calimere in Tanjore (Nagai district) and Villupuram (Ravikumar *et al* 2004) already exists. Kanchipuram and Cuddalore is an addition from this study.

Specimen examined: Cuddalore District: Sendirakillai, 12 m, 28.07.2004, WFG & NB 10556 (fruit); Chinnakumati, 27.08.2003, WFG & NB 9126 (fruit). Kanchipuram District: Muttukadu Sathram, , 18.02.2004, WFG 10217 (flower). Villupuram District: Oorani, 01.07.2000, KMM & WFG 3153 (fruit); 25.08.1999, JDH, WFG & NB 5522 (Flower).

Note: Ravikumar, Udayan & Subramani (2004) had written a detailed note on the distribution of this plant from southern India. As per the rapid assessment workshop on conservation of TDEF conducted at Auroville during 2002 has recorded around 250 mature individuals at the range of 2000 km² from the Coromandel Coast of Tamilnadu. However the recent studies show that the area has extended so as the regeneration and population status of this plant is yet to be studied.

Dimorphocalyx glabellus Thw., Enum. Pl. Zeyl. 278. 1861; Beddome in Trans. Linn. Soc. 25: 225, t. 26 (excl. ff. 10-12). 1865; Hook.f. Fl. Brit. India 5: 403. 1887; Chakra & Balak. Crotonoideae In: Fl. Ind. vol. 23: 222, Eds. Balak *et al.*, 2012. *Croton glabellus* B. Heyne in Wall. Cat. 8012. 1847, nom nud. (non L. 1753). ***Dimorphocalyx lawianus*** Hook.f. Fl. Brit. India 5: 404.

1887. EUPHORBIACEAE. Tamil name: Kalpottan, Malaikulukki. (Fig. 4).

Shrub to Small tree, to 5 m tall, dioecious, sometimes monoecious; branchlets terete, striate, smooth. 4.5-12 x 2-4 (-5) cm, oblong-obovate or oblanceolate and elliptic, obtuse-acute, often cuneate, at base, crenate or serrate-entire, bluntly acuminate, acute or often obtuse-rounded or cuspidate, thinly coriaceous-chartaceous. Male flowers in axillary, solitary or umbellately 2 to 3 flowered or in few branched cymes, stamens 10-11. Female flowers axillary and terminal, solitary to few, in umbellate 4 mm long racemes. Capsule 7-10 x 10-12mm, subglobose, ochraceous-puberulous. Fruiting sepals relatively smaller, 5-12 (-16) x 3-10 mm, equal or subequal. *Phenology*: Flower & Fruit: January-December. *Distribution*: India (Orissa, Andhra Pradesh, Maharashtra, Kerala and Tamilnadu) and Sri Lanka. In Tamilnadu: Coimbatore and Tirunelveli. Cuddalore and Villupuram is an addition from this study.

Specimen examined: Cuddalore District: Varakkalpattu, 10 m, 08.12.2004, WFG & NB 11366 (fruit); 11.12.2002, WFG & NB 4193 (flower & fruit); T.Pudhupalayam, 28.05.2003, WFG & NB 8351 (flower & fruit); Suriyanpet, 01.10.1999, AG F7343 & F7346 (flower & fruit); 01.07.1998, JDH, PB & WFG 2754 (fruit); 27.05.1998 GB, JDH & WFG 2751 (flower); 30.09.97, NB 0480; Villupuram District: Marakkanam RF, 10 m 24.06.96, JDH, PB & WFG 02946 (flower); 17.05.95 JDH, PB & WFG F02792 (flower & fruit); 05.05.95, JDH, PB & WFG F02758 (flower); 08.07.94 WFG 5146 (flower).

Note: Recorded as scarce, up to 900 m elevation, only in evergreen forests of Western Ghats. However, based on our recent field survey far the last 2 decades this plant has restricted only in 3 sacred groves and within a radius of 3 km². In Tamilnadu the distribution is vary par apart and the decline rate is more than 50 % from the groves due to cuttings and looping for fencing and fire woods.



FIGURE 4. *Dimorphocalyx glabellus* flower, distribution map and fruiting branch



FIGURE 5. *Eugenia bracteata* flowering branch, distribution map and ripe fruit

Eugenia bracteata (Willd.) Roxb. ex DC. Prodr.3: 264.1828; Roxb. Fl. Ind. 2: 490. 1832; Wight & Arn. Prodr. fl. Ind. Orient. 331. 1834; Wight, Ill. Ind. Bot. t. 13. 1840; Hook.f. Fl. Brit. India 2: 502. 1879; Gamble, Fl. Madras 1: 484 (342).1919; Matthew, Ill. Fl. Tamilnadu Carnatic t. 269. 1982 & Fl. Tamilnadu Carnatic vol 3 (1): 592. 1983. *Myrtus bracteata* Willd. Sp. Pl. 2 : 969. 1799.

