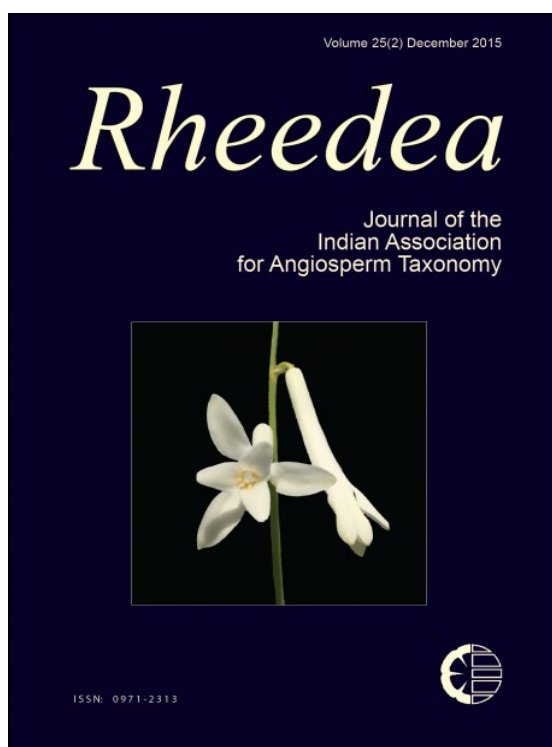




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A new species of *Rotala* (Lythraceae) from Kerala, India

Lemiya K.M.* and A.K. Pradeep

Interuniversity Centre for Plant Biotechnology, Department of Botany, University of Calicut, Kerala- 673 635, India.

*E-mail: lamiya8131@gmail.com

Abstract

Rotala anamika Lemiya, a new species of Lythraceae, from Kerala, India is described and illustrated. It is similar to *R. malampuzhensis* R.V.Nair ex C.D.K.Cook and *R. densiflora* (Roth ex Roemer & Shultes) Koehne, but differs from the former in having calyx appendages as long as or slightly longer than the calyx lobes, obovate and apically obtuse to sinuate petals, and from the latter by its unwinged stems, presence of staminodes and very short style. All species of *Rotala* from Peninsular India is also keyed out.

Keywords: *Rotala*, Lythraceae, new species, Kerala, India

Introduction

The genus *Rotala* L. is represented by more than 55 species distributed in tropical and subtropical regions of the world. It has greatest diversity in tropical Asia (Cook, 1979). Twenty nine species are reported so far from India, which include recently described eight species from Peninsular India (Prasad *et al.*, 2012; Gaikwad *et al.*, 2013; Prasad & Raveendran 2013a,b; Sunil *et al.*, 2013; Yadav *et al.*, 2013; Anto *et al.*, 2014; Ratheesh Narayanan *et al.*, 2014).

The authors during their biosystematic studies on South Indian *Ammannia* L., *Rotala* L. and *Nesaea* Kunth (Lythraceae) came across an interesting specimen of *Rotala* from the wet marshy fields of Kootumoochi near Parappanangadi in Malappuram district. The plants were found growing along with *Lindernia rotundifolia* (L.) Alston, *Nymphoides indica* (L.) Kuntze, *Dopatrium junceum* (Roxb.) Buch. -Ham. ex Benth, *Limnophila aquatica* (Roxb.) Alston and *Leersia hexandra* Sw. The collected specimens were grown at Calicut University Botanical Garden and studied in detail. It is similar to *R. malampuzhensis* and *R. densiflora* in its habit and some other vegetative features (Table 1). As it is quite different from all the known species of *Rotala*, it is described here as a new species. In addition, a key is provided to identify Peninsular Indian species of *Rotala*.

