

Aquatic and marshland plants in West Tripura, India

Somnath Bhowmik, Reema Saha and B. K. Datta

Plant Taxonomy and Palynology Laboratory, Department of Botany, Tripura University, Suryamaninagar- 799130,
Tripura, India

Abstract

The present communication deals with the systematic enumeration of hydrophytes occurring in West Tripura District of Tripura. In all 65 species comprising of 44 genera, representing 26 families of Angiosperms have been enumerated. Notes on habitat, flowering and fruiting time and place of collection are also incorporated in brief.

Keywords: Hydrophytes, West Tripura

INTRODUCTION

Aquatic vegetation is well observed in ponds, lakes, marshy places, rice fields, shady moist areas etc. Due to their habitational characteristics it is difficult to ascertain a clear definition of vascular hydrophytes. They are submerged, free floating, emergent or amphibious in nature and sometimes are accustomed to grow on moist and even on semi dry soils. Apart from these, there is existence of a good number of borderline species. The submerged, free-floating and emergent hydrophytes make efforts to lift up their flowers above the surface of surrounding water for pollination by wind or by insects. Some hydrophytes can even endure extreme temperature.

Reid (1961) described hydrophytes as plants, “whose seeds germinate in either the water phase or the substrate of a body of water and which must spend part of their life cycle in water”. The definition includes aerial leaved, as well as submerged, floating-leaved and free-floating hydrophytes.

Studies on aquatic and marshland plants of India are well documented by many authors including Biswas & Calder (1936); Subramanyam (1962); Chavan & Sabnis (1961); Maheshwari (1960); Majumdar (1965); Mirashi (1954, 1957, 1958); Patmaik & Patnaik (1956); Puri & MahaJanuary (1958); Unni (1967); Satyanarayana (1963); Sen & Chatterjee (1959); Vyas (1964); Bhaskar & Razi (1973); Kachroo (1984) and Lavania *et al* (1990).

West Tripura lies between 23°16' to 24°14' N and 91°09' to 91°47' E covering an area of 3,544 sq km. The district is bounded by Bangladesh in the north and west by North Tripura District in the east and South Tripura in the south. The climate of Tripura is characterized by intermediate temperature and highly humid atmosphere. The year may be divided into four seasons. December to February is the winter which is followed by summer (March – May), June to September is the monsoon and October to November is the post monsoon period. The cold weather starts by the end of November and continues up to February with daily maximum temperature of 26° C and minimum 8 – 4° C. During summer (April- May), maximum temperature reaches 38° C. Humidity remains high throughout the year. In summer the relative humidity ranges 50 – 75% while during monsoon it remains over 85%. The principal rivers of the district are Howrah and Gomati.

There are many lakes and ponds in the West Tripura District. The important lakes of the district are Rudrasagar, Kamalasar, Brahma Beel, Noyadi lake, Jirania lake, Padma pukur,

Nischintapur lake, Lembucharra lake, College Tilla lake, Mohanpur lake, Tarapur lake etc. Besides this, a considerable number of species also occur in stagnant water, wet places and in rice fields. The submerged and the floating aquatic plants are found mainly in lakes and ponds. The presence of huge water bodies favors the occurrence of a rich hydrophytic flora in this District.

METHODS OF SURVEY

A thorough floristic survey in the West District of Tripura was carried out in rivers, lakes, ponds, swamps and marshy areas throughout the district in different seasons. Specimens were processed in the laboratory following mostly conventional techniques (Jain & Rao 1977). Plants were identified using different monographs and floras including Arber (1920), Biswas & Caldar (1936), Subhramanyam (1962), Sculthorpe (1967), Bursche Eva (1971), Babu (1977), Saldhana & Nicolson (1976), Deb (1981, 1983), Muenscher (1994) and Fassett (2000).

Enumeration of Aquatic and Marshland Plants

Acorus calamus L. [Araceae/ Acoraceae]. **Local name:** *Boch*. Marshy aromatic herbs with creeping root stock.

Occurrence: Very rare in marshy places. **Exsiccatus:** Golaghati, *Datta* 365.

