NBU Journal of Plant Sciences

Vol. 9, No. 1, March 2015, pp. 70-77
ISSN No. 0974-6277

Wetland flora of West Bengal: Lythraceae J. St.-Hilaire

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Abstract

Considering the total area of wide range of wetlands, West Bengal is occupying the fourth position in India. Most of which are known to support very rich plant diversity. The present work recorded a total of 18 species belonging to five genera of Lythraceae J. St.- Hilaire growing in the aquatic or marshland habitat in West Bengal.

Introduction

Lythraceae J. St.-Hilaire is an important family of flowering plants, which is placed under the Myrtales of Malvids of eudicotclade in APG III system of classification (Chase & Reveal, 2009), with about 31 genera and 600 species, widely distributed in tropical regions of the world but relatively less common in temperate regions (Graham *et al.*, 2005). C. B. Clarke (1879) in *The Flora of British India* first time gave an account of Lythraceae of British India. There he included 11 genera viz., *Ammannia* Linnaeus (18 spp.), *Hydrolythrum* Hooker *f.* (1 sp.), *Woodfordia* Salisbury (1 sp.), *Pemphis* Forster (1 sp.), *Lawsonia* Linneaus (1 sp.), *Crypteronia* Blume (3 spp.), *Lagerstroemia* Linneaus (12 spp.), *Duabanga* Hamilton (1 sp.), *Sonneratia* Linnaeus *f.* (4 spp.), *Punica* Linnaeus (1 sp.) and *Axinandra* Thwaites (2 spp.). Cook (1995) reported 7 species of *Ammannia* Linneaus, 2 species of *Nesaea* Kunth and 29 species of *Rotala* Linnaeus from the fresh water bodies in India. Wetland areas are very suitable habitat for different annual or biannual herbaceous species of Lythraceae. The fresh and salt water bodies of West Bengal are quite rich in various species of Lythraceae (Chowdhury, 2009; Chowdhury & Das 2010). Nasker (1990) reported 3 species of *Ammannia* and 3 species of *Rotala* from lower Gangetic plains of West Bengal. Prain (1903) described 9 genera viz., *Ammannia* (*Rotala*) (13 spp. and 2 subsp.), *Hydrolythrum* (1 sp.), *Woodfordia* (1 sp.), *Lawsonia* (1 sp.), *Crypteronia* (1 sp), *Lagerostroemia* (4 spp and 1 sp), *Duabanga* (1 sp), *Sonneratia* (2 spp.) and *Punica* (1 sp.) from the pre-independence undivided Bengal. West Bengal is the bottleneck state of eastern India with unique topographic features. It spreads from the Himalayas in the north to the Bay of Bengal in the south along with the central Gangetic plains and *rarh* and small hills of South western Bengal (Purulia and Bankura districts). The state lies between 85° 50' and 89° 50' E longitude and 21°38' and 27°10' N latitude and spreading over an area of 88,752 km^2, shearing the international border with Bangladesh, Nepal and Bhutan. This state is having very wide range of climatic zones viz., tropical, sub-tropical, temperate and sub-alpine along with fresh and salt water wetlands of various sizes and shapes. These wetlands are known to host quite rich with diversified flora and fauna (Chowdhury and Das, 2009, 2010, 2011, 2013, 2014; Biswas *et al.* 2012; Chowdhury *et al.* 2014).

The present study focused on the species of Lythraceae J. St.-Hilaire which are widely growing in different water bodies of West Bengal. Through extensive survey during last 12 years accumulated rich and useful information about these plants from Bengal wetlands. The collected minor taxa of Lythraceae of West Bengal wetlands are enumerated below along with their identification keys, description, distribution and uses.

ENUMERATION

Key to the Genera:

1a. Aquatic floating herbs; fruits 1- seeded and with 2-4 spines..... *Trapa*

1b. Marshy or halophytic rooted herbs or trees; fruits with more than one seed, unarmed..... 2

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2a. Halophytic trees; calyx thickly coriaceous.. ..... *Sonneratia*

2b. Hydrophytic herbs; calyx thin, membranous 3

3a. Petals brick-red or absent; capsules open with lateral slit or irregularly at base ..... *Nesaea*

3b. Petals pink – purple or absent; capsules open with longitudinal slit or irregulary..... 4

4a. Flowers in axillary cymes ..... *Ammannia*

4b. Flowers solitary or in terminal spikes... ..... *Rotala*

AMMANNIA Linnaeus, Sp. Pl. 1: 119. 1753.