Key to Peninsular Indian species of *Rotala*

- 1 Flower apetalous 2
- 1 Flower petaliferous 6
- 2 Calyx appendages present 3
- 2 Calyx appendages absent 4
- 3 Calyx appendages 2-3 times longer than calyx lobes; bracts present *R. meenkulamensis*
- 3 Calyx appendages shorter than calyx lobes; bracts absent *R. cheruchakkiensis*
- 4 Leaves usually in whorls of 3, leaf base often sheathing; bracteoles leaf-like, partly or completely enclosing the flower 5
- 4 Leaves in whorls of 3-8 or decussate, leaf base not sheathing; bracteoles scarious, not enclosing the flower *R. mexicana*
- 5 Calyx lobes 5 *R. occultiflora*
- 5 Calyx lobes 4 *R. kasaragodensis*
- 6 Plants emergent aquatics 7
- 6 Plants amphibious or terrestrial 11
- 7 Leaves monomorphic *R. vasudevanii*
- 7 Leaves dimorphic 8
- 8 Stamens inserted at the middle or above the middle of the calyx tube; nectar scales absent 10
- 8 Stamens inserted towards the base of the calyx tube; nectar scales present 9

- 9 Leaves opposite, decussate; aerial leaves obovate-orbicular, cordate at base, rounded at apex; black hairs present in the axils of bracteoles *R. sahyadrica*
- 9 Leaves in whorls of 7–10; aerial leaves linear, narrowed towards base, bimucronate at apex; black hairs absent in the axils of bracteoles *R. cookii*
- 10 Submerged leaves elliptic or ovate; aerial leaves obovate, rounded at apex *R. tulunadensis*
- 10 Submerged leaves capillary; aerial leaves linear, minutely bifid at apex *R. verticillaris*
- 11 Calyx appendages present 12
- 11 Calyx appendages absent 20
- 12 Nectar scales present 19
- 12 Nectar scales absent 13
- 13 Bracteoles longer than flowers 14
- 13 Bracteoles shorter than flowers 15
- 14 Petals up to 0.25 mm long, apiculate at apex *R. dhaneshiana*
- 14 Petals 0.5–1 mm long, 2-lobed at apex *R. densiflora*
- 15 Leaves monomorphic; calyx appendages as long as calyx lobe 16
- 15 Leaves dimorphic; calyx appendages two times longer than calyx lobe *R. khaleeliana*
- 16 Capsules 3-valved 17
- 16 Capsules 4-valved 18
- 17 Stamens 0.5–0.7 mm long, attached at the middle of the calyx tube *R. rosea*
- 17 Stamens 3–4.5 mm long, attached at the base of the calyx tube *R. belgaumensis*
- 18 Bracts cordate-acuminate; calyx lobes almost equal to the tube; appendages as long as calyx lobes *R. illecebroides*
- 18 Bracts obovate-obtuse; calyx lobes much shorter than tube; appendages shorter than calyx tube *R. ritchiei*
- 19 Leaf apex acute to shortly truncate; petals elliptic to oblong, acute at apex *R. malampuzhensis*
- 19 Leaf apex subtruncate to slightly bimucronate; petals broadly obovate, shallowly sinuate at apex *R. anamika*
- 20 Petals fimbriate *R. fimbriata*
- 20 Petals entire 21
- 21 Leaves alternate; flowers heterostylous *R. floribunda*
- 21 Leaves decussate; flowers homostylous 22
- 22 Petals 5; leaves linear; nectar scales present ... *R. malabarica*
- 22 Petals 4; leaves ovate or obovate or orbicular, nectar scales absent 23
- 23 Stamens inserted at the middle of the calyx tube 24
- 23 Stamens inserted at the base of the calyx tube 25
- 24 Calyx tube constricted above; petals longer than calyx lobes *R. serpyllifolia*
- 24 Calyx tube not constricted; petals shorter than calyx lobes *R. indica*
- 25 Stamens as long as or shorter than calyx tube; bracteoles almost equaling the calyx tube *R. rotundifolia*
- 25 Stamens much longer than calyx tube; bracteoles much shorter than the calyx tube *R. macrandra*

***Rotala anamika* Lemiya, sp. nov.**

Typus: INDIA, **Kerala**, Malappuram District, Parappanangadi, Koottumoochi, 11°05.802' N, 75°52.068' E, 3.4 m, 25. 08. 2012, *Lemiya* 132916 (Holotypus, MH; Isotype CALL). **Fig.1, 2**



Fig. 1. *Rotala anamika* Lemiya.

