A PRELIMINARY REVISION OF THE GENUS ROTALA (LYTHRACEAE) IN MALESIA

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SUMMARY

A key is given to 7 species, 6 of which occur in Malesia. Of each the basionyms and a restricted synonymy are given, besides notes on their distribution. *Rotala diversifolia* Koehne, hitherto only known from Thailand, appears to occur in several localities in Malesia. A new combination, *R. catholica* (Cham. & Schlechtend.) B. van Leeuwen, is proposed for the American *R. dentifera* (A. Gray) Koehne, introduced in Luzon.

INTRODUCTION

At the end of a student's course in taxonomy at the Rijksherbarium, Leyden, I was entrusted with the identification of a number of unnamed specimens of *Rotala;* this led to checking other identifications, and finally resulted in a preliminary revision of the genus as represented in Malesia, based on specimens in the Rijksherbarium.

Rotala and *Ammannia* are not seldom confused in the herbarium, as they are much alike in habit. They can easily be distinguished by the fruit which dehisces with 3—5 valves in *Rotala* and breaks away irregularly at the apex or loses the apical part in an irregular-circumscissile way in *Ammannia.* Moreover, there is a distinct anatomical difference in the structure of the pericarp which in both genera consists of two main layers of parenchymatic cells, the inner of which is slightly more lignified than the outer one. In *Rotala* the cells of the inner layer are almost linear, strongly lignified, and transverse; this can also be observed macroscopically, preferably in transparent view, by the presence of fine transverse lines. This inner layer easily separates from the outer layer. In *Ammannia* the cells of both layers are similar in shape, although the cells of the inner layer are more lignified.

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KEY TO THE SPECIES

1. Calyx 6-merous. Petals and stamens 6 . . . . . **1. R. hexandra**
1. Calyx 4- or 5- merous. Petals 4 or 5. Stamens 2—5.
   2. At least part of the leaves in whorls of 3. Stamens 2—4, inserted at the base of the calyx-tube. Style absent.. . . . . **2. R. mexicana**
   2. Leaves always decussate. Stamens 4 or 5, inserted in the upper part of the calyx-tube, at least halfway. Style present, very short to half as long as the ovary.
      3. Calyx without interlobal appendages.
         4. Bracteoles linear. Calyx 2½—3 mm long. Petals half as long as the calyx-lobes. Style ⅓ of the length of the ovary. Fruit 2-valved . . . . . **3. R. indica**

4. Bracteoles ovate. Calyx 1—2 mm long. Petals twice as long as the calyx-lobes. Style ½—1 time as long as the ovary. Fruit 3-valved. . . . . **4. R. diversifolia**
3. Calyx with distinct interlobal appendages.
5. Bracteoles green. Calyx in most flowers 4-merous, green . . . . . **5. R. catholica**
5. Bracteoles hyaline. Calyx 5-merous, corolla-like, not green.
6. Bracteoles very narrowly lanceolate, widest below. Appendages mostly as long as the calyx-lobes. Petals minute. Style beneath the stigma less than ¼ mm. . . **6. R. pentandra**
6. Bracteoles ovate-oblong. Appendages longer (up to twice the length) than the calyx-lobes. Petals at least half as long as the calyx. Style beneath the stigma at least ¼ mm long. **7. R. densiflora**

ENUMERATION OF THE SPECIES

1. Rotala hexandra Koehne, Bot. Jahrb. 1 (1880) 176; Pfl. R. Heft 17 (1903) 37; Back., Onkr. Jav. Suiker. (1930) 462; Back. & Bakh. *f.*, Fl. Java 1 (1963) 252.

Distribution: SE. Asia; in Malesia once recorded near Djakarta at sealevel (specimens not seen).

2. Rotala mexicana Cham. & Schlechtend., Linnaea 5 (1830) 567; Koehne, Bot. Jahrb. 1 (1880) 150; Pfl. R. Heft 17 (1903) 29; Val., Bull. Dép. Agr. Ind. Néerl. 10 (1907) 36; Merr. & Perry, J. Arn. Arb. 22 (1941) 268; Back. & Bakh. *f.*, Fl. Java 1 (1963) 253.

Distribution: Ubiquist in warmer countries; in Malesia in E. Java, Madura, the Philippines, and New Guinea.

3. Rotala indica (Willd.) Koehne, Bot. Jahrb. 1 (1880) 172; Pfl. R. Heft 17 (1903) 40; Henderson, Mal. Wild Fl. (1959) 146, fig. 141; Back. & Bakh. *f.*, Fl. Java 1 (1963) 252. — *Peplis indica* Willd., Sp. Pl. 2 (1799) 244.

