

AGASTHIYAMALAIA (CLUSIACEAE), A NEW GENUS FOR *POECILONEURON*  
*PAUCIFLORUM*, AN ENDEMIC AND ENDANGERED TREE  
OF WESTERN GHATS, INDIA

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ABSTRACT

The taxonomic position of the Indian endemic tree genus *Poeciloneuron* was reassessed using morphological and anatomical data. *Poeciloneuron pauciflorum* differs from *P. indicum*, the only other species of the genus, in its solitary axillary flowers, inconspicuous parallel leaf venation and apotracheal banded wood parenchyma. Because of these differences we propose to place *P. pauciflorum* into a new monotypic genus **Agasthiyamalaia**, gen. nov. **Agasthiyamalaia pauciflora**, comb. nov., is proposed with the support from morphological and anatomical characters.

ABSTRACT

La posición taxonómica del género arbóreo endémico de la India *Poeciloneuron* se ha reevaluado usando datos morfológicos y anatómicos. *Poeciloneuron pauciflorum* difiere de *P. indicum*, la otra especie del género, por sus flores axilares solitarias, venación foliar paralela inconspicua y parénquima del xilema apotraqueal bandeado. Por todas estas diferencias proponemos colocar a *P. pauciflorum* en un nuevo género monotípico **Agasthiyamalaia**, gen. nov. Se propone la nueva combinación **Agasthiyamalaia pauciflora**, comb. nov., con el soporte de caracteres morfológicos y anatómicos.

INTRODUCTION

*Poeciloneuron* Bedd. is an endemic tree genus with two species belonging to the family Clusiaceae. It was described by Beddome (1865) under the family Ternstroemiaceae as a monotypic genus. Bentham and Hooker (1862–67) also included *Poeciloneuron* in Ternstroemiaceae. Beddome (1871) later added another species viz. *Poeciloneuron pauciflorum* to the genus. Beddome (1871) included this species under *Poeciloneuron*, with the comment, “if this species remains in the genus, the generic character must be considerably altered.” Even though *Poeciloneuron* has anatomical similarities with the family Bonnetiaceae, because of its entire opposite leaves (Seetharam 1985), and presence of secretory canals (Metcalfe & Chalk 1950; Dickson & Weitzman 1996), it was included in Clusiaceae (see also Engler 1888). Floral morphological and palynological studies also fixed its position in the family Clusiaceae (Seetharam & Pocock 1978; Seetharam 1985). Detailed floral morphological work suggested that *Poeciloneuron* belongs to the tribe Calophylleae, which also includes the genera *Calophyllum*, *Kayea*, *Mesua* and *Mammea* (Seetharam 1985). However, a critical comparative study of these two endemic species of *Poeciloneuron* is still needed.

METHODS

**Plant Materials**

Twigs with flowers and fruits were collected for morphological studies from southern Western Ghats in evergreen forests. Fresh flowers, fruits and leaves were preserved in FAA solution for laboratory studies. The wood samples were collected from mature branches for anatomical studies. The identify was confirmed in the regional herbarium of BSI (MH) and voucher specimens are deposited in the Herbarium, Department of Botany, Goa University, Goa, India.

**Wood anatomical studies**

Free hand sections (T.S., T.L.S. and R.L.S.) of wood were made. The sections were stained in safranin for

1–2 minutes and washed and processed for permanent mount following Johansen (1940). All the stained sections were observed under Leica MPS 32 microscope. The terminology of IAWA Committee on Nomenclature (1964) was followed in describing the wood anatomical characters.

## RESULTS AND DISCUSSION

### Morphology

The conspicuous reticulate veins of the leaves of *Poeciloneuron indicum* differ from distant parallel veins of *P. pauciflorum*. In *P. pauciflorum* the flowers are axillary and solitary (or paired) whereas in *P. indicum* they are in terminal or axillary panicles. The sepals are in two whorls in *P. pauciflorum* whereas they are in single whorl of five in *P. indicum* (Table 1).

### Wood anatomy

The wood of both species can be described as follows: Wood diffuse porous; vessels solitary, rounded in outline, ca. 56  $\mu\text{m}$  in diameter, mean member length 745  $\mu\text{m}$  (580–910  $\mu\text{m}$ ) tailed, ca. 16 per  $\text{mm}^2$ , perforation simple; vessels to ray pits simple or bordered, alternate. Rays uniseriate, heterogenous, type III, 5–16 cells in high, ca 280  $\mu\text{m}$  high, ca 70 per  $\text{mm}^2$ . Parenchyma apotracheal, banded. Fibers thick walled, bordered pits numerous, fiber tracheids present. The major difference between these two species based on wood anatomy is wood parenchyma arrangement. In *P. pauciflorum* the wood parenchyma is apotracheal banded and in *P. indicum* it is paratracheal aliform type. Other characters such as vessel length and diameter, and fiber length showed quantitative differences.