Uses: Leaves used to treat joint pain and bone fracture; rhizome sold in medicinal plants market.

Aeschynomene indica L. [Fabaceae]. **Local name:** *Shola gaach*. An erect branched herb. Flowers yellow. **Flowers & Fruits:** June – July.

Occurrence: Common in marshes and paddy fields. **Exsiccatus:** Champaknagar, *Bhowmik* 455.

Uses: Soft wood is used for making hats.

Alocasia indica (Roxburgh) Schott [Araceae]. **Local name:** *Kachu*. Robust herbs with sagittately cordate leaves. Female flowers yellow, male flowers white. **Flowers & Fruits:** June – July.

Occurrence: Common in marshy places. **Exsiccatus:** Ranirbazar, *Datta* 362.

Uses: Root stock is edible.

Alocasia fornicata (Roxburgh) Schott [Araceae]. A stout large herb. Spathe greenish yellow.

Occurrence: Frequently found in muddy streams. **Exsiccatus:** Ranir khamar, *Datta* 399.

Alternanthera philoxeroides (Martius) Grisebach [Amaranthaceae]. **Local name:** *Jal daraga*. A floating herb with fistular stem. Flowers white. **Flowers & Fruits:** July – September.

Occurrence: Occasionally found in stagnant water. **Exsiccatus:** Khayarapur, *Bhowmik* 421.

Uses: Tender shoots are edible.

Amischophacelus axillaris (L.) Rolla Rao *et* Kammathy [Commelinaceae]. An annual branching herb. Flowers blue. **Flowers & Fruits:** August – September.

Occurrence: Occasionally found in marshy places. **Exsiccatus:** Melagarh, *Datta* 554.

Ammania baccifera L. [Lythraceae]. Erect herb with quadrangular stem. **Flowers & Fruits:** November – January.

Occurrence: Very common in rice fields and wet places. **Exsiccatus:** Sekerkote, *Datta* 357.

Uses: Leaves are used as medicines by the tribals.

Bacopa hamiltoniana (Bentham) Wettstain [Scrophulariaceae]. An erect glabrous herb with quadrangular stem. Flowers pink with bluish tinge. **Flowers & Fruits:** June – July.

Occurrence: Uncommon, found in wet places. **Exsiccatus:** Indranagar, *Datta 361*.

Bacopa monnieri (L.) Pennell [Scrophulariaceae]. **Local name:** *Brahmi shak*. A prostrate herb rooting at nodes. Flowers purple to white. **Flowers & Fruits:** June – July.

Occurrence: Common in wet places. **Exsiccatus:** Nandanagar. *Datta 363*.

Uses: Leaves used as medicine by local tribes.

Blyxa auberlei Rich. [Hydrocharitaceae]. Aquatic herbs; leaves tufted, linear, crenulate. **Flowers & Fruits:** February – March.

Occurrence: Uncommon, found in lakes and ponds. **Exsiccatus:** Rudrasagar, *Bhowmik 428*.

Blyxa echinospermum (C. B. Clarke) Hook.f. [Hydrocharitaceae]. Submerged aquatic herbs. Leaves linear, entire. **Flowers:** December – February.

Occurrence: Occasionally found in lakes. **Exsiccatus:** Kamalasar, Kashba. *Bhowmik 496*.

Blyxa octandra (Roxburgh) Planchon [Hydrocharitaceae]. Aquatic herb; leaves entire.

Occurrence: Less common, in lakes and jheels. **Exsiccatus:** Chowmuhani bazar lake, *Datta 367*.

Canscora decussata (Roxburgh) Schultes [Gentianaceae]. Erect herb, stem 4 winged; flowers white.

Occurrence: Occasionally in marshes. **Exsiccatus:** Brahma Beel, Teliamura. *Datta 112*.

Centella asiatica (L.) Urban [Apiaceae]. Annual runner; lamina reniform. **Flowers & Fruits:** June – July.

Occurrence: Common in marshy places. **Exsiccatus:** Lembuchara lake, *Bhowmik 483*.

Drosera burmannii Vahl [Droseraceae]. A beautiful rosette insectivorous plant.

