



# A new variety of *Rivina humilis* and the status of *R. bengalensis* (Phytolaccaceae)

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## Abstract

Taxonomic circumscription of *Rivina humilis* L. is re-examined and *R. bengalensis* S.C.Srivast. & T.K. Paul is treated as a synonym. *Rivina humilis* var. *bracteata* is proposed as a new variety.

**Keywords:** new variety, Phytolaccaceae, *Rivina bengalensis*, *Rivina humilis* var. *bracteata*

## Introduction

*Rivina humilis* L. belongs to the family Phytolaccaceae is a native of tropical America and is now widespread throughout in tropics and subtropics (Dequan, 2003; Mabberley, 2008; Tseng *et al.*, 2008). In many countries this species is often cultivated in gardens as the juicy pericarp is used in cosmetics (Walter, 1909).

The genus was recognized by Linnaeus in 1753 and since then several species have been recognized by various workers, giving emphasis to morphological plasticity in vegetative as well as reproductive characters. Present day *Rivina* is treated with a single species, *R. humilis* (Dequan, 2003; Mabberley, 2008). As too much of emphasis was given to morphological variability in recognizing species under this genus, a re-examination of the taxonomy of *Rivina* was conducted based on field observation and the conclusions are presented here.

An elaborate taxonomic circumscription of the genus *Rivina* was provided first by Moquin (1849). He divided the genus into two sections: Sect. I. *Villamilla* (8-12 stamens, stigma sessile to subsessile, penicillate) with two species and Sect. II. *Piercea* (4 stamens, style elongated, curved and stigma papillose) with eight species. However, present day *Rivina* is treated with a single species, *R. humilis* and the rest are treated either as synonym or shifted to other genera (Mabberley, 2008).

As part of taxonomic study, plant materials were collected from all over West Bengal and its surrounding states. The detailed morphology has

been examined both in the field and laboratory. The collected specimens showed variability in many characters, particularly in the presence and distribution of trichomes, the size and shape of the leaves, the colour of the flowers and fruits and in garments (hairs) of the seeds. It is clear from the description given by Linnaeus (1753) and Moquin (1849) that overemphasis was paid to these characters while recognizing infraspecific variants.

Moquin (1849) had mentioned that in the typical situation the plants are densely pubescent with subulate bracts. However, in almost all other literatures this particular aspect is totally neglected. In all cases only the number, size and to some extent the degree of pubescence of bract have been mentioned. Recently, the authors have located two individual plants in the A.J.C. Bose Indian Botanic Garden, Howrah, West Bengal which possess all the characters mentioned by Moquin (1849). The plants are moderate to thick pubescent with typical subulate bracts. Though sometimes very slightly dilated towards middle in few other individuals.

Walter (1909) also provided a comprehensive taxonomic account of the species and he had mentioned the bracts as lanceolate instead of subulate. Interestingly, majority of the individuals growing in and around West Bengal possess lanceolate bracts. Therefore, the nature of the bract of *R. humilis* is either subulate or lanceolate. This fact is also established in the present study through the examination of hundreds of individuals.

The flower colour of *R. humilis*, in general, is encountered as pure white to pinkish. Fruits are really magnificent in appearance as bright scarlet, glossy red, shining yellow, sweet orange, pretty pink or even pure white and is so variable that it is impossible to correlate with any other characters and the individuals are frequently grown together in the same population.

During the maturation of the fruit, out of three layers of the pericarp the two inner layers become separated from the outer one and appressed and adherent to the seed coat. The cells of the outermost two layers elongate centrifugally forming tubular trichomes of 133-229 µm long. Thus the seeds appear as hairy and are sometimes described as pubescent (Thieret, 1966). The outer most layer of the pericarp becomes juicy at maturity (Kajale, 1954; Nautiyal & Gupta, 1984).