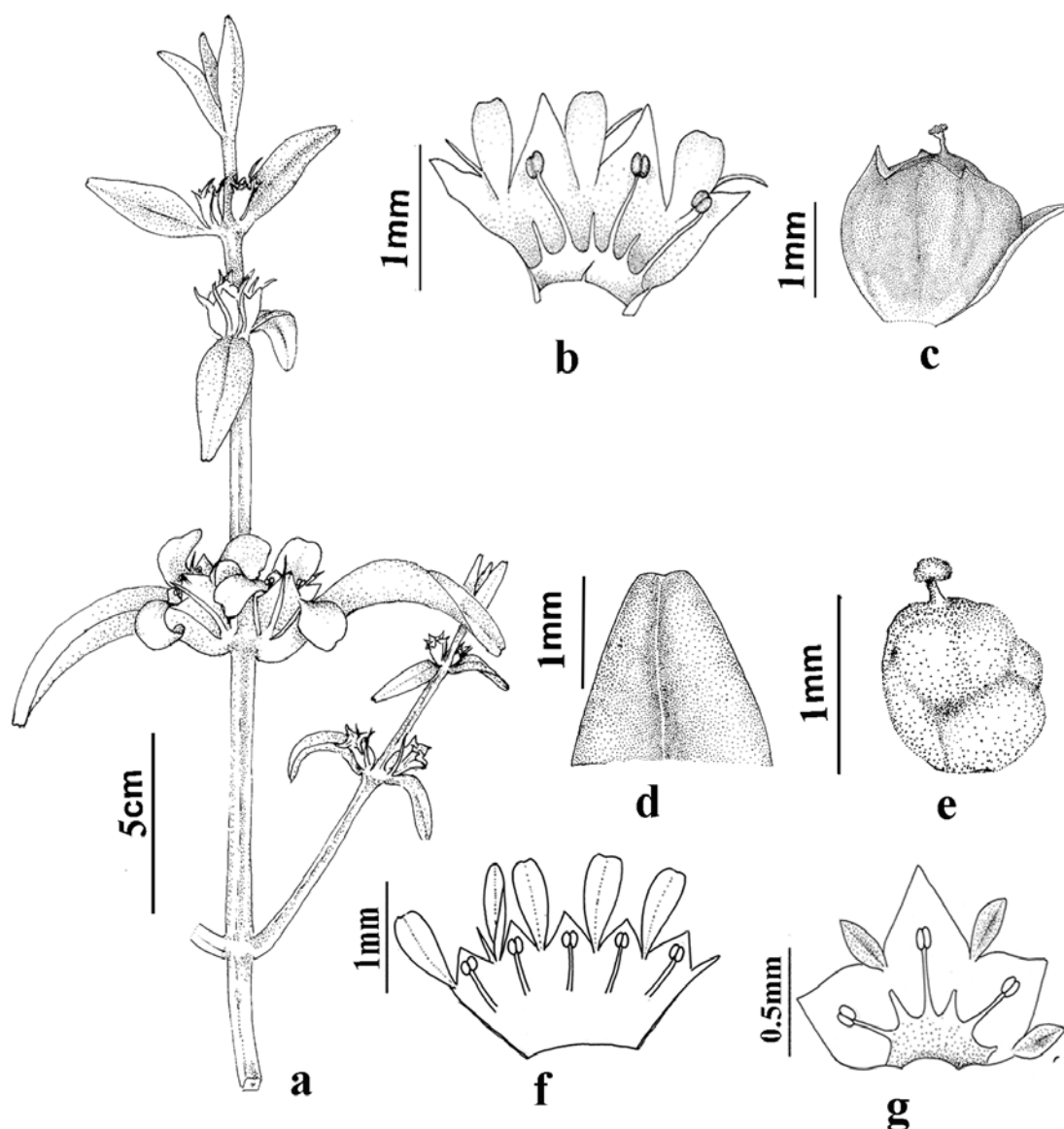


Fig. 2. *Rotala anamika* Lemiya: **a.** Habit; **b.** Flower split open; **c.** Fruit with calyx; **d.** Leaf tip enlarged; **e.** Gynoecium; **f & g.** Flower split open (Reproduced from Joseph & Sivrajan, 1989): **f.** *R. malampuzhensis* R.V.Nair ex C.D.K.Cook; **g.** *R. densiflora* (Roth ex Roemer & Schultes) Koehne.