Occurrence: Occurs rarely in wet places. **Exsiccatus:** Noyadi lake, *Saha 333*.

Eichhornia crassipes (Martius) Solms [Pontederiaceae]. **Local name:** *Kachuripana/ Kachurifena*. Floating herb with spongy leafy axis. **Flowers & Fruits:** August – November

Occurrence: Abundant throughout the district. **Exsiccatus:** Padmapukur, Khowai. *Bhowmik 471*.

Enydra fluctuans Loureiro [Asteraceae]. **Local name:** *Helencha*. A succulent prostrate herb with short ascending hispid branches; flowers yellowish. **Flowers & Fruits:** November – December.

Occurrence: Abundant in jheels. **Exsiccatus:** Jogendranagar lake, *Bhowmik 473*.

Uses: Tender shoots used as vegetables and as medicine against dysentery.

Euryle ferox Salisbury [Nymphaeaceae]. **Local name:** *Makhna/ Pukhal/ Thangjing*. Leaves floating, orbicular with stout recurved prickles. Flowers violet. **Flowers & Fruits:** April - September.

Occurrence: Found in few lakes in Jirania and Mohanpur. **Exsiccatus:** Jirania lake, *Datta 462*.

Uses: Fruits edible, used by Manipuri and tribal communities. Marketed elsewhere.

Floscopa scandens Loureiro [Commelinaceae]. A prostrate or subscandent herb. Flowers white or lilac. **Flowers & Fruits:** September – December.

Occurrence: Common in swampy areas. **Exsiccatus:** Sekerkote, *Bhowmik 459*.

Hydrilla verticillata Rich. [Hydrocharitaceae]. Submerged herbs; leaves sessile. **Flowers & Fruit:** October – April.

Occurrence: Common throughout the district. **Exsiccatus:** Collegetila lake, Agartala, *Bhowmik 470*.

Hydrocotyle sibthorpioides Lamarck [Apiaceae]. Annual runner; lamina orbicular, cordate. **Flowers & Fruits:** April – May.

Occurrence: Occasionally found in rice fields. **Exsiccatus:** Chechuria, *Bhowmik 491*.

Hydrolea zeylanica (L.) Vahl [Hydroleaceae]. Erect much branched herb. **Flowers & Fruits:** August – September.

Occurrence: Common in paddy fields. **Exsiccatus:** Mohanpur, *Bhowmik 451*.

Hygrophila polysperma (Roxburgh) T. Anderson [Acanthaceae]. Small prostrate procumbent herb with creeping stem, flowers purple. **Flowers & Fruits:** November – December.

Occurrence: Scattered throughout the district. **Exsiccatus:** Brahma Beel, Teliamura, *Saha 221*.

Hygrophila salicifolia (Vahl) Nees [Acanthaceae]. An erect herb with subsessile leaves; flowers violet. **Flowers & Fruits:** November – December.

Occurrence: Common in wet places. **Exsiccatus:** Gandhighat, *Bhowmik 411*.

Hygrophila auriculata (Schumacher) Heine [Acanthaceae]. **Local name:** *Kulekhara*. An erect herb with spines at the axis; flowers bluish violet. **Flowers & Fruits:** November – December.

Occurrence: Occasionally found in wet places. **Exsiccatus:** Bamutia, *Bhowmik 413*.

Uses: Leaves used as vegetables and medicine; known to increase blood-haemoglobin level.

Ipomoea aquatica Forster [Convolvulaceae]. **Local name:** *Jal kalmi*. A prostrate floating herb, stem fistular; flowers purple. **Flowers & Fruits:** November – December.

Occurrence: Common in stagnant water. **Exsiccatus:** Milansangha, *Bhowmik 417*.

Uses: Tender shoots used as vegetable.

Lasia spinosa (L.) Thwaites [Araceae]. Stout herbs with thick prickly rhizome. Spathe purple.

Occurrence: Scattered in marshy places. **Exsiccatus:** Kathaltali, *Datta 366*.

Uses: Tender leaves are eaten as vegetables by local tribes.

Lemna perpusilla R.H. Torrey [Lemnaceae]. A highly reduced minute floating plant.