Majority of the seeds (lenticular compressed) are hirtellous and hairs are arranged to form reticulate blocks. However, the degree of hairiness is largely variable. Many of the seeds are totally and uniformly covered with dense suppressed hairs. Sometimes the hairs are mostly concentrated towards the base of the seed and gradually reduced towards the apex. The seeds are often very minutely hairy along the margin only, leaving the surface perfectly glabrous. Interestingly, there are few individuals having perfectly glabrous seeds with granular, glossy surface. The colour of hairs is also very interesting. Majority of the individuals are with light brownish hairs. In the rest of the plants, it is greenish, yellowish or even white. The size of the hairs is also very much variable in different individuals. As in other cases the plants with this type of variability also grows in same population. The same colored fruits are also with different kind of seeds.

The anthers are found basifixed and dimorphic (two of them smaller). Anther cells are unequal and protrude beyond the attachment.

Srivastava and Paul (2003) described *Rivina bengalensis* as a new species based on its diagnostic features such as decumbent habit, densely pubescent plant parts, rugose ovary with green (immature) or yellow fruits and glabrescent, rugose seeds.

Examination of the type specimens and large numbers of populations in and around West Bengal showed that these characters are highly variable among the individuals in different populations. Many of these diagnostic characters are shared by

different individuals of the same populations. The rugose nature is actually the reflection of the veins of inner surface of the outer layer of pericarp and also observed in red or scarlet fruits. Outer layer of pericarp is juicy or succulent and often transparent/translucent at maturity. The hairiness of seed is not colour dependent as discussed earlier. The degree of hairiness on the plant surface is so variable that it could not be a diagnostic feature. The bracts of the type specimens are slightly dilated at middle and lanceolate. Because of these reasons, *R. bengalensis* is treated as synonym.

Recently several individuals have been identified in and around Kolkata, West Bengal which are surprisingly different from the typical one in the character of floral bracts and is here proposed as a new variety.

#### Key to the varieties of *R. humilis* occurring in India

1. Bracts subulate or slightly dilated towards middle (lanceolate) .....var. **humilis**
1. Bracts broadly oblanceolate, abruptly narrowed from middle, some times tridentate .....var. **bracteata**

***Rivina humilis*** L., Sp. Pl. 1: 121. 1753; Prain, Bengal Pl. 2: 883. 1903; Haines, Bot. Bihar Orissa 3: 811. 1961. **Fig. 1**

*Typus*: Herb. Clifford 35 (*Rivina* 1) (BM-digital image!). (Designated by Wijnands, 1983).