Key to the species:

1a. Styles up to 0.5 mm long..... 2

1a. Styles 1 – 5 mm long 3

2a. Lamina and sepals pubescent; sepal appendage distinct..... *A. verticillata*

2b. Lamina and sepals glabrous; sepal appendage absent..... *A. baccifera*

3a. Capsules 2 – 3.6 mm in diameter; sepal lobes erect in capsule..... *A. multiflora*

3b. Capsules upto 1.5 mm in diameter; sepal lobes reflexed in capsule ..... *A. verticillata*

Ammannia auriculata Willdenow, Enum. P1. Hort. Berol. 1:7,t.7. 1803. Cook, Aqua. Wetl. Pl. Ind. 249.1995.

Hyperhydrate or tenagophyte; erect or decumbent, 10-40 cm tall. Lamina linear-lanceolate, auriculate. Cymes pedunculate. Hypanthium 1.5-3 mm long, vertically 8-10 green ribbed; ribs obscure on fruits. Epicalyx minute. Petals obovate-cuneate or absent; stamens inserted above the middle of the hypanthium; ovary 1-2mm long. Capsule slightly exceeding the hypanthium. Seeds discoid.

Flowers & Fruits: August - November.

Distribution: Tropical and warm temperate regions of World; common throughout the Bengal-plains.

Ammannia baccifera Linnaeus, Sp. Pl. 120. 1753; Clarke in Hooker *f.*, Fl. Brit. Ind. 2: 569. 1879; Prain, Beng. Pl. 2: 500. 1903; Cook, Aqua. Wetl. Pl. Ind. 249.1995.(Plate I: F)

Hyperhydrate or tenagophyte; annual, erect, glabrous herbs. Stem reddish, quadrangular. Leaves opposite decussate; lamina sub- sessile, oblong and narrowly elliptic. Inflorescence axillary, sessile cluster. Flowers pink, bisexual. Capsules globose, irregularly dehiscing, depressed with black seeds.

Flowers & Fruits: July – March.

Distribution: Tropical and warmer regions of Africa, Asia and Australia; abundant throughout the Bengal-plains.

Uses: Leaves used to clear blisters and also given against rheumatism and fever (Misra & Dash, 2002; Pandey *et al.*, 2002).

Ammannia multiflora Roxburgh, Fl. Ind. 1: 447. 1820; Clarke in Hooker *f.*, Fl. Brit. Ind. 570. 1879; Prain, Beng. Pl. 1: 500. 1903; Cook, Aqua.Wetl. Pl. Ind. 250. 1995 (Plate I: B).

Hyperhydrate or tenagophyte; erect branched herbs. Stem quadrangular, hard. Lamina elliptic, sessile. Flowers reddish, axillary, cymes peduncled, compound. Capsules small, globose with persistent style.

Flowers & Fruits: November – February.

Distribution: Tropical and warmer regions of the old World; abundant throughout the plains.

Ammannia verticillata Lamarck, Encycl.[J. Lamarck &*al.*]1(1): 131. 1783; Cook, Aqua.Wetl. Pl. Ind. 251.1995. *Ammannia salicifolia* Heirn in Oliver, Fl. Trop. Afr. 2: 278. 1871. excl. syn.; Clarke in Hooker *f.* Fl. Brit. Ind. 2: 569. 1879; Prain, Beng. Pl.1: 501. 1903.

Hyperhydrate or tenagophyte; erect herbs; stem quadrangular, hard, purple, terete. Leaves opposite decussate; lamina lanceolate, rounded at the base. Inflorescence clusters many flowered, sessile; calyx not covered by calyx teeth. Fruits globose, irregularly dehiscing.

Flowers & Fruits: October – January.

Distribution: Pantropical; abundant throughout the Bengal-plains.

NESAEA Kunth, Nova Genera *et* Sp. Pl. 6 (ed. folio). 1823.