Occurrence: Common; waste water bodies and ponds. **Exsiccatus:** Tarapur lake, *Bhowmik 419*.

Limnophila sessilis (Bentham) C.E.C. Fischer [Scrophulariaceae]. An erect or procumbent glabrous herb with subsessile leaves. Flowers purple. **Flowers & Fruits:** August – September

Occurrence: Common in wet and marshy places. **Exsiccatus:** Ranirbazar, *Datta 721*.

Limnophila heterophylla Bentham [Scrophulariaceae]. A glabrous herb with pinnatifid leaves. Flowers pink. **Flowers & Fruits:** August – September

Occurrence: Very common in marshy places. **Exsiccatus:** Nischintapur lake, *Bhowmik 499*.

Limnophila rugosa (Roth.) Merrill [Scrophulariaceae]. An aromatic branching herb with elliptic to ovate leaves. Flowers bluish purple. **Flowers & Fruits:** July – August
Occurrence: Common in marshy places. **Exsiccatus:** Sakerkote, *Saha 231*.

Limnophila sessiliflora (Vahl) Blume [Scrophulariaceae]. A sparingly branching pubescent herb with sessile leaves; flowers light purple. **Flowers & Fruits:** July – August
Occurrence: Common in wet places and rice fields. **Exsiccatus:** Suryamaninagar, *Bhowmik 493*.

Ludwigia adscendens (L.) Hara [Onagraceae]. **Local name:** *Gaura sak*. A profusely branching aquatic herb with spongy white pneumatophores; flowers white. **Flowers & Fruits:** October – November.
Occurrence: Very common in marshy areas. **Exsiccatus:** Indranagar, *Bhowmik 495*.
Uses: Whole plant is used as vegetable by local tribes.

Ludwigia octovalvis ssp. *sessiliflora* (Micheli) Raven [Onagraceae]. Suffruticose; leaves pubescent subsessile; corolla yellow. **Flowers & Fruits:** October – November.
Occurrence: Occasionally found in wet places. **Exsiccatus:** Brahma Beel, Teliamura, *Bhowmik 497*.

Ludwigia perennis L. [Onagraceae]. An erect glabrous herb; flowers yellow. **Flowers & Fruits:** Almost throughout the year.
Occurrence: Common in rice fields and in wet places. **Exsiccatus:** Mohanpur lake, *Datta 191*.

Ludwigia prostrata Roxburgh [Onagraceae]. A small prostrate herb with reddish stem; flowers yellow. **Flowers & Fruits:** November – December.
Occurrence: Uncommon, in moist places. **Exsiccatus:** Phatikchara, *Saha 621*.

Monochoria hastata (L.) Solm. [Pontederiaceae]. Emerging herbs with hastate leaves. **Flowers & Fruits:** July – October.
Occurrence: Abundant throughout west Tripura. **Exsiccatus:** Nagerjala, *Bhowmik 475*.
Uses: Leaf decoction applied locally to heal boils by Tripuri tribe.

Monochoria vaginalis (Burm.f.) Presler [Pontederiaceae]. Local name: *Vansha kachu/ Chichiri*. Emerging herbs, leaves linear or lanceolate. **Flowers & Fruits:** July – September.
Occurrence: Common in paddy fields. **Exsiccatus:** Anandanagar, *Bhowmik 474*.
Uses: Young tender shoots used as vegetable by Tripuri tribe; leaf-decoction used against gastritis.

Murdania nudiflora (L.) Brenan [Commelinaceae]. A diffuse annual herb; flowers blue. **Flowers & Fruits:** February – March.
Occurrence: Common in ditches and wet places. **Exsiccatus:** Badharghat, *Bhowmik 433*.

Myriophyllum tuberculatum Roxburgh [Haloragaceae]. Aquatic herbs; stem floating; leaves sessile, whorled. **Flowers & Fruits:** December – January.
Occurrence: Occasionally found in jheels and lakes. **Exsiccatus:** Collegetila lake, Agartala, *Bhowmik 464*.