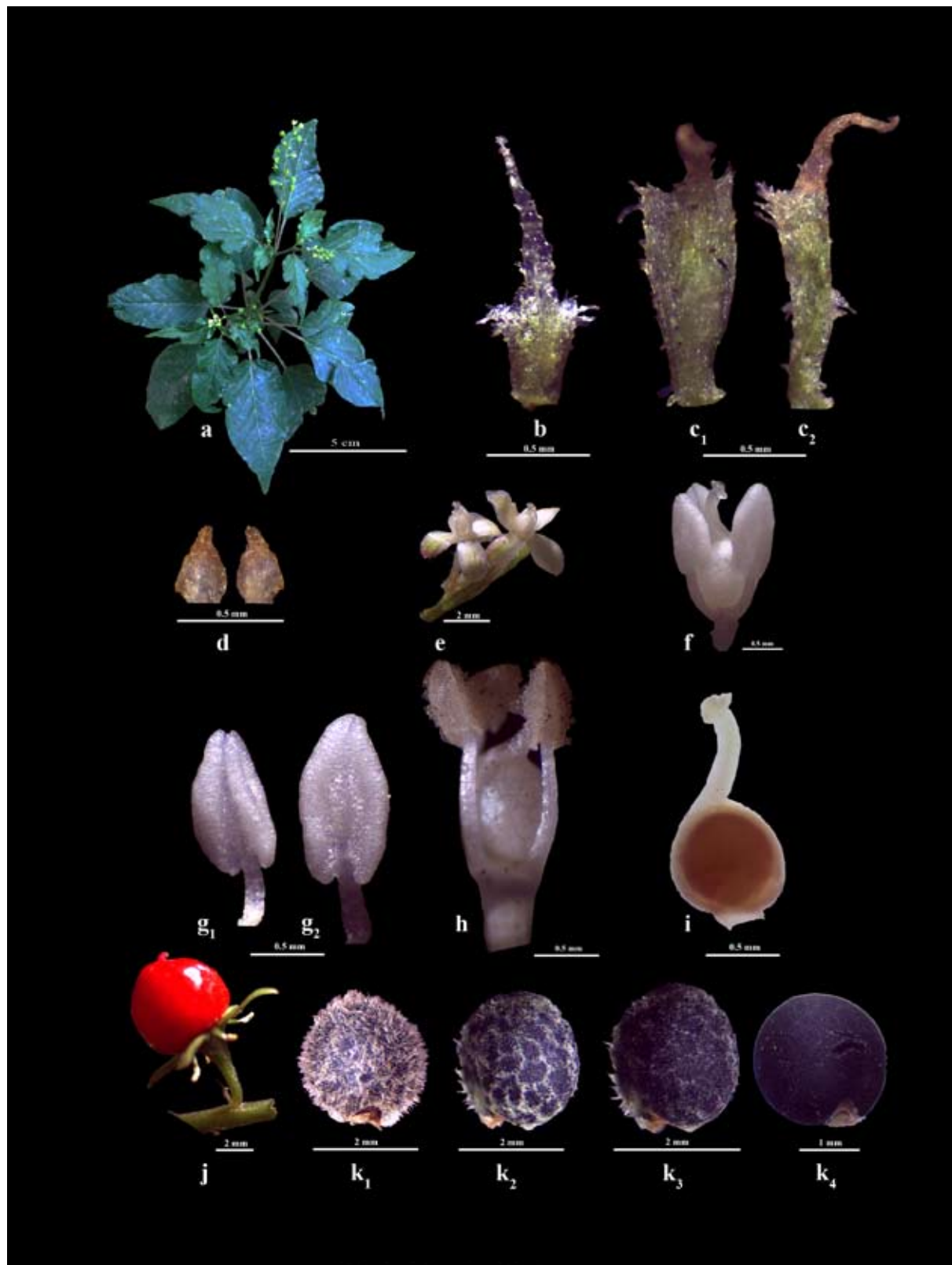
*Rivina bengalensis* S.C. Srivast. & T.K.Paul, Indian J. Forest. 26: 357. 2003. **syn. nov.**

*Typus*: INDIA: **West Bengal**, Howrah, Andul Road adjacent to Indian Botanic Garden, 08.10.2001, T. K. Paul & S.C. Srivastava 28183 A (*Holotypus*: CAL!; *Isotypii*: 28183 B, C, D, CAL!).

Diffusely branched, variously hairy herb, to 1 m tall; lamina ovate, ovate-lanceolate, elliptic, or oblong, 5–14 × 2–9 cm, variously hairy on both the surfaces, often glabrescent, base attenuate, rounded or truncate, margin undulate, often slightly serrulate, apex acute to long acuminate; flowers many in terminal or axillary racemes to 15 cm long; pedicels with a bract and a pair of bracteoles; bracts subulate to lanceolate (slightly dilated towards middle); petals absent; sepals petaloid, shining white, white flushed with pink or pink, elliptic or obovate-oblong, accrescent and green in fruting, reflexed; stamens slightly dimorphic; anther basifixed; berry globose or pyriform; seeds lenticular, variously hairy, often glabrous.



