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RESEARCH ARTICLE

A New Species of *Rotala* L. (Lythraceae) from Kerala, India

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ABSTRACT: A new aquatic species of the family Lythraceae (*Rotala meenkulamensis*) collected from the lateritic plateau at Meenkulam, Kerala, India is described and illustrated here. It is closely allied to *R. rosea* (Poiret) C. D. K. Cook, but differs in having quadrangular, winged stem, subulate bracteoles, calyx appendages 2–3 times the size of calyx lobes, absence of petals and papillose seeds with a distinct depression.

KEY WORDS: India, Kerala, Lythraceae, New species, *Rotala meenkulamensis*.

INTRODUCTION

Rotala L. is a comparatively large amphibious genus, with 44 species distributed mainly in tropical and subtropical regions of the world (Cook, 1979; Mabberley, 2008). In India the genus is represented by 25 species, of which 21 are found in Peninsular India as this is the fifth discovery after its revision (Joseph and Sivarajan, 1989) for Peninsular India (Prasad *et al*., 2012). Of these 15 are endemic to Indian Peninsula. During floristic explorations in the lateritic hillocks of Northern Kerala, the authors collected an interesting specimen from a temporary pool at Meenkulam, Kannur district. On critical analysis, it turned out to be quite different from any of the known taxa and is described here as a new species with illustrations.

TAXONOMIC TREATMENTS

Key to the species of *Rotala* in India

1a. Lower leaves alternate; upper bracts scale-like …….. ***R. floribunda***
1b. Lower and upper leaves decussate or whorled; bracts not scale-like ……..…..…..…… 2
2a. Leaves in whorls of 3 or more …… 3
2b. Leaves decussate (rarely in whorls of 3 at the stem apex) ……..…… 8
3a. Petals absent ……..……..……... 4
3b. Petals present ……..……..……. 5
4a. Bracteoles leaf-like, partly or completely enclosing the flower, at least 2 times as long as the calyx …….. ***R. occultiflora***
4b. Bracteoles scareous, linear, not enclosing the flower and rarely exceeding the calyx ……..……..…. ***R. mexicana***
5a. Calyx tube at anthesis cylindrical to sub-urceolate, somewhat constricted at the throat; capsules opening by 3 valves; calyx lobes 3 or 5; petals 3 or 5 …….. ***R. verticillaris***
5b. Calyx tube at anthesis campanulate, not constricted at the throat; capsules opening by 2 or 4 valves; calyx lobes usually 4; petals usually 4 ……..…… 6
6a. Leaves monomorphic ……..…….. ***R. vasudevanii***
6b. Leaves dimorphic ……..…... 7
7a. Leaf number equal in the submerged and emergent whorls; petals shorter than the calyx; nectar scales unlobed ……..…. ***R. cookii***
7b. Leaf number unequal in the submerged and emergent whorls; petals longer than the calyx; nectar scales lobed ……..…. ***R. wallichii***
8a. Petals pinnately divided into linear segments …….. ***R. fimbriata***
8b. Petals entire or lobed, not pinnately divided into linear segments or absent ……..…. 9
9a. Calyx appendages present between the calyx lobes ……..…….. 10
9b. Calyx appendages absent between the calyx lobes ……..…... 17
10a. Calyx lobes 3 ……..…….. ***R. malampuzhensis***
10b. Calyx lobes 4 or 5 ……..…….. 11
11a. Calyx lobes 4 ……..…….. 12
11b. Calyx lobes 5 ……..…….. 14
12a. Stamens inserted near the base of the calyx tube; calyx tube globose to sub globose in fruit; bracts cuneate at base …… ……..…... ***R. andamanensis***
12b. Stamens inserted about halfway up the calyx tube; calyx tube campanulate to somewhat urceolate in fruit; bracts truncate or cordate at base ……..…... 13
13a. Calyx lobes acutely triangular, apiculate at apex; bracteoles equal to or longer than the calyx tube; leaves uniform in shape, with acute apex ……..…… ***R. illecebroides***
13b. Calyx lobes very shallowly triangular, obtuse at apex; bracteoles less than half as long as the calyx tube; leaves variable in shape, with obtuse apex ……..…….. ***R. ritchiei***
14a. Bracteoles 2 to 3 times longer than the total calyx, with a midrib …… ***R. densiflora***
14b. Bracteoles equal to or shorter than the total calyx, without a midrib ……..…… 15
15a. Stem distinctly winged; calyx appendages 2–3 times the size of calyx lobes; petals absent …….. ***R. meenkulamensis***
15b. Stem not winged; calyx appendages equal to or shorter than the calyx lobes; petals present ……..…… 16
16a. Stamens 0.5–0.7 mm long, included, inserted at the middle of calyx tube ……..…... ***R. rosea***
16b. Stamens 3.5–4.5 mm long, exerted, inserted at the base of calyx …… ***R. belgaumensis***
17a. Capsule opening by 4 valves ……..…….. 18
17b. Capsule opening by 2 or 3 valves ……..…... 20
18a. Floral bracts like foliage leaves; calyx tube distinctly 4-winged …….. ***R. tulunadensis***
18b. Floral bracts distinctly different from the foliage leaves in shape and size; calyx tube not winged ……..…… 19
19a. Anthers and stigmas included within the calyx; bracts longer than wide; bracteoles about equal to the calyx tube in length; inflorescence in fruit lax; ……..…… ***R. rotundifolia***