Najas graminea Delile [Najadaceae]. Submerged aquatic herb. **Flowers & Fruits:** April – May.
Occurrence: Common in lakes and jheels. **Exsiccatus:** Collegetila lake, Agartala, *Datta 396*.

Najas marina L. [Najadaceae]. A submerged herb with stout stem.

Occurrence: Common in lakes and jheels. **Exsiccatus:** Rudrasagar, Melagarh, *Datta 398*.

Najas minor (Persoon) Allioni [Najadaceae]. A much branched slender submerged herb; flowers fascicled. **Flowers & Fruits:** March – April.

Occurrence: Common in lakes and jheels. **Exsiccatus:** Rudrasagar, Melagarh, **Saha 295**.

Nechamandra alternifolia (Roxburgh) Thwaites [Alismataceae]. A submerged perennial herb.

Occurrence: Common in Rudrasagar lake. **Exsiccatus:** Rudrasagar, Melagarh, *Datta 368*.

Nelumbo nucifera Gaertner [Nymphaeaceae]. **Local name:** *Lal / Sada Padma*. Leaves peltate, raised above the water; flowers pink or white. **Flowers & Fruits:** August – October.

Occurrence: Common in lakes and ponds. **Exsiccatus:** Nischintapur lake, *Bhowmik 431*.

Uses: Fresh fruits used as vegetable by rural people.

Neptunia prostrata (Lamarck) Baillon [Mimosaceae]. **Local name:** *Panilajuk/ Kharai sak*. A floating herb with spongy stem; flowers yellow. **Flowers & Fruits:** November – December.

Occurrence: Occasional in lakes, ponds and jheels. **Exsiccatus:** Kamalghat lake, *Bhowmik 482*.

Uses: Manipuri community in the state use it as vegetable.

Nymphaea micrantha Guillemin *et* Perrottet [Nymphaeaceae]. **Local name:** *Shapla*. Leaves floating; roots very long; flowers blue to violet. **Flowers:** July – October.

Occurrence: Common in lakes and ponds. **Exsiccatus:** Collegetila lake, Agartala, *Bhowmik 452*.

Nymphaea nouchali Burm.f. [Nymphaeaceae]. **Local name:** *Lal sapla*. Leaves floating, orbicular, blotched purple beneath; perianth red. **Flowers & Fruits:** July – September.

Occurrence: Throughout the District. **Exsiccatus:** Noyadi lake, *Bhowmik 456*.

Uses: Young tender petiole is used to increase the haemoglobin level.

Nymphaea pubescens Willdenow [Nymphaeaceae]. **Local name:** *Sada sapla*. Leaves orbicular, floating; perianth white. **Flowers & Fruits:** July – October.

Occurrence: Common in lakes, ponds. **Exsiccatus:** Nischintapur lake, *Bhowmik 458*.

Uses: Young tender petiole is used as vegetable.

Nymphaea stellata F. Mueller [Nymphaeaceae]. **Local name:** *Sankha sapla*. Leaves floating; perianth pale blue. **Flowers & Fruits:** July – October.

Occurrence: Common in lakes and ponds. **Exsiccatus:** Nischintapur lake, *Bhowmik 460*.

Nymphoides cristatum Roxburgh [Menyanthaceae]. Leaves floating, orbicular; corolla white.

Flowers: September – November.

Occurrence: Common in lakes. **Exsiccatus:** Collegetila lake, Agartala, *Bhowmik 466*.

Nymphoides indica (L.) Kuntze [Menyanthaceae]. Leaves deeply cordate. **Flowers & Fruits:** August – October.

Occurrence: Throughout the District. **Exsiccatus:** Rudrasagar, Melagarh, *Bhowmik 468*.

Ottelia alismoides (L.) Persoon [Hydrocharitaceae]. **Local name:** *Pani kala*. Submerged succulent herb; lamina ovate-lanceolate. **Flowers & Fruits:** July – September.

Occurrence: Very common in lakes and jheels. **Exsiccatus:** Padmapukur, Khowai, *Saha 568*.

Uses: Tender peduncle and flower buds are used as vegetable by rural people.