**Fig.1.** *Rivina humilis* var. *humilis* L.: **a.** Flowering twig; **a<sub>1</sub>** & **a<sub>2</sub>**, Bracts, dorsal and ventral face; (**a**, **a<sub>1</sub>** & **a<sub>2</sub>** - from densely pubescent plant with subulate bracts; **b.** Flowering twig (almost glabrous plant with very large growth habit); **c.** Flowering twig; **c<sub>1</sub>** & **c<sub>2</sub>**, Bracts, dorsal and ventral face; **d.** Flower; **e<sub>1</sub>**- **p<sub>2</sub>**, Fruits with respective seeds.



**Fig. 2.** *Rivina humilis* var. *bracteata* D. Maity *et al.*: **a.** Flowering twig; **b.** Bract (Dorsal face); **c<sub>1</sub>** & **c<sub>2</sub>**- Bracts, dorsal and lateral face; **d.** Bracteoles; **e.** Flowers; **f.** Flower (sepals removed); **g<sub>1</sub>** & **g<sub>2</sub>**- Stamens; **h.** Flower at anthesis (sepals removed); **i.** Gynoecium; **j.** Fruit with persistent sepals, stamens and bract; **k<sub>1</sub>**-**k<sub>4</sub>**- Seeds.

***Rivina humilis* L. var. *bracteata* D. Maity, Sonia Mitra, Manasi Mandal *et* Maity, var. nov.**

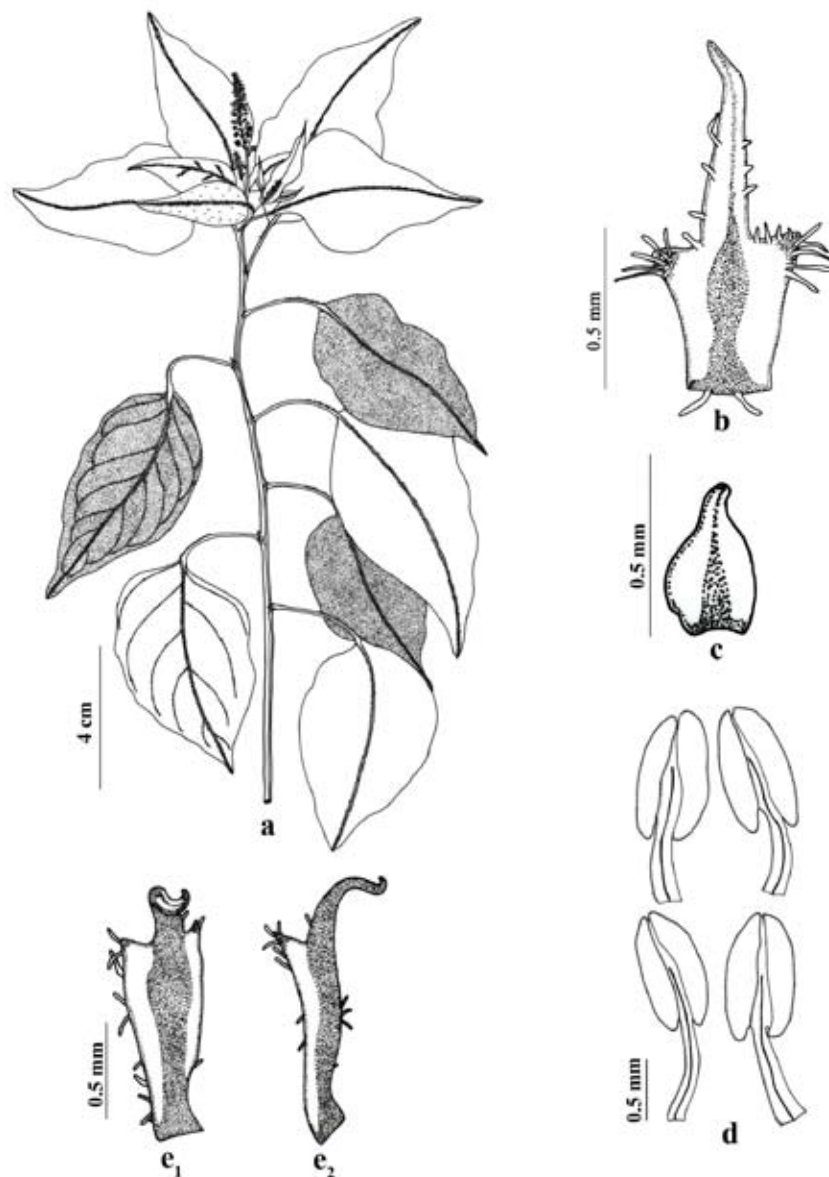
*Typus*: INDIA: **West Bengal**, Kolkata, 24.04.2013, Maity 20105 (*Holotypus*: CUH; *Isotypii*: CAL, CUH).