### Pollen morphology

The characters of pollen morphology were adapted from Seetharam and Pocock (1978). Tricolporate isopolar, polar axis  $20.8 \pm 2.2 \mu\text{m}$ , Equatorial axis  $22.6 \pm 2.0 \mu\text{m}$ , P/E ratio 0.9, ectoaperture  $7\text{--}12 \times 1.5 \mu\text{m}$ , endoaperture  $4\text{--}6 \times 1\text{--}2 \mu\text{m}$ , tectum  $11\text{--}20 \mu\text{m}$ , perforate, more or less regular, bear warty projections. The species of *Poeciloneuron* differ in the arrangement of their endoapertures. In *P. indicum* the endoaperture is perpendicular to ectoaperture, whereas in *P. pauciflorum* it is parallel. Tectal perforations are irregular in *P. indicum* and regular in *P. pauciflorum*, tectal crests are smooth in *P. indicum* whereas they are warty in *P. pauciflorum* (Table 2.)

*Poeciloneuron* Bedd. is represented by two species: *P. indicum* and *P. pauciflorum*. The differences between these two are substantial enough to necessitate placing *P. pauciflorum* in a separate genus.

## KEY TO GENERA

Flowers in terminal or axillary panicles; sepals 5, in a single whorl; stamens 12; leaves with fine reticulation

***Poeciloneuron***

Flowers solitary or paired in leaf axils; sepals 4, in 2 whorls; stamens 16–22; leaves with distantly parallel venation

***Agasthiyamalaia* gen. nov.**

***Agasthiyamalaia*** S. Rajkumar & Janarth., gen. nov. TYPE: *Poeciloneuron pauciflorum* Bedd., Fl. Sylv. 1:93, t. 93. 1871. *Agasthiyamalaia pauciflora* (Bedd.) S. Rajkumar & Janarth., comb. nov. herein.

*Poeciloneuro proxima*, floribus solitariis vel binatis, sepalis quattuor in verticillis duobus, staminibus 16–22, foliis venatione remote parallela differt.

*Agasthiyamalaia* gen. nov. is very similar to *Poeciloneuron* Bedd. but differs in its solitary or paired axillary flowers, four sepals in two whorls, 16–22 stamens and leaves with distantly parallel venation. *Agasthiyamalaia* also differs from *Poeciloneuron* s. str. in certain micro-morphological characters. The apotracheal banded wood parenchyma and perpendicular arrangement of pollen endoaperture to ectoaperture of the former are distinct from paratracheal aliform wood parenchyma and parallel positioned pollen endo and ectoapertures of the latter.

Trees with clear bole. Leaves simple, opposite, petiolate, petiole rough, channeled. Flowers solitary or paired in the axils of the fallen leaves, pedicellate; sepals 4, in two whorls, inner two larger than outer ones, puberulous; petals 6–8, imbricate, pubescent within; stamens 16–22, attached to an elevated disc below

TABLE 1. Morphological differences between *P. indicum* and *Agasthiyamalaia* (= *P. pauciflorum*).

Characters	<i>P. indicum</i>	<i>Agasthiyamalaia</i> (= <i>P. pauciflorum</i> )
<b>Leaf size</b>	Up to 25 × 6 cm	Up to 12 × 4 cm
<b>Leaf shape</b>	Ovate to oblong, acuminate at apex	Oblong, bluntly acuminate at apex
<b>Leaf surface</b>	Reticulate conspicuous venation	Parallel inconspicuous venation
<b>Inflorescence</b>	Axillary and terminal panicle	Solitary or paired in leaf axils
<b>Sepals</b>	5, ovate, all equal in size	4, in 2 whorls, inner two larger
<b>Petals</b>	5, contorted	6–8, imbricate
<b>Stamens</b>	12	16–22
<b>Fruit</b>	Without lobes and blunt apex	2 lobed, pointed at apex
<b>Seed</b>	Testa smooth	Testa wrinkled

TABLE 2. Differences in pollen morphology between *P. indicum* and *Agasthiyamalaia* (= *P. pauciflorum*) adapted from Seetharam and Pocock (1978).