Key to the species:

1a. Lamina base cordate and sub-amplexicauled; petals absent..... *N. brevipes*

Plate- I. Lythraceae from wetlands: A. *Rotala rotundifolia* (Buchanan-Hamilton) Koehne B. *Ammannia multiflora* Roxburgh C. *Sonneratia caseolaris* (Linnaeus) Engler D. *Trapaincisa* Siebold & Zuccarini E. *Trapanatans* Linnaeus F. *Ammannia baccifera* Linnaeus G. *Nesaea brevipes* Kiehne

1b. Lamina base attenuate; petals present .....*N. prostrata*

Nesaea brevipes Koehne, Bot. Jahrb .S yst. 3: 326. 1882. *Ammannia cordata* Wight & Arnott,

Prodr. 304. 1834, non Hiern; Prain, Beng. Pl. 1: 501. 1903; Cook, Aqua. Wetl. Pl. Ind. 252. 1995 (Plate I: G).

Hyperhydrate or tenagophyte; annual, erect or diffused, glabrous herbs. Leaves opposite, oblong – cordate.Flowers 2 – 6, pedicel short; calyx lobes 4, campanulate, green. Capsules globose with sub hemispheric seeds.

Flowers & Fruits: November – March.

Distribution: Indian sub-continent; abundant throughout the Bengal-plains.

Nesaea prostrata (Buchanan-Hamilton ex Dillwyn) Suresh in D.H. Nicolson, C. R. Suresh & K.S. Manilal, Interpret.Van Rheede's Hort. Malab. 168. 1988; Cook, Aqua. Wetl. Pl. Ind. 252. 1995. *Ammannia prostrata* Buchanan-Hamilton *ex* Dillwyn, Rev. Hortus Malab. 40. 1839; D.J. Mabberley in Taxon 26(5–6): 533. 1977, as *'Ammania'*. 1839.

Hyperhydrate or tenagophyte; annual, erect or decumbent herbs. Lamina linear-lanceolate to oblong. Cyme sessile. Flowers sessile; bracteoles lanceolate to oblong; sepals 4-5; petals 4-5, pink, rarely absent; stamens 4-5. Capsules globose.

Flowers & Fruits: November – March.

Distribution: India, Sri Lanka and Australia; throughout the Bengal-plains; rare.

ROTALA Linnaeus, Mant. Pl. Altera 143. 1771.

Key to the species:

1a. Leaves whorled.....2
1b. Leaves decussate.....3
2a. Racemes terminal; petals present; stamens 4..... *R. wallichii*
2b. Flowers axillary solitary; petals absent; stamens 1-4 .....*R. mexicana*
3a. Flowers in terminal spikes; stigma massive, discoid.....*R. rotundifolia*
3b. Flowers in axillary spikes; stigma capitate to punctiform.....4
4a. Lamina margin translucent to opaque white cartilaginous; capsules 2-valved ...*R. indica*
4b. Lamina margin green, membranous; capsules 3- or 4-valved.....5
5a. Stems broadly 4-winged; bracts smaller than foliage leaves; flowers in axillary spikes or sub-sessile on main stem.....6
5b. Stems terete or 4-angled; bracts like foliage leaves; flowers sessile on main stem.....*R. rosea*
6a. Epicalyx segments between sepals absent; sepals 4..... *R. cordata*
6b. Epicalyx segments between sepals setiform, about half of corolla tube; sepals 5.....*R. densiflora*

Rotala cordata Koehne, Bot. Jahrb. Syst. 1: 172. 1880. Cook, Aqua. Wetl. Pl. Ind. 255.1995. *Rotala diversifolia* Koehne, Bot. Jahrb. Syst. 41(2): 77. 1907. *Ammannia cordata* Wight & Arnott, Prodr. Fl. Ind. Orient. 1: 304. 1834. Prain, Beng. Pl. 1: 501. 1903. Clarke in Hooker *f.*, Fl. Brit. Ind. 2: 570.1879.

Hyperhydrate or tenagophyte; annual Herbs. Stem branched, 4-winged. Leaves decussate, narrowly oblong to lanceolate. Bracts lanceolate to oblong. Flowers solitary, subsessile, in bracts of axillary spikes; bracteoles minute, at base of floral tube, scarious. Floral tube 4-merous, broadly campanulate; sepals 4, pink-tinged; petals 4, obovate; stamens 4; ovary globose; style exserted. Capsules globose.