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19b. Anthers and stigmas exerted beyond the calyx; bracts wider than long; bracteoles half or less as long as the calyx tube; inflorescence in fruit dense ……..…….. ***R. macrandra***
20a. Capsule opening by 3 valves ……...…...…….. 21
20b. Capsule opening by 2 valves ……..…….. 30
21a. Bracteoles leaf-like, partly or completely enclosing the flower, at least 2 times as long as the calyx ……..… ***R. occultiflora***
21b. Bracteoles scareous, linear, not enclosing the flower, not more than 2 times as long as the calyx ……... 22
22a. Calyx lobes 5 ……..... 23
22b. Calyx lobes 4 or 3 ……..…….. 27
23a. Calyx tube 0.5–0.75 mm long; petals absent ……..…….... 24
23b. Calyx tube at least 1 mm long; petals present ……..…… 25
24a. Amphibious tuft-forming herb; stem erect; leaves dimorphic ….. ……..……..... ***R. mexicana***
24b. Terrestrial mat-forming herb; stem prostrate; leaves monomorphic ……..….. ***R. pygmaea***
25a. Capsules exceeding the calyx lobes; style less than 0.5 mm long; bracteoles about as long as the calyx tube …… 26
25b. Capsules not exceeding the calyx lobes; style 0.75–1 mm long; bracteoles longer than the total calyx ……..…… ***R. densiflora***
26a. Leaves linear, apex bimucronate; calyx with distinct interjected folds; petals distinctly clawed; nectar scales prominent …… ……..….. ***R. malabarica***
26b. Leaves linear-lanceolate, apex obtuse or acute; calyx without interjected folds; nectar scales absent ……. ***R. rosea***
27a. Calyx lobes 4 ……..…….. 28
27b. Calyx lobes 3 ……..….. 29
28a. Calyx tube 0.5–0.75 mm long ……..…….. ***R. mexicana***
28b. Calyx tube more than 0.75 mm long ……..…… ***R. cordata***
29a. Capsule not exceeding the calyx lobes; petals absent …… ……... ***R. mexicana***
29b. Capsule exceeding the calyx lobes; petals present …… ……..…… ***R. malampuzhensis***
30a. Leaves with a distinct cartilaginous margin ……..….... 31
30b. Leaves without a cartilaginous margin ……..….. ***R. serpyllifolia***
31a. Flowers distinctly pedicellate; anthers borne above the petals …. ……..…….. ***R. subrotunda***
31b. Flowers sessile or subsessile; anthers included within the calyx ... ……..... ***R. indica***

Rotala meenkulamensis K. S. Prasad & K. Ravi ***sp. nov.*** Fig. 1

Type: INDIA, Kerala, Kannur District, Meenkulam temporary pool, 12° 10’ 48” N, 75° 19’ 20” E, alt. 100 m, 02 September, 2012, *K. S. Prasad 03106* (Holotype: CAL; Isotypes: BSI, MH, MBGS).

Paratype: INDIA, Kerala, Kasaragod District, Mugu paddy field, 12° 36’ 56” N, 75° 01’ 40” E, alt. 150 m, 28 October, 2012, *K. S. Prasad 03143* (Sir Syed College Herbarium).