Characters	<i>P. indicum</i>	<i>Agasthiyamalaia</i> (= <i>P. pauciflorum</i> )
<b>Polar axis</b>	15.6±1.5mm	20.8±2.2mm
<b>Equatorial axis</b>	14.6±0.9mm	22.6±2.0mm
<b>P/E ratio</b>	1	0.9
<b>Ecoaperature</b>	8–12 × 1 mm	7–12 × 1.5mm
<b>Endoaperature Arrangement</b>	2 × 4 mm, perpendicular to ectoaperature	4–6 × 1–2 mm, paraell to ecoaperature
<b>Tectum thickness</b>	6–8 mm	11–20mm
<b>Tectal crests</b>	Smooth	Warty
<b>Tectal perforation</b>	Irregular	Regular

ovary, anthers lobulate, dehiscence longitudinal; ovary globose, 2-celled, with pair of ovules in each; style 2, divided halfway, undulate along the margins, greenish yellow. Fruit globose, pointed at the tip, dehiscent in to two valves, one seeded. Seed hard, rounded, testa loose, membranaceous, striate, easily separable from the seed; cotyledons very large, fleshy.

*Distribution*.—Southern parts of Western Ghats in Tamil Nadu and Kerala States of India.

*Etymology*.—The genus is named after Agasthiyamalai Hills in and around which it is found.

***Agasthiyamalaia pauciflora*** (Bedd.) S. Rajkumar & Janarth., comb. nov. (**Fig. 1**). *BASEONYM*: *Poeciloneuron pauciflorum* Bedd., Fl. Sylv. 93, t. 93. 1871; Dyer in Hook. f., Fl. Brit. India. 1:278. 1874; Gamble, Fl. Madras 1:546. 1967 (repr. ed.); Singh in Sharma et al., Fl. India 3:146. 1993. *TYPE*: Bedd., Fl. Sylv. 1:93, t. 93. 1871.

Trees up to 15 m high, clear bole, bark grayish. Leaves with petiole, petiole up to 1.5 cm long, rough, channeled; lamina coriaceous, oblong, up to 12 × 4 cm, rounded or acute at base, entire along the margin, bluntly acuminate at apex. Flowers solitary or paired in the axils of the fallen leaves, pedicellate, pedicels up to 2.5 cm long, glabrous, green in colour; sepals 4, ovate, the outer two ca 2.5 × 3 mm, the inner two up to 8 × 3 mm, apically obtuse, green, puberulous; petals ovate, ca 0.3 × 0.2 cm, apically obtuse, white, pubescent within; stamens 16–22, ca. 0.6 cm long. Ovary ca. 0.2 cm. Fruit globose, up to 2 × 1.7 cm.

*Local name*.—Puli-vayila, Puthangkolli.

Specimens examined: **INDIA. Tamil Nadu**: Mundanthurai to Kannikatti, 17 Mar 1917, s.l. 14647 (MH); way to Nagapothigai from Inchikuzhi, 8 Feb 1989, R. Gopalan 90105 (MH); Etha river bank, 1000 m 24 Apr 1990, R. Gopalan 93232 (MH); bank of Sigapparu, way to Nagapothigai, 750 m, 22 Jan 1991, R. Gopalan 94640 (MH); Valayar River bank, 900 m, 3 Apr 1991, R. Gopalan 96216 (MH); way to Poonkulam, 900 m, 17 Apr 1992, R. Gopalan 99305 (MH); banks of Chittar, 8 km above Keeriparai, Kanniyakumari Dt., 23 Feb 1998, S. Rajkumar 210 (Herbarium, Goa Univ.); 2 Nov 2000, S. Rajkumar 680 (Herbarium, Goa Univ.); Inchikuzhi to Kannikatty, 15 Aug 2002, S. Rajkumar s.n. (Herbarium, Goa Univ.). **Kerala**: Travancore, s.d. & s.l. acc. No. 3224 (MH).

*Distribution*.—Banks of streams or rivers, in evergreen forests surrounded by grasslands. Locally dominant, associated with *Cinnamomum* spp., *Glochidion* spp., *Knema attenuate* and *Ochlandra* spp. Young leaves are mem-