Eugenia willdenowii Wight Icon. Pl. Ind. Orient t. 545. 1842. *Syzygium ruscifolium* (Willd.) Santapau & Waugh, Bull. Bot. Surv. India 5: 109. 1963. *Myrtus ruscifolia* Willd. Sp. pl. 2: 970. 1799. MYRTACEAE. Tamil name: Kayaa. (Fig. 5).

Shrub or small tree up to 6 m tall; leaves opposite decussate, ovate or elliptic, 2-7 x 1.5-3.5 cm,

subcoriaceous, nerves 10-12 pairs, glabrous, base cuneate, margin entire, apex obtuse or acute. Flowers white, axillary, cyme 2- flowered. Fruit globose, orange-red when ripe, 8 x 7 cm diameter, crowned with calyx-lobes; seeds 1 or 2.

Phenology: Flower: April-May; Fruit: Throughout the year.

Distribution: Peninsula, Sri Lanka (Hook.f. *l.c*). In Tamilnadu: Coimbatore, Kanchepuram, Kanniyakumari, Theni, Thiruvallur, Tirunelveli. Salem and Dharmapuri (Matthew *l.c*). Cuddalore and Villupuram is an addition from this study.

Specimen examined: Kanchepuram District: Mugaiyur, 5 m, 21.07.2004, WFG & NB 10518 (fruit); 21.12.2002, WFG & NB 4482 (flower); Kadapakkam, 21.12.02, WFG & NB, 4596 (flower & fruit). Villupuram District: Marakanam, 25.07.2003, WFG & NB 8786 (fruit) & 8781 (flower); Oorani, 5 m, 19.12.2002, WFG & NB, 4320 (flower & fruit); Puthupet, 5 m, 04.09.1996, JDH, PB & WFG, F 5612 (flower); Kommetichavadi, 5 m, 29.12.1995, JDH, PB & WFG, F 5499 (flower).

Note: This Indo-Sri Lankan species found as common along the coast but it is represented only in 6 out of 13 coastal districts. It is one of the pioneer species along the transition zone between the Neidhal and Marutham land as mentioned in the Tamil Sanga literatures and a very stabilizer of the sand dune.

Garcinia spicata (Wight & Arn.) Hook.f. in J. Linn. Soc. Bot. 14: 486. 1785; Gamble 1: 74 (53). 1915.

Xanthochymus spicatus Wight & Arn. Prodr. 102. 1834. ***Garcinia ovalifolia*** Hook.f. var. *spinuta* (Wight & Arn.) T. And. In Hook.f. Fl. Brit. India 1: 269. 1874. CLUSIACEAE. Tamil name: Perettai. (Fig. 6).

Plant dioecious. A moderate sized evergreen tree, branches angular. Leaves coriaceous. Broadly elliptic-oblong, apex obtuse or retuse. Flowers unisexual, male and female often mixed in one fascicle, but usually the female are fascicled and the males often spiked. Berry oblong, smooth, dark green; seed 1-3.

Phenology: Flower: December-February; Fruit: March-July.

Distribution: India (Assam, Meghalaya, Orissa, Andhra Pradesh, Maharashtra, Karnataka, Tamilnadu and Kerala) and Sri Lanka. In Tamilnadu: Coimbatore, Cuddalore, Kanchepuram, Nilgiri, Pudukkottai and Villupuram.

Specimen examined: Cuddalore District: Kothattai, 25.06.2003 WFG & NB 8662 (fruit); Suraiyanpet, 20 m, 28.05.2003, WFG & NB 8355 (fruit); 27.05.98, GB, JDH, & WFG, F6621 (flower). Kanchepuram District: Kunnathamman kovil, 23.04.03 NB 8505 (flower & fruit); 14.08.02 WFG 3800; Villupuram District: Kurumbaram 16.04.03, NB 8502 (fruit); 09.06.95, JDH, PB & WFG F 02828 (flower); 05.05.95, JDH, PB & WFG F 02757 (flower). Pondicherry (UT): Manapattu, 30.04.03, NB 8556 (flower & fruit).

Note: The distribution is very scattered both in the state as well as in the country.