Distribution: SE.—E. Asia; in Malesia in the Malay Peninsula, Central & N. Sumatra, Java, Madura, Lesser Sunda Is. (Lombok), Celebes, and the Philippines.

4. Rotala diversifolia Koehne, Bot. Jahrb. 41 (1908) 77.

Distribution: Originally only from Thailand (Chiengmai), now also found in Malesia in Central & N. Celebes and NW. New Guinea (Vogelkop Peninsula).

5. Rotala catholica (Cham. & Schlechtend.) B. van Leeuwen, *comb. nov.* — *Ammannia catholica* Cham. & Schlechtend., Linnaea 2 (1827) 378, *pro A. catholica philippensis, lectotypus, ex luzoniae, ? excl. (? var.) catholica brasiliensis.* — *R. ramosior* (L.) Koehne, Fl. Bras. 13, 2 (1877) 194, t. 39, fig. 1; Bot. Jahrb. 1 (1880) 157; Pfl. R. Heft 17 (1903) 32; Merr., Fl. Manila (1912) 342; Sp. Blanc. (1918) 220; En. Philip. 3 (1923) 135, *pro specim. philip.* — ? *Ammannia monoflora* Blanco, Fl. Filip. ed. 1 (1837) 64. — *Ammannia dentifera* A. Gray, Smiths. Contr. 5 (1853) 55. — *R. dentifera* (A. Gray) Koehne, Bot. Jahrb. 1 (1880) 161; Pfl. R. Heft 17 (1903) 32, fig. 3B.

Distribution: Obviously native of the neotropics, introduced in the Old World, only found as yet in Malesia in the Philippines: Luzon.

Notes. Ammannia catholica was described on two collections: one obviously collected by Chamisso in Luzon which was fully described, and one from Sellow from Rio de Janeiro, which was provided only with a meagre description without floral details. Chamisso & Schlechtendal obviously found them different, but, possibly in absence of flowers of the Brazilian plant, found them not so different as to distinguish them as species. They called them '*A. catholica philippensis*' and '*A. catholica brasiliensis*' respectively, presumably intended as varieties. As the general description of *A. catholica* contains

the floral characters, and these are of the Philippine plant, the latter must be regarded as the lectotype specimen.

Koehne referred both 'varieties' to *Rotala ramosior* (L.) Koehne; this may be correct for the Brazilian 'variety', but cannot apply to the Philippine plant.

From the Philippines Blanco described an *Ammannia monoflora* Blanco but his description is too meagre to interpret it with certainty. Merrill in doing so collected *Rotala dentifera* as a topotype but he followed for the naming Koehne and referred the Philippine plants to *R. ramosior*. In our material from the Philippines, and in general for the whole of Malesia, we have not come across any specimen of *R. ramosior*. These two species are easily distinguished and excellently opposed by drawings in Koehne's monograph, page 33, figures 3 A and B. Thus our pertinent conclusion is that the Luzon plant described as *Ammannia catholica* is the same as what later has been called *Rotala dentifera*.

R. ramosior has bracteoles about half as long as the calyx-tube and the appendages of the calyx are shorter than the calyx-lobes; in *R. dentifera* the bracteoles are at least as long as the calyx and the appendages are four times as long as the calyx-lobes.

6. Rotala pentandra (Roxb.) Blatt. & Hallb., J. Bomb. Nat. Hist. 25 (1918) 707, *pro parte, pro basion. et syn. R. leptopetala.* — *Ammannia pentandra* Roxb., Fl. Ind. 1 (1820) 448. — *Ammannia leptopetala* Bl., Mus. Bot. Lugd. Bat. 2 (1856) 134. — *R. leptopetala* (Bl.) Koehne, Bot. Jahrb. 1 (1880) 162; Pfl. R. Heft 17 (1903) 34; Back. & Bakh. *f.*, Fl. Java 1 (1963) 253.

Distribution: S.E. Asia; in Malesia in the Malay Peninsula, W. Sumatra, W. & Central Java, Madura, Celebes, the Philippines, and New Guinea.

Notes. The nomenclature of this species is somewhat confused. Roxburgh's name and description are absolutely clear. Wight in the text of his Icones to tab. 217, where he recognized *Rotala* and *Ammannia* as distinct genera, suggested that *A. pentandra* should be placed in *Rotala*, but did not make the formal combination, as was erroneously assumed in Index Kewensis. But the latter work did not validate it either because of referring the combination *R. pentandra* to the synonymy of *Ammannia pentandra* by not recognizing *Rotala* as a distinct genus. Blatter & Hallberg made the formal combination in 1918, but at the same time they merged it with *R. densiflora* and added its basionym *Ammannia densiflora* Roth *ex* R. & S., 1818, and several other synonyms of the latter among the references. This merging made the combination *R. pentandra* incorrect. However, by excluding the synonym *R. densiflora*, as done here, the combination becomes the correct one for the species, in accordance with the Code, art. 63, note, where an exactly similar example is given.