Flowers & Fruits: November – March.

Distribution: NE India, China, Laos, Thailand, Vietnam; throughout the Terai of Darjeeling and Jalpaiguri districts, ascending upto 400 m; less common.

Rotala densiflora (Roth) Koehne, Bot. Jahrd.1: 164. 1880; Datta & Majumdar, Bull. Bot. Soc. Beng. 20 (2): 89. 1966. *Ammannia densiflora* Roth, R. & S. Syst. Veg. 3: 394. 1818. *Ammannia pentandra* Roxburgh, Fl. Ind. 1: 488. 1820; Prain, Beng. Pl. 1: 500. 1903.

Hyperhydrate or tenagophyte; spreading herbs with divarcating floriferous branches, fleshy pink. Leaves elliptic oblong. Flowers small, bracteate, bracteoles scarious, axillary, solitary; epicalyx segments present between sepals, setiform; petals 5, bright pink or white, equal to or surpassing sepals, persistent. Stamens 5. Capsules 3 – 4 valved. Seeds black.

Flowers & Fruits: August – February.

Distribution: Northern parts of India to Australia; common throughout the Bengal-plains.

Rotala indica (Willdenow) Koehne, Bot. Jahrb. Syst. 1: 172. 1880. Cook, Aqua. Wetl. Pl. Ind. 257.1995. *Peplisindica* Willdenow, Sp. Pl. 2: 244. 1799.

Hyperhydrate or tenagophyte; ascending or erect, annual Herbs. Leaves decussate, lamina obovate-elliptic or obovate-oblong, margin translucent to opaque. Bracts leafy or distinctly smaller on axillary spikes.Flowers in axillary spikes or sessile in bracts on main stem; bracteoles linear. Floral tube 4-merous; sepals 4, lanceolate-deltoid; petals 4, pink; stamens 4; ovary ellipsoid; style as long as ovary.Capsules ellipsoid.

Flowers & Fruits: September – April.

Distribution: S & SE Asia; introduced to Africa, Europe and N America; common throughout the Bengal-plains.

Rotala mexicana Chamisso & Schlechtendal, Linnaea 5: 567. 1830. Grierson & Long, Fl. Bhut. 2 (1): 274. 1991. *Ammannia pygmaea* Kurz, J. Bot. 5: 376. 1867; Prain, Beng. Pl. 1: 500. 1903.

Hyperhydrate or tenagophyte; annual, floating, erect or ascending, minute herbs. Leaves whorled, aerial leaves narrowly lanceolate to broadly. Flowers sessile, solitary, axillary; bracteoles linear; petals absent; stamens (1 or) 2 or 3 (or 4), included; ovary subglobose. Fruits capsule.

Flowers & Fruits: September – January.

Distribution: Tropical and warmer regions of world except Pacific Islands, NE Africa, Arabia; throughout the plains North Bengal; rare.

Rotala rosea (Poiret) C.D.K. Cook in Boissiera 29: 86. 1979; Panda & Das, Fl. Sambalp. 150. 2004. *Ammannia rosea* Poiret in Lamarck, Encycl. Meth. Bot. (Suppl. 1) 329. 1810. *A. pentandra* Roxburgh, Fl. Ind. (ed. 1) 1: 448. 1820; Clarke in Hooker *f.*, Fl. Brit. Ind. 2: 568. 1879; Prain, Beng. Pl. 1: 500. 1903.

Hyperhydrate or tenagophyte; annual, terrestrial or amphibious, ascending herbs. Leaves opposite decussate; lamina linear – lanceolate to lanceolate – oblong. Flowers solitary, sessile, axillary; bracteoles linear. Floral tube campanulate; epicalyx segments setiform, equaling sepals; petals 5; stamens 5; anthers reaching margin of floral tube; ovary globose. Capsules globose.

Flowers & Fruits: August – September.

Distribution: S & SE Asia; common throughout the Bengal-plains.