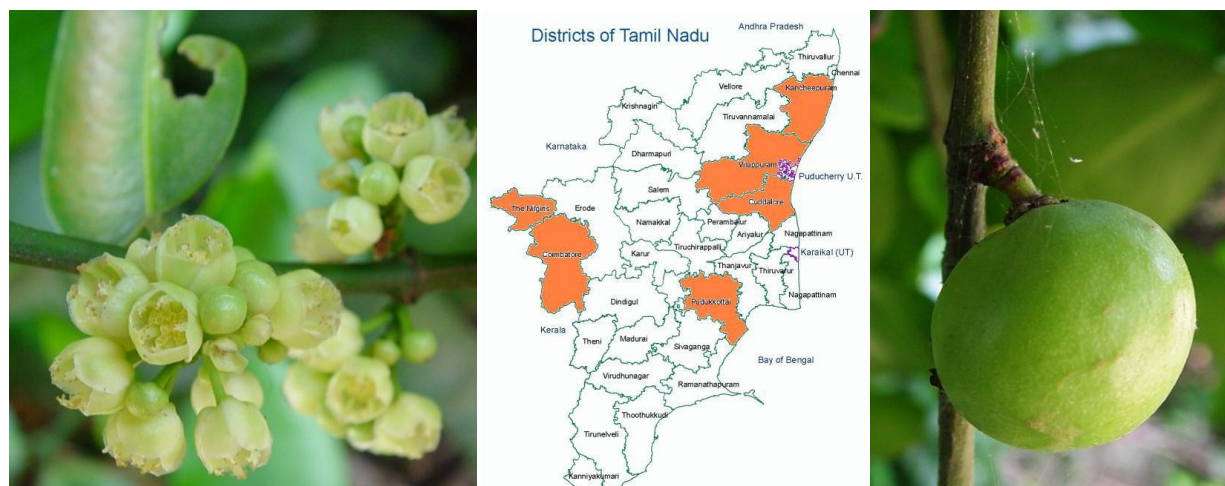


FIGURE 6. *Garcinia spicata* male flowers, distribution map and young fruit

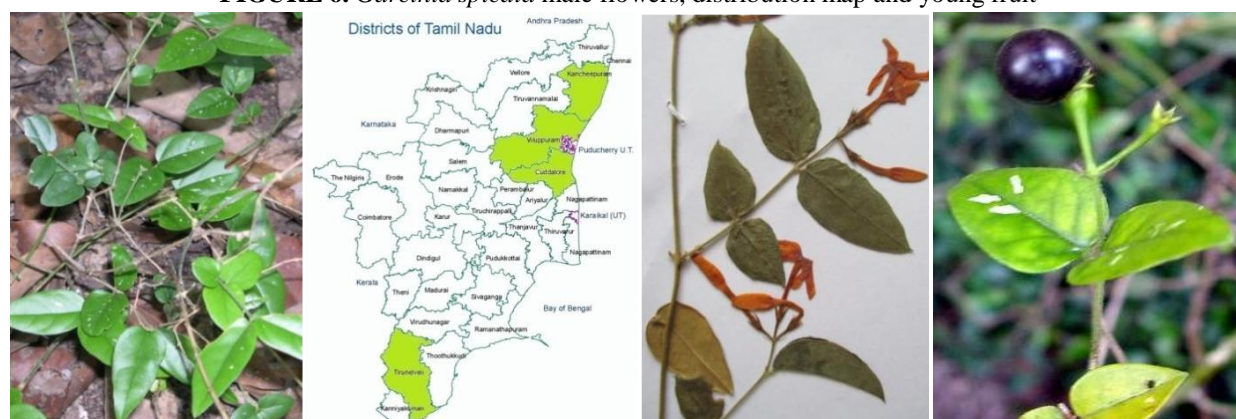


FIGURE 7. *Jasminum angustifolium* var *hirsutum* habit, distribution map, flowering and fruiting branch

***Jasminum angustifolium* (L.) Willd. var. *hirsutum* P.S. Green**, Kew Bull. 40: 228. 1985; Dassanayake and Fosberg, Fl. Ceylon 6: 259. 1987; Gastmans & Balach., J Econ Taxon Bot 30 (2): 365-367. OLEACEAE. (Fig. 7).

Evergreen, slender twiner, stem tomentose. Leaves simple, opposite, subcoriaceous, broadly ovate-orbicular to elliptic (1)2 – 4(6) x (0.7)1 – 2(4) cm; minutely puberulent; base of the lamina rounded to subcordate, apex obtuse to broadly acute, with small mucro; margin entire; venation (3) 4 – 5 pairs of fine, lateral veins, prominent on both sides, domatia in the first or first and second pair of nerve axils below. Inflorescence terminal, on side shoots, peduncle to 11 mm long, pedicel 4 – 8 mm long, 1-3 flowered; calyx tube 1 – 1.5 mm long, lobes 5, corolla hypocrateriform, white, fragrant, tube 11 – 14 mm long, lobes 5, rarely 7. Fruit a paired berry, sometimes single by abortion, 7 – 8 x 10 mm, black and shiny when ripe.

Phenology: Flower: August-January; Fruit: October-March.

Distribution: Peninsular India (Gastmans and Balachandran 2006) and Sri Lanka. In Tamilnadu: Cuddalore, Kanchepuram, Tirunelveli and Villupuram.

Specimen examined: Cuddalore District: Paalvathunnam, 01.10.03, WFG & NB 9280 (flower); Periyakumati, 25.06.03, WFG & NB 8630 (flower); Thirumannikuzhi, 19.03.2003, WFG & NB 8250 (fruit); S.Pudur, 15.02.03, WFG & NB 4985 (fruit); Ramapuram, 12.02.03, WFG & NB 4913 (fruit); Kulanthaikuppam, 26.11.97, NB, PB & WFG F 5992 (flower). Villupuram District: Kiliyanur, 12.03.03, WFG & NB 8208 (fruit); Kasipalayam, 18.06.98 WFG F6657 (flower). Pondicherry (UT): T. Murthikuppam, 18.06.03, WFG & NB 8371; 8370 (flower). Tirunelveli District: Mundanthurai (Personal observation).

