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IS *NYMPHAEA RUBRA* ROXB. EX ANDREWS—AN APOMICT ?

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ABSTRACT

Studies on several populations of *Nymphaea rubra* in the Howrah, Hooghly and 24-Parganas districts in West Bengal and Barisal district in Bangladesh reveal that this species, claimed to be a native of Bengal, never sets fruit in nature. The plant propagates mainly through stolons and vegetative buds and, in exceptional cases, by proliferation of flowers. The report of meiotic irregularity and high incidence of polysomaty and pollen sterility is indicative of its apomictic nature. The nomenclature of the plant has been discussed.

The crimson-red waterlily, *Nymphaea rubra* Roxb. ex Andrews (1808), claimed as a source of magnificent red colour for many cultivars, has been very problematic for its exact taxonomic status. De Candolle (1821, 1824), Wight and Walker-Arnott (1834), again Prain (1903, 1905), and Conard (1905) treated it as a distinct species. Hooker f. and Thomson (1855, 1872), however, considered *N. rubra* 'Roxb.' as synonymous to *N. lotus* Linn. *N. lotus* Linn. differs from both *N. rubra* Roxb. ex Andrews and *N. pubescens* Willd. by its leaf being nearly glabrous beneath. With regards to its colour of flowers (white, or sometimes a few outer petals tinged purple without), *N. lotus* Linn. is more closely related to *N. pubescens* Willd., which may prove to be a geographical subspecies of *N. lotus* Linn.

Although *Nymphaea rubra* Roxb. mss. was validated by Andrews in 1808, this plant in the meanwhile appeared in print in Hooker's Parad. Lond. 1: t.14 (2 pl.). 1805 as *Castalia magnifica* with Roxburgh's manuscript name cited therein as a *'pro syn'*. Conard (1916), therefore, proposed the combination, *Nymphaea magnifica* (Salisb.) Conard for Roxburgh's plant being unaware of of an earlier homonym *N. magnifica* Gilg (1908) described from Africa. This resulted in reinstating the traditional name—*N. rubra* for this Indian plant as follows:

Nymphaea rubra Roxb. ex Andrews, Bot. Rep. 8(104): t. 503. 1808 (Type: *l.c.* t. 503); Sims in Curt. Bot. Mag. 31: t. 1280. 1810; Roxb. Hort. Beng. 41. 1814 *et* Fl. Ind. 2: 576. 1832; Wt. Ill., t. 10. 1840; Conard, Carnegie Inst. Wash. Publ. 4: 199. pl. 8. 1905. *Castalia magnifica* Salisb. in Hook. Parad. Lond. 1: t. 14. 1805 (Type: *l.c.* t. 14). *N. magnifica* (Salisb.) Conard in Rhodora 18: 120. 1916, non Gilg (1908). *N. lotus* auct. non Linn.: Hook. f. & Thoms. Fl. Ind. 1: 241. 1855 *et* in Hook. f. Fl. Brit. Ind. 1: 114. 1872, uterque p.p. quoad syn. *N. rubra* Roxb.

Note: Both the iconotypes of *Nymphaea rubra* Roxb. ex Andrews and *Castalia magnifica* Salisb. were drawn from living plants in Mr. Vere's Kensington-Gore in the vicinity of London, where it flowered for the first time in U. K.

Thus, while, nomenclaturally speaking *N. rubra* Roxb. ex Andrews is the legitimate name of the plant, its treatment as a "true-breeding sexual species" is debatable. Observations (RLM) on a number of populations of *Nymphaea rubra* in the Howrah,

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Hooghly and 24-Parganas districts in West Bengal and Barisal district in Bangladesh for the past few years showed that this species, claimed to be a native of 'Bengal', never sets fruit in nature. The flowers remain above water surface and open consecutively for three to four days and then float in water (Plate I, fig. 1). Soon the peduncle below the flower starts decaying followed by the flower itself.

Unlike other two species common in Indian plains, namely, *Nymphaea nouchali* and *N. pubescens, N. rubra* is not met with in temporary habitats like seasonally inundated fields, rice swamps, shallow ditches along roadsides and railway tracks etc., and is restricted only to the permanent ponds. This is indicative of its sterile nature and dispersal by human agencies.