An aquatic annual herb. Stem erect, 17–45 cm long, rooting at base, branched above, succulent, quadrangular, winged, with distinct nodes and internodes; branches quadrangular, slightly winged. Leaves simple, sessile, decussate, ovate-lanceolate, lateral veins indistinct; base cuneate to attenuate, apex slightly bimucronate, margins entire, green; submerged leaves larger, 13–25 × 3–4 mm; aerial leaves modified into bracts, 4–12 × 2–3 mm. Flowers axillary, solitary, monomorphic, sessile, borne on exposed branches. Bracts leaf like, decreasing in size towards apex, obovate, 4–12 × 2–3 mm. Bracteoles subulate, 0.7–0.8 mm long. Calyx tube 1.1–1.3 mm long, campanulate to urceolate, becoming semiglobose as fruit matures, enlarging in fruits up to 1. 7 mm long, translucent; lobes 5, broadly triangular, 0.1–0.15 mm long; calyx appendages alternating with calyx lobes, subulate, 2–3 times the size of calyx lobes, 0.2–0.3 mm long. Petals absent. Stamens 5; filaments inserted at the base of calyx tube, 0.1–0.2 mm long; anthers dorsifixed. Ovary globose to subglobose, obscurely trilobed, 0.5–0.6 × 0.2–0.3 mm; style short,. 0.1–0.12 mm long; stigma thick. Capsule 1.8–2 × 1.1–1.3 mm, depressed globose, red, irregularly circumsciss, 3-valved; valves induplicate. Seeds many, 0.2–0.3 mm long, varying in shape, round to ovoid, papillose, straw-coloured, with a distinct depression.

Flowering and fruiting: August–November.

Habitat and ecology: The material was collected from the temporary, shallow pool in depressions on lateritic rocks. Plant remains submerged during the rainy season and emerges out as water recedes. It grows in association with *Rotala indica* (Willd.) Koehne, *Blyxa aubertii* L. C. Rich. var. *echinosperma* (Clarke) Cook & Lound, *Limnophila repens* (Benth.) Benth., *Oryza rufipogon* Griff., *Utricularia reticulata* Smith and *Geissaspis tenella* Benth.

Note: *Rotala meenkulamensis* K. S. Prasad & K. Ravi *sp. nov.* is similar to *R. rosea* (Poiret) C. D. K. Cook but differ from the latter by the characters given in the Table 1.

Etymology: The new species is named after the type locality “Meenkulam” in Kannur District, Kerala State, India.

Conservation status: The species is confined to an area of less than 5 km^2 on lateritic hillocks of Meenkulam and paddy fields of Mugu which are prone to mining, land conversion, uncontrolled tourism and grazing. The current assessment as per the IUCN guidelines (IUCN, 2001) indicates that this species is ‘Critically Endangered’ (CR) based on the extent of occurrence, area of occupancy, severely fragmented population and quality of habitat. However, further studies and explorations are required to ascertain its status.