Note: During the study period it is reported as a new record to India from the Coromandel Coast of Tamilnadu (Gastmans and Balachandran *l.c.*), mean while it has recently found growing along the Ghats of Tirunelveli district.

***Miliusa eriocarpa* Dunn** in Gamble, Fl. Madras 1: 21 (15). 1915 & Bull. Misc. Inform. 1916: 58.1916; Matthew, Ill. Fl. Tamilnadu Carnatic t. 7. 1982 & Fl. Tamilnadu Carnatic, vol 3(1): 10, 1983. ANNONACEAE. Tamil name: Sakkadamaram. (Fig. 8).

Shrub or tree to 6 (8) m; branchlets tomentose. Leaves oblong or ovate-lanceolate, 3-7 x 1-2.5 cm, thin coriaceous, glabrous and glossy above, pilose below, base obtuse or subcordate, margin entire, apex acute. Flowers axillary, 1 cm across, solitary; sepals 3, ovate, subequal, pilose; petals 3+3, flesh coloured. Torus beaked above, not concealing anthers. Carpels 6, pilose; ovule 1-2 per cell; stigma oblong or conical. Mericarps 5 or 6 in a cluster, orange – deep blue when ripe, globose, to 1 cm, 1-seeded.

Phenology: Flower: November-March; Fruit: January-April.

Distribution: Peninsula, Sri Lanka (Hook.f. *l.c.*). In Tamilnadu: Though it is recorded as almost all districts very few individuals were found in, Kanchepuram (Narasimhan 1991) and Cuddalore districts.

Specimen examined: Cuddalore District: T.Pudhupalayam, 10 m, 12.11.2004, WFG & NB 11189 (flower); 11.12.2002, WFG & NB 4211 (flower); 23.09.2002, JDH 3823.

Note: Found usually on the hills, above (500) 900 m as under growth in moist shola forests, extending to the drier slopes where the size diminishes (Matthew *l.c.*). Only three individuals recorded from a sacred grove in Cuddalore district. This figure is alarming the past and present existence of this species.



FIGURE 8. *Miliusa eriocarpa* flower and young fruiting branch

***Pleiospermium alatum* (Wight & Arn) Swingle**. J. Wash. Acad. Sci. 6: 427. 1916; Matthew, Ill. Fl. Tamilnadu Carnatic t. 112. 1982 & Fl. Tamilnadu Carnatic vol 3(1): 211. 1983. *Limonia alata* Wallich ex Wight & Arn. Prodr. fl. Ind. orient. 92. 1834; Wight, Ill. Ind. Bot. t. 41. 1840; Beddome, Fl. sylv. S. India, Anal. Gen. 45. T. 7. F. 4.

1870; Hook.f. Fl. Brit. India 1: 508. 1875; Gamble, Fl. Madras 1: 157 (112). 1915. RUTACEAE. Tamil name: Kurunthumulthazhai. (Fig. 9).

Densely foliaceous, armed shrub or tree, 5-8 (12) m; spine solitary, axillary, straight, to 2 cm. Leaves 3-foliolate, 3.5-7cm, leaflets obovate, ovate or elliptic, thin

coriaceous, glabrous, base cuneate, margin subentire, apex obtuse, retuse; petiole winged, petiolule 0. Panicle terminal and/or axillary, to 8 cm. Flowers fragrant, 4-5 merous, bisexual; calyx campanulate, gland dotted, pubescent; petals cream, disc thick, copular; stamens 10, free. Berry globose, to 2.5 cm; seeds ca 4.

Phenology: Flowers January-April; Fruit: throughout the year.

Distribution: Peninsula, Sri Lanka and Andaman & Nicobar Islands. In Tamilnadu: Recorded as in almost all

districts but from the study region it is recorded only in 3 sacred groves of Cuddalore district.

Specimen examined: Cuddalore District: Ramapuram, 40 m, 09.07.2003, *NB* 8710 (fruit); T.Pudhupalayam, 10 m, 17.07.2002, *WFG* 3636 (fruit); 24.06.1999, *PB* & *WFG* F7013 (fruit); Thirumaanikuzhi, 02.04.2002, *JDH* & *WFG* 3498; 16.07.1997, *NB*, *PB* & *WFG*, F 5934 (fruit).

Note: Foothills (locally abundant) to 500 (900) m; less in the plains to the coast in scrub jungles. The population status and the area of occupancy along the Coromandel Coast need to be studied and focused for the conservation.



FIGURE 9. *Pleiospermium alatum* flowering branch, fruit and fluted trunk

Polyalthia korintii (Dunal) Thwaites, Enum. Pl. Zeyl. 398. 1864; Hook.f. & Thomson in Fl. Brit. India 1: 64.1872; Mitra, Annonaceae. In: Sharma et al. Fl. India vol. 1: 273. 1993. *Guatteria korintii* Dunal, Monogr. Fam. Anon. 133: 1817. ANNONACEAE. (Fig. 10).