Intensive search for fruiting materials of this species in herbarium also proved futile. It is pertinent to note that only Conard (1905: 199), refers to the fruits and seeds of *N. rubra,* but Conard (*l.c.*: 200) expresses his misgivings: "We are doubtful if true *N. rubra* exists in this country".

How, then, does *N. rubra* propagates itself in nature ?

(1) This perennial rhizomatous herb propagates mainly through stolons and vegetative buds produced from the rhizome. While the stolons run horizontally in the mud to a distance of 15 to 60 cm, or even 1 m and then turn upward to form new plants, the lateral vegetative buds develop into young plants entangled among the roots and leaves of the parent. During the dry season, in plants growing along the receding margin of tanks, the old caudex dies and the lateral buds ripen into irregularly-shaped resting tubers. Prior to the resting season, the stolons which normally give rise to new plants, transform into small, rounded, resting tubers. During the growing season, the resting tuber produced from lateral buds (Plate I, fig. 2) gives rise to a large number of slender, often much-curved stolons from all over its apical region. Each of these stolons bears a simple lanceolate or subulate bract at its first node and a tuft of leaves and roots at the summit of the second node and thus form a new plant. Some of these stolons, however, instead of giving rise directly to new plants produce small, rounded, secondary resting tubers. These secondary resting tubers and those produced by stolons arising from main caudex, either give rise directly to new plants, or form stolons from their growing apices which in turn produce new plants instead of producing a second node (Plate I, figs. 3 & 4).

(2) An unusual means of propagation by way of proliferation of flower was noticed in a population growing in shallow water (15-30 cm deep) along the margin of a tank in the Indian Botanic Garden, Howrah. It was noted that in a number of flowers the floral parts were transformed to various states of foliage which, in turn produced rootlets from the bases of such deformed leaves (Plate I, fig. 5) while these were held high above water level by their stout peduncles. In the same population we noticed two other plants producing two to three such deformed flowers which had already struck strong roots in the mud and given rise to new plants with luxuriant growth of foliage (Plate I, fig. 6) while still attached to the parent plant by the stout peduncles which were showing no signs of decay.

In *Nymphaea,* several cases of floral proliferation leading to the formation of foliage, buds and supernumerary flowers in place of floral appendages have been reported in the past (Masters 1869, Debbarman 1934, Biswas 1940, Bose 1940 and Bose 1961). These cases were usually considered as simple instances of teratology and presumed to have been caused by some internal factor or even external injury. But Barber (1889), and Mohan Ram and Nayyar (1974) reported similar features involving forma-