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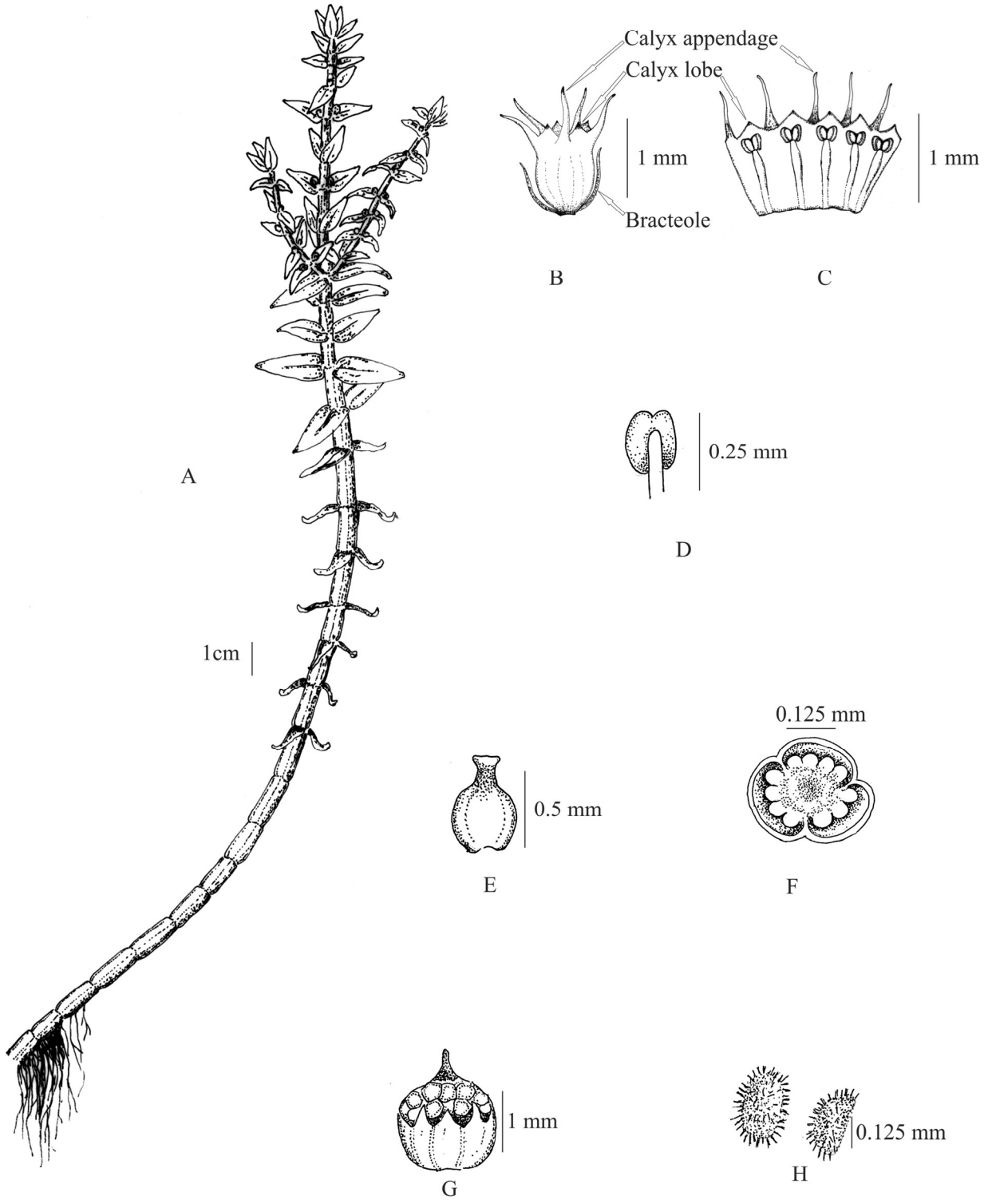


Fig. 1. ***Rotala meenkulamensis*** **K. S. Prasad & K. Ravi. A: Habit. B: Flower. C: Calyx, opened. D: Stamen. E: Gynoecium. F: Ovary, cross section. G: Fruit. H: Seeds.**

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Table 1. The distinguishing features between *Rotala meenkulamensis* and *Rotala rosea*

Characters	*R. rosea*	*R. meenkulamensis*
Stem	Terete, branched below	Quadrangular, slightly winged, with distinct nodes and internodes, branched above
Leaves	Monomorphic, linear-lanceolate	Dimorphic, ovate-lanceolate
Bracteoles	Linear or capillary	Subulate
Calyx appendages	As long as the calyx lobes	2–3 times longer than the calyx lobes
Petals	5 or rarely 4 or rudimentary	Absent
Stamens	Inserted just below the middle of the calyx tube	Inserted at the base of the calyx tube
Ovary	Globose	Obscurely trilobed
Seeds	Semi-ovoid, shining	Ovoid to round, papillose, with a distinct depression

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自印度喀拉拉邦發現的水豬母乳屬（千屈菜科）新種

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摘要：本文發表千屈菜科的一個水生新種*Rotala meenkulamensis*，採集地點在印度喀拉拉邦，明庫蘭姆的紅土高原。此種相近於五蕊水豬母乳，但具下列之特徵而可與相近之分類群辨明：四邊形、有翼、且可高達45公分的的莖，莖節與節間分明，上面分枝，具錐型小苞片，葉卵形至披針型，花萼臂狀突的大小約為萼裂片之2到3倍，缺乏花瓣，雄蕊自萼筒基部長出，子房隱約成三瓣狀，種子具有從凹孔凸出的乳突狀突起。

關鍵詞：印度、喀拉拉邦、千屈菜科、新種、*Rotala meenkulamensis*。

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