Shrubs or small trees, 3-5 m tall, spreading; young branches glabrous. Leaves lanceolate, elliptic-oblong to ovate-oblong, acute to round at base, long acuminate at apex, 5-15 x 3-6 cm, glabrous, coriaceous, strongly reticulate. Flowers solitary, axillary or rarely 1-3 together from the tubercles on old wood; pedicel slender, 2-3 cm long. Sepals 3, ovate, appressed pubescent outside. Petals 6 (3+3), oblong, obtuse; inner ones longer and broader than outer ones. Stamens numerous, connectives almost flat at top. Carpels 7-14, oblong. Fruit bright crimson.

Phenology: Flower: January-March; Fruit: August-November.

Distribution: India (Andhra Pradesh, Tamilnadu and Kerala) and Sri Lanka. Tamilnadu: Coimbatore, Madurai,

Nilgiri and Tirunelveli. Villupuram (Kadamban 1998), Cuddalore (Gnanasekaran *et al.*, 2012) and Kancheepuram are recent additions.

Specimen examined: Cuddalore District: Sendirakillai, 28.07.04, *WFG* & *NB* 10557 (flower & fruit); 24.06.04, *PB* 9875 (flower & fruit). Kancheepuram District: Gudulur R.F., 35m, 03.02.05, *NB* 11860 (fruit). Villupuram District: Kurumbaram R.F., 10 m, 16.06.1995, *JDH*, *PB* & *WFG* F 02842 (flower); 16.09.94, *WFG* 5203 (flower).

Note: It is found as occasional in evergreen forests, whereas very rare in TDEF. The present work shows that the distribution has extended in 3 coastal districts of Tamilnadu. However from the record of rapid assessment workshop in TDEF conducted during 2002, the root bark is used as antidote of snake venom and many of the seeds are not viable. The number of mature individuals is less than 500 at the range of 25000 km² distribution imply that this figure is highly significant to consider for placing this species in 'vulnerable' category.

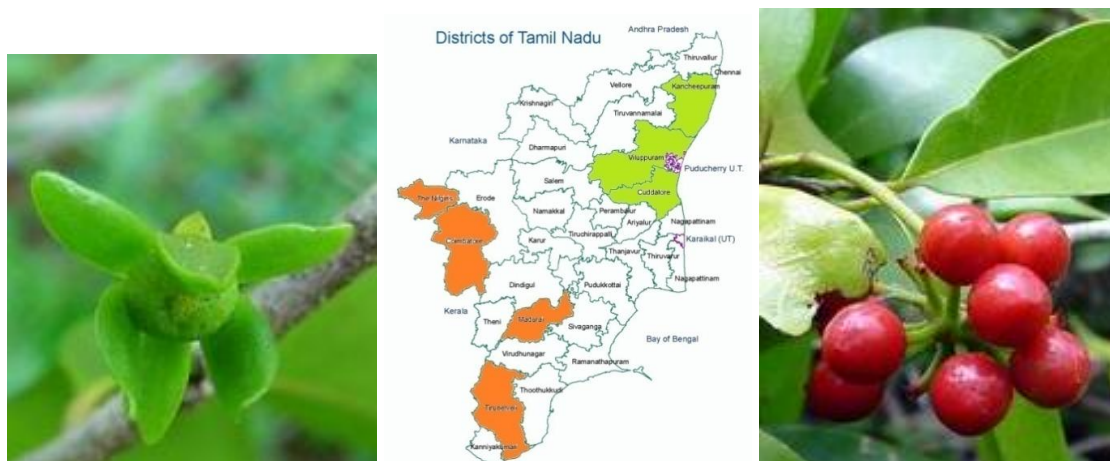


FIGURE 10. *Polyalthia korintii* flower, distribution map and ripe fruits

Suregada angustifolia (Muell. Arg.) Airy Shaw, Kew Bull. 23. 128. 1969; Fl. Tamilnadu Carnatic vol 3(2): 1478. 1983; N.P. Balak. & Tapas, Euphor. India. 219. 2007. *Gelonium lanceolatum* auct. Non Willd.; Roxb. Fl. ind. 3: 831. 1832; Wight, Icon. Pl. Ind. Orient. T. 1867. 1852; Hook.f. Fl. Brit. India 5: 459. 1887; Gamble, Fl. Madras 2: 1343(940), 1925. EUPHORBIACEAE. (Fig. 11).

Dioecious, evergreen tree to 6(10) m. Leaves alternate, obovate to oblanceolate, 5-10 x 3-6 cm, coriaceous, pellucid-punctate, base acute, apex subacute, nerves 6-8 pairs; petiole to 0.5 pairs; stipules caduceous. Male flowers 5-8 in axillary subumbellate clusters. 5 mm across. Tepals 5. Concave, thick, obtuse, imbricate; outer mixed with glands; filaments filiform; anthers dehiscence longitudinal. Female flower 3-5, axillary, ca 3 mm across. Tepals 5, ovate, finely ciliate. Ovary globose, ovules 3, axile. Disc annular. Capsule 3-lobed; seeds globose.