Rotala rotundifolia (Buchanan-Hamilton) Koehne in Bot. Jahrb.1: 175.1881; Bora & Kumar, Flor. Div. Ass. 158. 2003. *Ammannia rotundifolia* Buchanan–Hamilton in Don Prodr. 220. 1825; Clarke in Hooker *f.*, Fl. Brit. Ind. 2: 566. 1828; Prain, Beng. Pl. 1: 500. 1903.(Plate I: A)

Hyperhydrate or tenagophyte; extensively creeping and rooting herbs with red stem. Lamina sessile, orbicular or broadly elliptic – rounded. Flowers pinkish sessile, closely packed in terminal simple or panicle spikes; calyx tube campanulate, sepals 4; petals 4, pink; stamens 4; ovary pyriform to globose. Capsules 4-valved ellipsoid; seeds elliptic peltate.

Flowers & Fruits: November – April.

Distribution: S & SE Asia; abundant throughout the Bengal-plains.

Rotala wallichii (Hooker *f.*) Koehne, Bot. Jahrb. Syst. 1: 154. 1880. Cook, Aqua. Wetl. Pl. Ind. 262.1995. *Hydrolythrum wallichii* Hooker *f.* in Bentham & Hooker*f.*, Gen. Pl. 1: 777. 1867.

Hyperhydrate or tenagophyte; emergent, perennial, Herbs. Leaves whorled; aerial leaves 3-12 whorled, linear to oblong, submerged leaves filiform. Bracts much reduced in inflorescence, oblong or ovate. Flowers 5-8-whorled per node, shortly pedicellate in a bracteate raceme; bracteoles short. Floral tube 4-merous, campanulate; sepals 4; epicalyx absent; petals 4, light red or pink, orbicular; stamens 4; ovary globose; style included. Capsules globose,

Flowers & Fruits: September – April.

Distribution: S & SE Asia; common throughout the Bengal-plains.

Sonneratia Linnaeus *f.*, Suppl. Pl. 38, 252.1782; *nom. cons.*

Key to the species:

1a. Lamina elliptic-lanceolate; stigma peltate.....*S. apetala*

1b. Lamina ovate-oblong; stigma capitate.....2

2a. Corolla absent; ovary 6-celled.....*S. griffithii*

2b. Corolla red; ovary 16-20 celled.....*S. caseolaris*

Sonneratia apetala Buchanan-Hamilton, Syems. Embassy Ave. 3: 477. 1800; Prain, Beng. Pl. 1: 505. 1903; Naskar, Pl. Wealth Ganga Delta 1: 351. 1993.'***Tak Keora'***

Intertidal; evergreen tree with erect pneumatophores. Leaves simple, opposite; lamina elliptic, obovate. Inflorescence axillary, 3-flowered cyme. Flowers white; calyx 4 lobed, reflex; petals absent, stamens numerous, filament bent inwards in bud; ovary 2-20 celled, stigma large. Fruit a berry.

Flowers & Fruits: December – July.

Distribution: Native to Bangladesh, India, Myanmar, Sri Lanka, China; inter-tidal river flats of mangrove swamps, muddy flats of Sundarbans; common.

Sonneratia caseolaris (Linnaeus) Engler, Engler & Prantle, Nachtr. 261. 1897; Naskar, Pl. Wealth Ganga Delta 1: 351. 1993. *Rhizophora caseolaris* Linnaeus, Herb. Amboin. (Linnaeus) 13. 1754.'***Chakkeora'***(Plate I: C)

Intertidal; evergreen tree, glabrous throughout. Pneumatophore present. Leaves opposite; lamina elliptical, oblong or ovate, entire, leathery. Flowers 1-3 at end of drooping twigs malodorous, nocturnal; hypanthium with 6-8 calyx lobes; petals dark or blood-red; stamens numerous, with threadlike filaments; pistil with 16-21 celled; style long, stout. Fruit berry.

Flowers & Fruits: March – October.

Distribution: SE Asia, Philippines, N Australia; common in inter-tidal river flats and inner estuary of mangrove swamps of Sundarbans.

Sonneratia griffithi Kurz, J. Asiat. Soc. Bengal 40 (2): 56. 1871; Naskar, Pl. Wealth Ganga Delta 1: 351. 1993. *Sonneratia acida* Linnaeus; Prain, Beng. Pl. 1: 505. 1903.'***Ora'***

Intertidal; evergreen tree with numerous pneumatophores. Leaves simple, opposite decussate, extipulare; lamina obovate. Inflorescence solitary cyme. Flowers pedicellate; sepals 6 – 8; petals absent; stamens numerous, free; carpels 6, style 1. Fruits berry.