Rotala anamika is similar to *R. malampuzhensis* R.V.Nair ex C.D.K.Cook and *R. densiflora* (Roth ex Roemer & Shult.) Koehne, but differs from the former in having calyx appendages equaling calyx lobes; obovate and apically obtuse to sinuate petals and from the latter by its unwinged stems, presence of staminodes and very short style.

Erect, annual, glabrous herb, 7–10 cm tall; stem 4-angular, not winged, rooting from lower nodes. Leaves sessile, lamina elliptic-ovate, 2–4 × 1–2 mm, glabrous, broader towards base, rounded, apex subtruncate to slightly bimucronate, 1-nerved, leaves often deciduous while in fruiting. Bracts

similar to foliage leaves. Bracteoles linear, 1–1.5 mm long, as long as calyx tube, glabrous. Flowers sessile, axillary, solitary, 3, 4 or 5-merous. Calyx tube 1–2 mm long, glabrous, bright pink at anthesis, lobes 3–5, broadly triangular, 0.5–0.8 mm long, acute, calyx appendages alternating with calyx lobes, 0.3–0.5 mm long, linear or capillary, as long or slightly longer than the calyx lobes, petals 3–5, bright pink, spreading, broadly obovate, 0.75–1 mm long, shallowly sinuate at apex, margin entire. Stamens 3–5, bright pink, *c.* 1 mm long; filaments inserted slightly below the middle of the calyx tube. Staminodes 3, lanceolate, *c.* 0.25 mm long, bright pink, alternating with stamens, shorter

than ovary. Anthers up to the level of calyx tube, not exerted. Ovary globose to elliptic or slightly trilobed, 1–1.3 mm long, glabrous, trilocular. Style short, c. 0.25 mm long, often persistent in fruit, stigma capitate. Capsule 3- valved, enclosed more

than half way by the persistent calyx, (depressed) globose, c.1 mm long. Seeds pale green, up to 15, plano-convex, c. 0.5 mm long.

Flowering & Fruiting: September – December.

Table 1. Diagnostic morphological differences between *R. malampuzhensis*, *R. densiflora* and *R. anamika*

<i>R. malampuzhensis</i> R.V.Nair ex C.D.K.Cook	<i>R. densiflora</i> (Roth ex Roemer & Schultes) Koehne	<i>R. anamika</i> Lemiya
Leaf apex acute to shortly truncate.	Leaf apex obtuse to acute or acuminate.	Leaf apex subtruncate to slightly bimucronate.
Calyx tube bright red.	Calyx tube bright pink.	Calyx tube bright pink.
Bracts linear to lanceolate, as long as foliage leaves.	Bracts ovate to broadly ovate, much shorter than foliage leaves	Bracts elliptic to ovate, as long as foliage leaves.
Calyx appendages shorter than calyx lobes, sometimes rudimentary or absent.	Calyx appendage as long as or twice as long as calyx lobes	Calyx appendages as long as or slightly longer than calyx lobes.
Petals usually elliptic to oblong, acute at apex, bright red.	Petals narrowly obovate, sub acute - obtuse at apex, bright pink.	Petals broadly obovate, shallowly sinuate at apex, bright pink.
Staminodes present, alternating with stamens, pale green in colour with reddish tinge at apex.	Staminodes absent.	Staminodes present, alternating with stamens, bright pink.
Style shorter than half as long as ovary or subsessile.	Style as long as ovary.	Style shorter than half as long as ovary.

Specimens examined: INDIA. **Kerala**, Malappuram district, Calicut University Botanical Garden (CUBG), 45 m, 13.09. 2014, *Lemiya* 132969 (CALI)

Etymology: The specific epithet *anamika* in Sanskrit language means without name.

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