In passing, I remark that I cannot agree with merging *R. pentandra* with *R. densiflora*. Blatter & Hallberg did not use the characters stressed in my key. Indian botanists are invited to test these characters on more material than I had at my disposal.

There is only one old epithet which might come into this question, viz. *Ammannia nana* Roxb. But Roxburgh himself in his careful account of 1820 did distinguish this from *A. pentandra* and furthermore Clarke in his meticulous disentangling of names in *Ammannia/Rotala* referred this to *A. peploides* Spreng. which is *R. indica* which Roxburgh did not have.

7. Rotala densiflora (Roth *ex* R. & S.) Koehne, Bot. Jahrb. 1 (1880) 164; ibid. 4 (1883) 388; Pfl. R. Heft 17 (1903) 35; Back. & Bakh. *f.*, Fl. Java 1 (1963) 253. — *Ammannia densiflora* Roth *ex* R. & S., Syst. 3 (1818) 304; Roth, Nov. Sp. Ind. Orient. (1821) 99; DC., Prod. 3 (1828) 79. — *Sellowia uliginosa* Roth *ex* R. & S., Syst. 5 (1819) 407; Roth,

Nov. Sp. Ind. Orient. (1821) 163; DC., Prod. 3 (1828) 380. — *Winterlia uliginosa* Spreng., Syst. 1 (1825) 788. — *R. roxburghiana* R. Wight, Icon. 1 (1840) t. 260B, *excl. syn. Ammannia pentandra.* — *R. densiflora* ssp. *uliginosa* Koehne, Bot. Jahrb. 1 (1880) 165; Pfl. R. Heft 17 (1903) 36.

Distribution: Said to occur from SE. Asia to Australia (Koehne, l.c.) but not yet collected in Malesia. At Leyden there are no specimens from Australia, but many from SE. Asia.

Notes. In the Flora of British India Clarke merged this species with *Ammannia pentandra*, and this was also the opinion of Blatter & Hallberg when making their new combination *R. pentandra*. But I agree with Koehne in keeping both species apart by the characters given in the key.

I agree with Koehne in reducing *Sellowia uliginosa* to *R. densiflora*, and not to *R. pentandra*, as Clarke did in the Flora of British India, followed by Index Kewensis. I have seen isotypes of both Heyne collections and compared them with Roth's own more elaborate descriptions, with which they agree.

Why Roth did not recognize *Ammannia densiflora* and *Sellowia uliginosa* as conspecific, and even accommodated them in separate genera, is not very clear, and the only explanation is that Roth was too much impressed by the Linnean classes and found *Ammannia densiflora* to belong to *Tetrandria* and *Sellowia uliginosa* to *Pentandria*, not realizing that merousness of flowers is variable in this species, even often in one plant. The only flaw in the description of the first named species is that, in comparing it with *Ammannia baccifera*, Roth stated that *A. densiflora* would have 2 or 3 sessile flowers per axil, whereas they are actually solitary. I cannot account for this discrepancy.

LIST OF SOME IDENTIFICATIONS

Among the material of *Rotala* and *Ammannia* I examined in the Rijksherbarium there were a number of sheets on which the original identification under which it was received as a duplicate was inadequate or had to be changed. This included also some sheets from Asia. It may be of use to herbarium curators to list these additional identifications.

If a *Rotala*, the collecting number is followed by the number of the species as treated here.

Rotala

Boerlage s.n. 10.10.'88: 3 — Carr 11557: 2 — Coert 318: 3 — Eyma 1253: 4, 3458: 4 — Hallier 4217: 5 — Hosseus 275 (isotype): 4 — Kerr 2260: 4 — Lörzing 13013: 3 — Merrill 9782: 6; Sp. Blanc. 426: 5; Sp. Blanc. 752: 5 — van Ooststroom 12654: 6 — PNH 11302: 6 — van Royen 4579: 6 — van Royen & Sleumer 6704: 4; 6707: 2 — Santos 6106: 3.

Ammannia

Alston 13776 = *A. microcarpa* DC.; 14708 = *Gonostegia pentandra* (Roxb.) Miq. (Urtic.) — Hallier 4361 = *A. baccifera* L. — Milicante 71 = *A. baccifera* L. — Noerkas 317 = *A. microcarpa* DC. — Philipp 2691 = *A. baccifera* L. — PNH (Mendoza) 22503 = *A. coccinea* Rottb. — van Steenis 18200 = *A. baccifera* L.