Flowers & Fruits: April – October.

Distribution: Africa, Indo-Malaysia, Australia; common in inter-tidal river flats and outer estuary of mangrove swamps of Sundarbans.

Trapa Linnaeus, Sp. Pl. 1: 120. 1753.

Key to the species

1a. Lamina much villose beneath; margin incised; fruits with 2 soft spines.....*T. natans*

1b. Lamina slightly villose beneath; margin not incised; fruit with 4 stiff spines.....*T. incisa*

Trapa incisa Siebold & Zuccarini, Abh.Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4(2): 134. 1845. *Trapa natans* var.*incisa* Makino, Bot. Mag. (Tokyo) 1: 105. 1887 – 1892. *Trapa bispinosa* var. *incisa* (Siebold & Zuccarini) Franchet & Savatier, Nakai, Fl. Kor. 2: 490. 1911. Clarke in Hooker *f.*, Fl. Brit. Ind. 2: 590. 1879; Prain, Beng. Pl. 1: 508. 1903. (Plate I: D)

Epihydrate; floating herbs. Floating lamina in rosettes, rhombic – triangular, glabrous or sparsely pubescent on veins, margin coarsely and sharply incised-dentate distally. Petals pink to pale purplish or white. Fruit narrowly rhombic, 4-horned, surface variously ribbed to smooth, crest absent; horns conic.

Flowers & Fruits: May – November.

Distribution: S & SE Asia, China, Japan, Korea, Laos, Malaysia and Vietnam; abundant in stagnant water bodies throughout the Bengal-plains.

Uses: Fleshy larger cotyledon is edible.

Trapa natans Linnaeus, Sp. Pl. 1: 120. 1753. *Trapa natans* Linnaeus var. *bispinosa* (Roxburgh) Makino in Iinuma, Sumoku-Dzusetd "ed. 3", 1: 137.1907; Prain, Beng. Pl.1: 508. 1903. *Trapa bispinosa* Roxburgh, Pl. Cor. 3: t. 234. 1815; Clarke in Hooker *f.*, Fl. Brit. Ind. 2: 590. 1879.'***Singara Phal'*** or ***'Pani Phal'***(Plate I: E)

Epihydrate; floating herbs. Floating leaves in rosettes, rhomboid, crowded in the upper part of stem; submerged ones dissected. Flowers

solitary, axillary; calyx lanceolate, acute; corolla white; pubescent; stamens 4. Nuts 3-angled with 2 spiny horns.

Flowers & Fruits: September – January.

Distribution: Tropical parts of Asia; throughout the Bengal plains; commonly cultivated and marketed in large amount.

Uses: Fleshy larger cotyledon is edible.

Discussion

Lythraceae is a family of both terrestrial and wetland elements. 18 species of wetland plants recorded from West Bengal during the present survey and are representing five genera except three tree species of *Sonneratia* that are growing in salt water marshes of Sunderban mangroves, all others are small herbs growing in various depths, mostly as emerge plants near the periphery of water bodies. Majority of the recorded species are widely distributed in the tropical wetlands of the state except *Nesaea prostrata* and *Rotala mexicana*, which are quite rare in distribution and are only recorded from few wetlands of South and North Bengal respectively. Species of *Rotala* and *Neasea* are decumbent fleshy herbs growing at the peripheral marshy zone of different wetlands forming a dense mat along with several species of grasses, sedges and sometimes with isolated *Ammannia* sp.

The occurrence of these species appears to be normal but, considering broadly, the abundant use of herbicides in fields of wetland crops greatly affecting their population in such habitat. Most part of the population of *Sonneratia* spp. is growing near the estuaries but legal and illegal clearing activities are, certainly, affecting its population.

Like any other hydrophyte and/or wetland plants these are also prone to be affected due to different changed conditions in the habitat. If the wetlands are conserved properly then, automatically, most of these species will continue to survive in their natural habitat.

Acknowledgements

The first and second authors are grateful to CSIR & RGNF-UGC for their financial assistance during different phases of the study period. Director, Botanical Survey of India is also acknowledged for permitting the authors to work at CAL.

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