Persicaria hydropiper (L.) Spach [Polygonaceae]. **Local name:** *Bish katali*. A small decumbent herb with ascending branches; flowers pink. **Flowers & Fruits:** September – October.

Occurrence: Very common in wet and moist places. **Exsiccatus:** Noyadi, *Bhowmik 438*.

Pistia stratiotes L. [Araceae]. A stemless stoloniferous floating herb.

Occurrence: Common in lakes and ponds. **Exsiccatus:** Nagerjala pond, *Bhowmik 412*.

Rotala densiflora (Roth) Koehne [Lythraceae]. An erect herb with spreading branches; flowers pink. **Flowers & Fruits:** November – February.

Occurrence: Common in wet places. **Exsiccatus:** Jirania lake, *Bhowmik 479*.

Rotala indica (Willdenow) Koehne [Lythraceae]. An erect succulent herb; flowers pale pink. **Flowers & Fruits:** November – January.

Occurrence: Very common in rice fields and wet places. **Exsiccatus:** Jirania, *Saha 289*.

Sagittaria guayanensis L. [Alismataceae]. Lamina ovate, deeply cordate. **Flowers & Fruits:** August – October.

Occurrence: Common, found in paddy fields. **Exsiccatus:** Aanandanagar, *Bhowmik 472*.

Sagittaria sagittifolia L. [Alismataceae]. **Local name:** *Tir mukhi*. Aquatic herbs; lamina sagittate raising above the water surface. **Flowers & Fruits:** December – February.

Occurrence: Common in Rudrasagar lake and Brahma Beel. **Exsiccatus:** Rudrasagar, Melaghar, *Datta 549*.

Uses: Tubers are consumed as vegetables by local tribes.

Sphenoclea zeylanica Gaertner [Sphenocleaceae]. An erect herb with hollow stem. **Flowers & Fruits:** June – August.

Occurrence: Occasionally found in paddy fields. **Exsiccatus:** Sekerkote, *Bhowmik 453*.

Spirodella polyrrhiza (L.) Schleid [Lemnaceae]. A small floating herb.

Occurrence: Common in stagnant waste water bodies. **Exsiccatus:** Champamura, *Datta 541*.

Trapa natans var. *bispinosa* (Roxburgh) Makino. [Trapaceae]. **Local name:** *Singara phal*. Leaves floating with long stoloniferous stems. **Flowers & Fruits:** September – December.

Occurrence: Common in lakes, jheels and tanks. **Exsiccatus:** Jirania lake, *Datta 546*.

Uses: Fruits edible.

Utricularia aurea Loureiro [Lentibulariaceae]. A submerged aquatic herb. Flowers yellow.

Flowers & Fruits: June – August.

Occurrence: Very common in rice fields and Marshland places. **Exsiccatus:** Collegetila lake, *Bhowmik 390*.

Utricularia exoleta R. Br. [Lentibulariaceae]. Free floating aquatic herb; flowers yellow. **Flowers & Fruits:** July – September.

Occurrence: Very common in wet places and rice fields. **Exsiccatus:** Noyadi, *Bhowmik 379*.

Wolffia arrhiza (L.) Hook. *ex* Wimm. [Lemnaceae]. A minute floating plant.

Occurrence: Common in stagnant waste water bodies. **Exsiccatus:** Nagerjala, *Bhowmik 447*.

DISCUSSIONS

The aquatic and marshland vegetation of West Tripura is quite rich and diverse due to the presence of large number of natural lakes and swamps. A thorough floristic study of the district reveals the occurrence of 65 species of aquatic and Marshland plants belonging to 44 genera and spreading over 26 families. Each plant has been enumerated with correct name, local name, flowering and fruiting time, availability in the study area and references to voucher specimens and uses if any. Among the 26 families, 4 dicotyledonous and 5 monocotyledonous families are purely aquatic.