**Fig. 2, 3**

Similar to *R. humilis* L. var. *humilis*, but bracts broadly oblanceolate, abruptly narrowed from middle or above middle into a long subulate to narrowly triangular, acuminate apical lobe (often tridentate near middle).

Erect or decumbent, sparingly branched, glabrescent herb to 75 cm high; leaves ovate or

rarely ovate-elliptic, base often oblique, petiolate, exstipulate; inflorescence terminal or axillary raceme; flowers white, often flushed with pink along sepal margin, pedicellate, bracteate; bracts broadly oblanceolate, 1–1.5 × 0.4–0.5 mm, abruptly contracted towards middle or above middle into a long subulate to narrowly triangular, acuminate apical lobe or often tridentate with two small lateral lobes; lateral lobes triangular, 0.1–0.2 × 0.1–0.2 mm; mid-lobe subulate or narrowly triangular-acuminate, c. 0.5 × 0.1 mm; minutely hairy, often persistent in ripe fruits; sepals 4, obovate or ovate-elliptic, 2–3 × 0.9–2.5 mm, sparsely hairy on outer surface, white, often flushed with pink along



**Fig. 3.** *Rivina humilis* var. *bracteata* D. Maity *et al.*: **a.** Flowering twig; **b.** Bract; **c.** Bracteole; **d.** Stamens (from holotype, Maity 20105 - CUH); **e<sub>1</sub>** & **e<sub>2</sub>**. Bracts, dorsal and lateral views (Maity 20106 - CUH).

margin, persistent, becoming green; stamens 4, dimorphic, two smaller; filaments persistent, becoming green, often acrescent; anthers with unequal lobes, basifixed, often persistent in ripe fruits; ovary globose, often with fine reticulate striations; style subterminal; fruits globose, succulent, red or scarlet; seeds black, sparsely hairy or glabrous, shiny with granular surface.

*Paratypes*: INDIA: **West Bengal**, Kolkata, Ballygunge, 06.06.2011, *Mitra* 20019 Kolkata, Ballygunge, 07.08.2012, *Mitra & Maity* 20032 (CUH).

*Distribution*: Endemic to Kolkata, India.

*Proposed IUCN conservation assessment*: Data Deficient (DD). The plant is known from only two populations that comprises nearly 100 individuals. Its extent of occurrence and area of occupancy are both currently unknown. Until further report from other localities, it seems best to classify it as Data Deficient (IUCN, 2001).

*Etymology*: The infraspecific epithet of the new taxon refers to its prominent bract.

*Notes*: Observation on the individuals of the new taxon for a period of four years (2011-2014) revealed that the typical nature of the bracts as described above is a constant feature and shows no variation in their morphology. Moreover, the mid-lobe of the bracts is often curled at maturity. The bracteoles are ovate to broadly ovate and often with caudate-acuminate apex. Plants are glabrescent to moderate hairy with white (often flushed with pink along the sepal margin) flowers and scarlet fruits. However, the most variable part is the garment of seeds. The seeds are either uniformly dense hairy, hairs are arranged in a reticulate fashion, glabrescent with few hairs along margin to perfectly glabrous with granulate surface. Both the bracts and the anthers in these individuals are very late deciduous and significantly present in the ripe fruits.

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