Phenology: Flowers: January-April; Fruits: February onwards.

Distribution: Peninsula, Sri Lanka (Airy Shaw *l.c.*) In Tamilnadu: Chengalpet, Coimbatore, Cuddalore, Dharmapuri, Madurai, Tiruchi, Tirunelveli, Tiruvannamalai, Salem, Vellore and Villupuram.

Specimen examined: Cuddalore District: S.Pudur, 09.07.2003, NB 8702 (flower). Villupuram District: Kurumbaram R.F., Marakkanam, 10 m, 16.04.2003, NB 8501 (fruit); 12.05.1995, JDH, PB & WFG F02781 (flower); Kumulampet R.F., 07.01.2004, WFG & NB 9674 (flower); Aranya, 19.09.2003, WFG & NB, 8983 (fruit). Cancheपुरam District: Salayur R.F., 40 m, 22.01.2003, WFG & NB 4793 (fruit); Thirukazhukundram, 90 m, 15.03.2002, WFG 4384 (flower).

Note: This plant shows wide range of distribution in Tamilnadu however it is highly sporadic in Coromandel Coast of Tamilnadu. It is not recorded as tree from in TDEF, because this plant is also used for making comb as like *Tricalysia*.

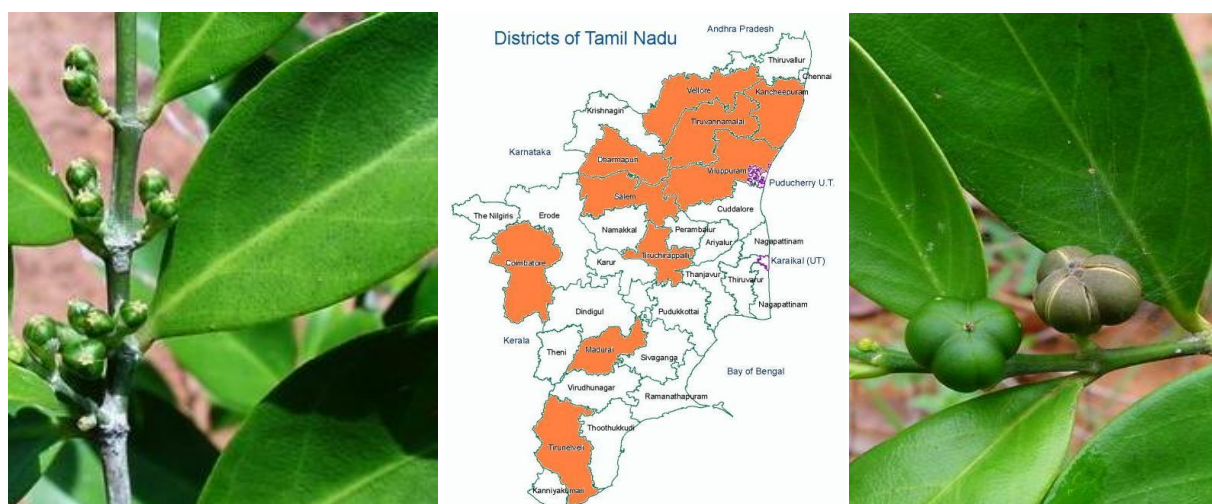


FIGURE 11. *Suregada angustifolia* female flowering branch, distribution map and ripe fruits

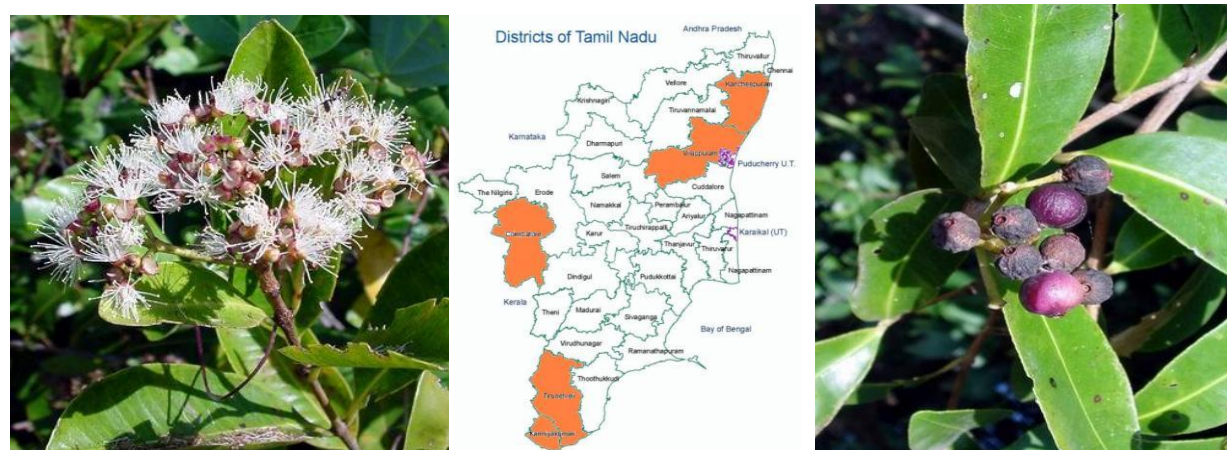


FIGURE 12. *Syzygium caryophyllatum* flowering branch, distribution map and ripe fruits