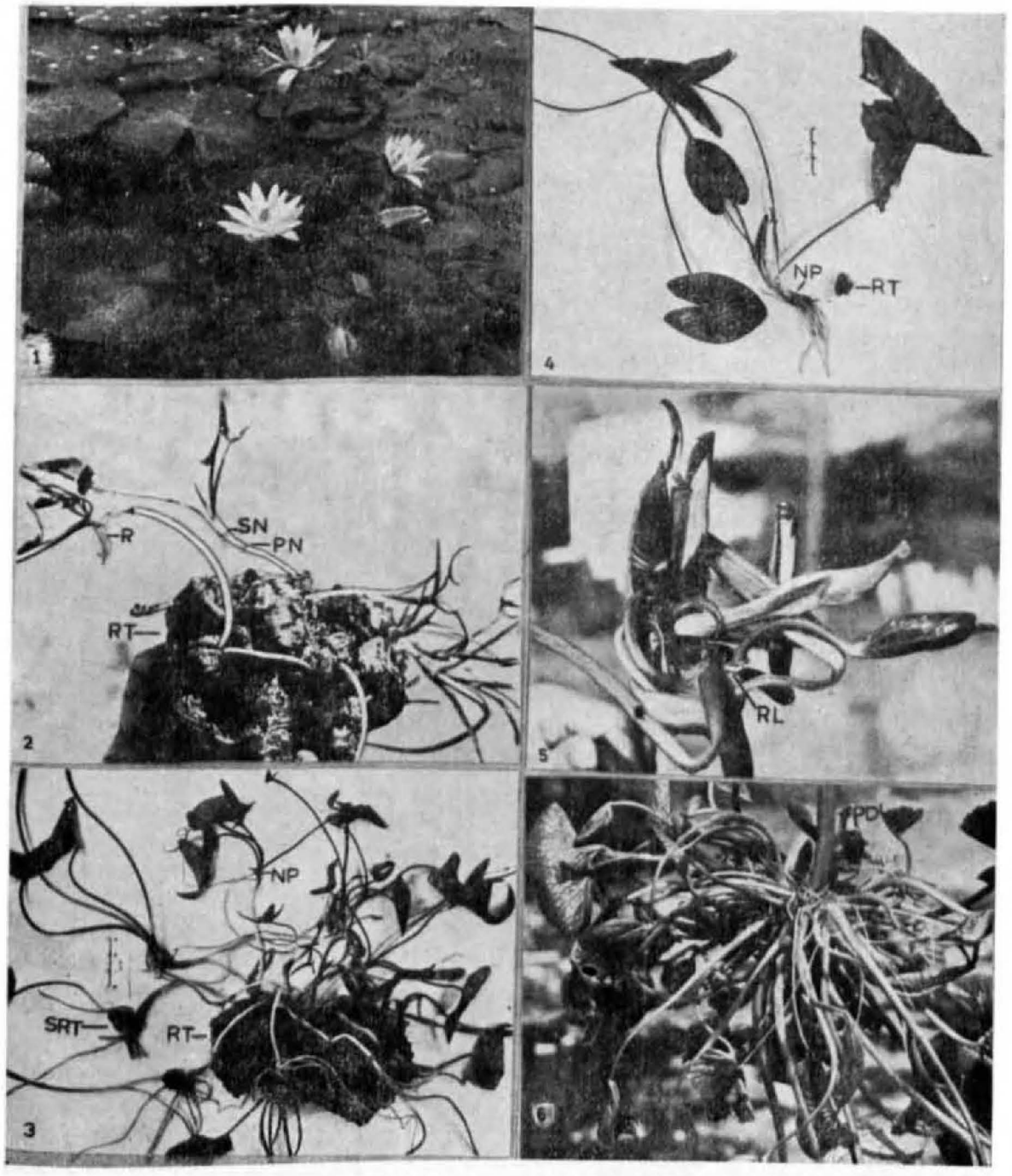


Plate I. Figs. 1-6: 1. A population with erect, open flowers and floating, closed, decaying old flowers. 2. Resting tuber (RT) developed from lateral buds showing initiation of stolons with primary (PN) and secondary (SN) nodes, and roots (R). 3. Resting tuber (RT) developed from lateral buds either producing new plants (NP) directly or through secondary resting tuber (SRT). 4. Resting tuber (RT—severed from lateral stolon originated from rhizome) developed from lateral stolon producing new plant (NP). 5. Initiation of rootlet (RL) from a deformed flower. 6. Uprooted deformed flower showing massive growth of foliage and roots. Healthy peduncle (PD) still conspicuous.

tion of roots from the leaf-bases of deformed flowers in *N. lotus* and *N. mexicana* respectively. Mohan Ram and Nayyar (*l.c.*) further stated: "what appeared in the initial stages as flower anomaly led to the finding of a means of vegetative propagation in this plant."

Therefore, the failure of *Nymphaea rubra* to set fruits/seeds in nature raises a pertinent question. Should *N. rubra* be considered a taxonomic species at par with other sexually reproducing species ?

In 1971, Sen and Bhaduri reported 2n= 70 with as many as 35% of the cells showing varying numbers like 2n=68, 66 and 64 in *N. rubra.* Meiosis is very irregular and this, according to them, is clearly reflected in its low pollen fertility (14.1%) and prominent pollen size differences. Examination of pollen of this species from different habitats in Bengal, stained with aceto-carmine also confirmed these observations.

Under cultivation there are now several forms of waterlilies with presumed *Nymphaea rubra* parentage, and for many of these hybrid forms *Nymphaea rubra* is claimed even as a pollen parent. In view of its high pollen sterility, however, it seems highly improbable.

May we thus consider *Nymphaea rubra* as an apomictic species? An answer to this question, must await embryological studies involving abortive ovules in *N. rubra.*

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