LITERATURE CITED

- Arber, A. 1920. *Water Plants: A Study of Aquatic Angiosperms*. Cambridge University Press, London.
- Babu, C. R. 1977. *Herbaceous Flora of Dehra Dun*, CSIR, New Delhi.
- Bhaskar, V. & Razi, B. A. 1973. *Hydrophytes and marsh plants of Mysore city*. Prasaranga, University of Mysore, Mysore.
- Biswas, K. & Calder, C. C. 1936. *Handbook of Common Water & Marsh Plants of India and Burma*. Bishen Singh & Mahendra Pal Singh, Dehradun.
- Bursche Eva, M. 1971. *A Handbook of Water Plants*. Frederick Warne & Co. Ltd., London.
- Chavan, A. R. & Sabnis, S. D. 1961. A study of the Hydrophytes of Baroda and environs. *J. Indian Bot. Soc.* **40**: 121 – 130.
- Deb, D. B. 1981, 1983. *The Flora of Tripura State*, Vol.- I & II. Today and Tomorrow's Printers and Publishers, New Delhi.
- Fassett, N. C. 2000. *A Manual of Aquatic Plants*, Agrobios (India), Jodhpur.
- Jain, S.K. & Rao, R.R. 1977. *A Handbook of Field and Herbarium Methods*. Today & Tomorrow's Printers and Publishers, New Delhi.
- Kachroo, P. 1984. *Aquatic Biology in India*. Bisen Singh Mahendra Pal Singh, Dehra Dun.
- Lavania, G. S.; Paliwal, S. C. & Gopal, B. 1990. Aquatic vegetation of the Indian subcontinent. In: (Ed.) Brij Gopal "*Ecology and Management of Aquatic Vegetation in the Indian Subcontinent*", pp. 29 - 76. Kluwer Academic Publishers, Dordrecht Boston/ London.
- Maheshwari, J. K. 1960. The Origin and Distribution of the naturalized plants of Khandwa Plateau, Madhya Pradesh. *J. Biol. Sci.* **3**: 9 – 19.
- Majumdar, N. C. 1965. Aquatic and semi- aquatic flora of Calcutta and adjacent localities. *Bull. Bot. Soc. Bengal.* **9**: 10 – 17.
- Mirashi, M. V. 1954. Studies in the hydrophytes of Nagpur 1. A preliminary Survey. *J. Indian bot. Soc.* **33**: 299- 308.
- Mirashi, M. V. 1957. Studies in the hydrophytes of Umred. *J. Indian bot. Soc.* **36**: 397 – 407.
- Mirashi, M. V. 1958. Studies in the hydrophytes of Mansar. *J. Biol. Sci.* **1**: 45 – 52.
- Muenscher, W. C. 1994. *Aquatic Plants of the United States*. Comstock Publ Co., New York.
- Patmaik, H. & Patnaik, N. K. 1956. The hydrophytes of Cuttack. *J. Indian bot. Soc.* **35**: 167 – 170.
- Puri, G. S. & Mahajan, S. D. 1958. The Vegetation of marshes and swamps in the Poona District. *Proc. Nat. Ins. Sci. India* **24**: 159 – 164.
- Reid, G. K. 1961. *Ecology of Inland Waters and Estuaries*. Reinhold Publication Corporation, New York.

- Saldanha, J & Nicolson, H. 1976. *Flora of Hassan District, Karnataka, India*, Amerind Publishing Co., New Delhi.
- Satyanarayana, G. 1963. Hydrophytic vegetation of Jalukbari, *Bull. Bot. Surv. India* **4**: 217 – 218.
- Sculthorpe, C. D. 1967. *The biology of aquatic vascular plants*. Arnold, London.
- Sen, D. N. & Chatterjee, U. N. 1959. Ecological studies on aquatic and swampy vegetation of Gorakhpur. *Agra Univ. J. Res. (Sci.)* VIII **1** : 17 – 29.
- Subramanyam, K. 1962. *Aquatic Angiosperms*. Botanical Monograph (3) CSIR, New Delhi.
- Unni, K. S. 1967. Studies on the Vegetation of ponds, swamps and river banks in Raipur, M. P. *J. Bombay Nat. Hist. Soc.* **64**: 95 – 102.
- Vyas, L. N. 1964. A study of hydrophytes and marsh plants of Alwar and environs. *J. Indian Bot. Soc.* **43**: 7 – 30.