Syzygium caryophyllatum (L.) Alston in Trimen, Handb. Fl. Ceylon 6 (suppl.): 116. 1931; Ashton, o.c. 450; Matthew, Ill. Fl. Palni hills t. 318. 1996 & Fl. Palni hills, 495. 1999. *Myrtus caryophyllata* L. Sp. pl. 472. 1753. *Syzygium caryophyllaceum* auct. non Gaertner 1788: Wight & Arn. Prodr. fl Inf. Orient. 329. 1834; Gamble, Fl. Madras 1: 480 (339). 1919. *Eugenia caryophyllaea* Wight,

Icon. Pl. Ind. Orient. T. 540. 1842; Duthie, J.F. Fl. Brit. India 2: 490. 1878. MYRTACEAE (Fig. 12).

Densely foliaceous tree; branchlets terete. Leaves obovate, to 5 x 1.5 cm, coriaceous, base attenuate, apex acute; petiole to 0.6 cm. Corymb terminal; peduncle 4 cm. Flowers cream, 4 mm wide; calyx-tube ovoid, 3x2 mm; lobes 4, ovate; petals 4, cream, suborbicular, rounded;

stamens many; ovary 2-celled; ovules many. Berry depressed globose, red when ripe.

Phenology: New foliage reddish, turning green; Flowers: March-May; Fruits: May onwards.

Distribution: Peninsular India and Sri Lanka. In Tamilnadu: Coimbatore, Kanniyakumari, Tirunelveli and Villupuram.

Specimen examined: Kancheperum District: Pannaiyur, 5m, 22.07.1999, *PB* & *WFG* F 7172 (flower & fruit); 19.08.98, *JDH*, *PB* & *WFG* F 6763 (flower). Villupuram District: Vada Agaram, Marakkanam, 22.12.2004, *WFG* & *NB* 11748 (flower & fruit).

Note: Tree to 20(30) m; crown hemispherical, widely spreading. Upper Palnis, 1800-2200 m: occasional shola tree of the plateau. There is wide gap found for this species between Western Ghats and the Coastal Plains. Though it grows near water bodies it attains up to 7 m high but not as in shola. In India, this plant assessed as per IUCN category, version 2.3, during 1998 categorised as “Endangered B1+2c” species.

Vitex leucoxylon L.f. Suppl. Pl. 293.1781; Roxb. Fl. Ind. 3: 74. 1832; Hook.f. Fl. Brit. India 4: 587. 1885; Gamble, Fl. Madras 2: 1103 (772). 1924; Matthew, Ill. Fl. Tamilnadu Carnatic t. 559. 1982 & Fl. Tamilnadu Carnatic Vol 3 (1): 1239. 1983. VERBENACEAE. Tamil name: Neernochi. (Fig. 13).

Tree to 12 m. Leaves 3-7 foliolate; leaflets obovate-oblongate, 7-15 x 3-5 cm, thin coriaceous, lateral nerves

ca 14 pairs, glabrescent, rounded to gradually acute to both ends, margin entire to toothed; petiolule 2 cm. petiole to 10 cm. Cymes divaricate, axillary, of corymbose panicles, to 10 cm. Calyx 3 mm, appressed-pubescent without, 5-toothed. Corolla cream, purplish within, 1.5 cm across; tube 5 mm, puberulous without; lobes 5; upper lip 3.5 mm; lower lip 8 mm, obtuse. Stamens 4; filament pairs 4 and 6 mm; anthers 0.5 mm, Ovary 2 mm, top hairy; style 8 mm. Drupe ellipsoid-oblong, 1.5 x 0.8 cm.

Phenology: Flowers: February-April Fruits: almost through the year.

Distribution: Peninsula, Sri Lanka (Hook.f. l.c). In Tamilnadu: Coimbatore, Cuddalore, Dharmapuri, Madurai, Nilgiri, Tiruchi and Villupuram. Tiruvannamalai (Vijayasankar *et al.*, 2012) is an addition from the recent study.

Specimen examined: Villupuram District: Sevr R.F., 10 m, 27.01.2005, *NB* 11833 (fruit); Kommetchavadi, 21.12.2002, *WFG* & *NB* 4614 (flower & fruit); Mandavayil, 5 m, 12.08.1998, *JDH*, *PB* & *WFG* F6861 (fruit); Pakkammalai R.F., Gingee, 17.04.1997, *PB* 0428 (flower).

Note: Rare in plains along river bank; occasional to 800 m and it is an economically important species (Henry *et al* 1987). During the survey in the study area we found only 8 mature individuals in three sites. Propagation through seeds is very easy so as enough conservation measures were attempted successfully in Auroville.