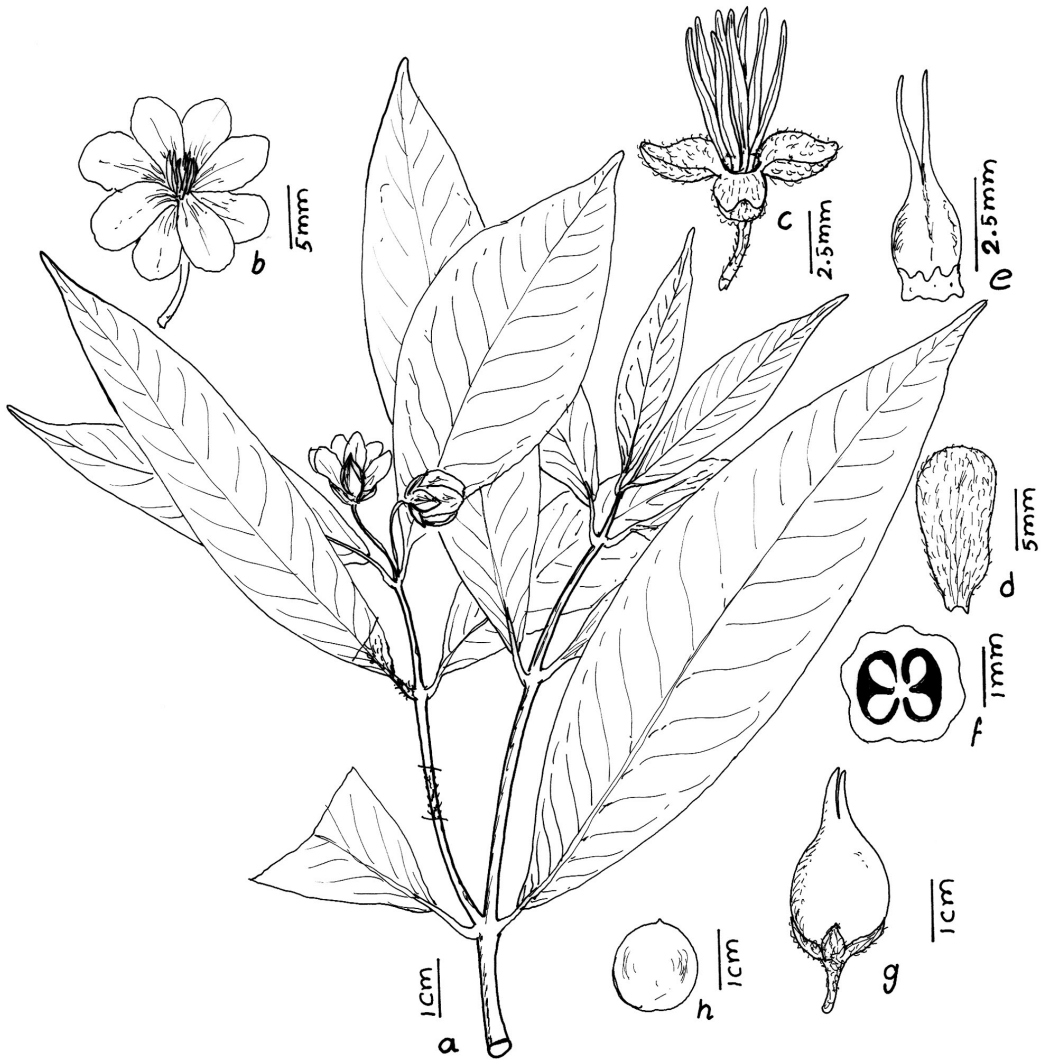


FIG. 1. *Agasthiyamalaia pauciflora* a. flowering shoot. b. flower c. calyx with stamens (corolla removed). d. petal. e. pistil. f. ovary. g. fruit. h. seed.

branous, white, turning pinkish. *Agasthiyamalaia* (= *P. pauciflorum*) is a narrow endemic and was relocated by Ravikumar (pers. comm.) 70 years after its previous collections. It is listed as an endemic rare plant of Western Ghats, India (Ahmedullah & Nayar 1990; Gopalan & Henry 2000; Mohanan & Sivadasan 2002).

*IUCN Conservation Assessment.*—This species has been assessed as Critically Endangered (CR B1+2c ver. 2.3 (1994) by WCMC (1998) under *Poeciloneuron pauciflorum* Bedd. However, recent collections from several populations, though from a small geographic region necessitates its reassessment. Mass multiplication using tissue culture is being tested as part of a species recovery program by the Department of Biotechnology, Ministry of Science and Technology, New Delhi, India.

## ACKNOWLEDGMENTS

We thank Peter Stevens, Missouri Botanical Garden for his critical comments on the earlier version of manuscript; Joint Director (MH, Coimbatore) for permission to consult the herbarium; K. Ravikumar (FRLHT, Bangalore) for help in locating the plant; D. Narasimhan (Madras Christian College, Chennai) for pickled specimens; and to J.F. Veldkamp (Leiden, The Netherlands) for the Latin diagnosis. We also thank reviewers John J. Pipoly III and Barney Lipscomb (BRIT) whose comments greatly helped us in revising the manuscript.

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