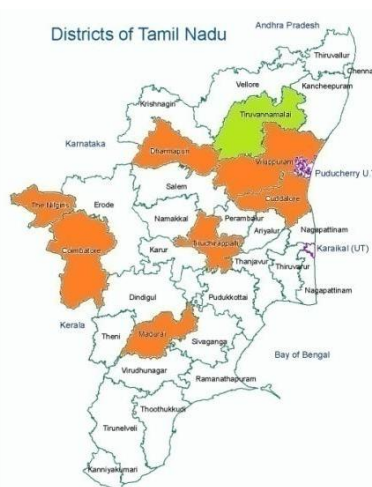


FIGURE 13. *Vitex leucoxylon* flowering branch, distribution map and young fruits

Walsura trifoliolata (Adr. Juss) harms in Engl. Nat. Pflanzenfam. (ed. 2) 19 B. 1: 177. 1940 (‘trifolia’); Mathew, Ill. Tamilnadu Carnatic t. 133. 1983 & Fl. of Tamilnadu Carnatic vol 3(1): 242. 1983. MELIACEAE. Tamil name: Walsura. (Fig. 14).

Densely foliaceous tree, to 12 (15) m. Leaves 3-foliolate, to 12 x 9 cm; leaflets oblong, ovate-lanceolate, 5-8 x 2-4.5 cm, thick coriaceous, glabrous, glossy above, glaucous below, base cuneate, margin entire, apex obtuse – retuse; petiole 4 cm; petiolule to 1 cm. Panicle axillary and/or terminal, corymbose to 15 cm; peduncle to 9 cm. Flowers 5-merous, bisexual, 8 mm across; calyx lobes 5; petals 5, cream, lanceolate; disc annular; staminal tube deeply 10-lobed, stamens 10, anthers exserted; ovary globose. Berry globose, 2 x 1 cm, velvety tomentose; seed solitary.

Phenology: Flowers: January-March; Fruits: August onwards.

Distribution: Peninsula, Sri Lanka (Hook.f. l.c). In Tamilnadu: In most of the districts.

Specimen examined: Cuddalore District: Muthanai, 35 m, 08.03.2000, *JDH*, *NB*, *PB* & *WFG* F7896 (flower). Kancheperum District: Thottacheri, R.F., 10 m, 16.04.2002, *JDH* & *WFG* 3518 (fruit). Villupuram District: Pachaiaimman Kovil R.F., Gingee, 270 m, 17.02.2000, *NB* & *WFG* F7795 (flower); Oorani, 16.02.96, *JDH*, *WFG* & *NB* 5516 (fruit); Marakkanam R.F., 10 m, 09.06.1995, *JDH*, *PB* & *WFG* F02827 (fruit). Nagai District: Kodiakadu RF, Point Calimere, 5 m, 05.04.1995, *JDH*, *PB* & *WFG* F5391 (flower).

Note: Hills on Villupuram, Kalrayans, both on the E. W. slopes and on Theerthamalai a few isolated populations

found (Matthew *l.c.*). Though it is recorded as almost all districts the population size is very meager and fruit setting and regeneration in the wild habitat is almost nil

(personal observation) whereas the fruit setting and regeneration in the planted habitat (especially in Auroville) is enormous.



FIGURE 14. *Walsura trifoliolata* new leafy branch, flowers and trunk with bark

DISCUSSION

The mother earth accommodates all living organisms with no restrictions, while each species (either plants or animals or any lower group of organisms) have their own perambulation in their distribution. Plants such as *Acacia planifrons*, *Albizia amara*, *Hardwickia binata* and *Rhodendron* sp from the published sources show that their distribution is very unique. In the present study, there are 13 Indo-Sri Lankan, evergreen and woody species studied and discussed. *Cadaba fruticosa* and *Dimorphocalyx glabellus* are restricted in red soil at sea level but it occurs at 800 m elevation in the Western Ghats after a wide gap. *Capparis rotundifolia* and *Eugenia bracteata* are recorded from the coastal sandy soils in this study area and it also occurred on the hills up to 1000 m elevation. *Pleiospermium alatum* and *Vitex leucoxydon* shows wider range of distribution from the earlier records but during the survey we found very small size of population in 3 SGs and found only in alluvial-clay soil. *Garcinia spicata*, *Miliusa eriocarpa*, *Suregada angustifolia* and *Walsura trifoliolata* shows wider range of distribution where as *M.eriocarpa* has recorded less than 50 mature individuals in 3SGs of Cuddalore district. *Capparis rotundifolia*, *Eugenia bracteata*, *Polyalthia korinti* and *Vitex leucoxydon* shows extended distribution while the present study on regeneration, number of mature individuals and the area of distribution is quiet significant to fix them under vulnerable-critically endangered category. *Syzygium caryophyllatum* has already categorised as “Endangered B1+2c” type as per the IUCN standard. *Dimorphocalyx* and *Jasminum angustifolium* var *hirsutum* are very far apart and fragile in distribution. The data from the rapid assessment workshop in TDEF held during 2002 shows that the conservation measures by both *in situ* and *ex situ* models are utmost vital after studying their distribution, population size, reproductive biology and threat assessments with international standard.

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