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## THE AQUATIC PLANT SECTION OF ACHARYA JAGADISH CHANDRA BOSE INDIAN BOTANIC GARDEN (AJCBIBG): *EX-SITU* CONSERVATION AND PROPAGATION

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### ABSTRACT

Aquatic plants play an important role in aquatic ecosystem, not only as service provider but also as phytoremediation. Rapid urbanization, industrial expansion and ineffective protective measures had a cumulative effect on the loss of aquatic biodiversity. The conservation and awareness of these plants therefore becomes necessary. With this view an aquatic section was developed at AJC Bose Indian Botanic Garden, Howrah. The aquatic section is built in an area of more than 12000 sq.ft. to enrich visitors with different species and cultivars of aquatic plants at the same time serving as an *ex-situ* conservatory of aquatic plants germplasm. 25 types of *Nelumbo* including both wild and cultivars, 26 types of *Nymphaea* (cultivars plus wild species), ca. 39 types of aquatic ferns, hydrophytes and nymphoides and others are conserved in this newly developed aquatic plant section.

**Key words :** Aquatic plants, AJC Bose Indian Botanic Garden, *Euryale ferox*, *Victoria amazonica*, Zhizun Qianban - Ultimate thousand petals.

### Introduction

Aquatic plants are major components of rivers, lakes, ponds and marine environments. They are the primary providers of any aquatic ecosystem. They are the vital sources of food and oxygen, as well as provides congenial habitats for zooplanktons and fish. Not only animals, the aquatic plants are also the source of food, medicine and aesthetic items such as flowers for human beings. Despite the importance of aquatic biodiversity, they are continuously being degraded and forced to degrade by the very act of the human. Rapid urbanization, industrial expansion and ineffective protective measures had a cumulative effect on the loss of aquatic biodiversity. Restoration and preservation of aquatic diversity is surely one of the strategies to check the genetic erosion of such highly productive ecosystems. However, aquatic environments take years to evolve and develop, so every strategy to protect them must be used (Ferreira *et al.*, 2023). Apart from the usual ecosystem services, in recent

trends, aquatic plants are used in phyto-remediation of waste water. Aquatic plants have the ability to absorb organic and inorganic contaminants and heavy metals present in agricultural, domestic and industrial waste water. Among the aquatic plants, *Salvinia molesta* D. Mitch. and *Pistia stratiotes* L. have been widely used for the treatment of agricultural, domestic and industrial waste water (Hauwa *et al.*, 2021). The conservation and awareness of these plant groups, therefore becomes even more necessary for the better as well as effective management of aquatic ecosystem not only for its ecosystem services, but also for sustainable development of the human society for posterity.

AJC Bose Indian Botanic Garden covers an area of 273 acres having 24 lakes, which are interconnected with each other and ultimately connected with the canal running in the periphery of the garden and get fed from the river Hoogly running in the western side of the garden. A dedicated section was developed to enrich visitors with

aquatic plants of eastern India which also acts as a site of germplasm conservation. According to Chowdhery and Pandey (2007), the garden had members of Nymphaeaceae, Nelumbonaceae with few notable hybrids. The major attraction of the aquatic section was *Victoria amazonica* (Poepp.) Klotzsch. (Giant water lily/ Victoria lily) and *Euryale ferox* Salisb. (Makhana). Presently the section has been clearly defined and is built in area of more than 12000 sq.ft. to enrich visitors with different species and cultivars of aquatic plants at the same time serving as an excellent *ex-situ* conservatory of aquatic plants germplasm.

### Materials and Methods

**Plant selection :** Aquatic plants can be divided into three major categories such as emergent, submerged and floaters. Emergent or marginal plants are found along the edges of a pond, while the roots are attached to the bottom the portions of their stems are above the water. Submerged plants also called oxygenators remain beneath the water surface. These plants help in controlling the algal growth by consuming excess nutrients and lower the eutrophication levels. At the same time, they produce oxygen during day light hours. Floaters are not rooted in the soil, but are allowed to float freely above the water surface. Floaters enhance the display of the pond. For a balanced aquatic garden all the three types of plants are necessary (Nolting, 2010). Seedlings, rhizomes and bulbs were collected from the wild as well as from different conservatorium and institutes.

**Soil type :** Soils for water lilies, lotuses and other aquatic plants is heavy clay loam type. These types of soils are generally well-balanced nutritionally and enhance the growth rate. Commercial potting soil or other artificial mixes are not used as they are light weight and do not hold nutrients for longer time (Hagen, 1996).

**Planting aquatics :** In the development of the base of the man-made pool highly enriched clay soil and leaf litter was used. Compost mixed with coco peat, leaf litter, vermicompost were added as fertilizer. The rhizomes and seedlings were planted after the tank was filled with water. Soil used for planting should be damp. The rhizome is placed with growing point just above the soil level. Once planted, the soil is covered with a 1/2 to 3/4 inches layer of pea gravel. This prevents soil particles from clouding the water. Water lilies are planted at a water depth of 15 cm, such that the primary leaves are just above the water level. Sunlight should be sufficient for the growing tip to receive light. Lotus is usually planted at a depth of 30 cm and water levels are continuously monitored. Water lilies, lotuses and emergent plants can

tolerate temperatures about 25<sup>o</sup>-40<sup>o</sup>C (Hagen, 1996).

**Dormancy :** November onwards lotuses and some cultivars of lilies (Inter sub generic lilies) will go dormant. During this time the plants are removed from the tank, most of the leaves dry out and are removed. The rhizomes and bulbs are shifted to small containers and stored for the next year, in places where plenty of sunlight is there. Tropical lilies bloom throughout the year, but during winter the vegetative and reproductive growth will be reduced due to low temperature. Hardy lilies bloom 2-3 times throughout the year. Next year under suitable temperature conditions they sprout again (Nolting, 2010). They can then be potted in small pots and shifted to the pond at the appropriate or on the onset of conducive conditions and time.

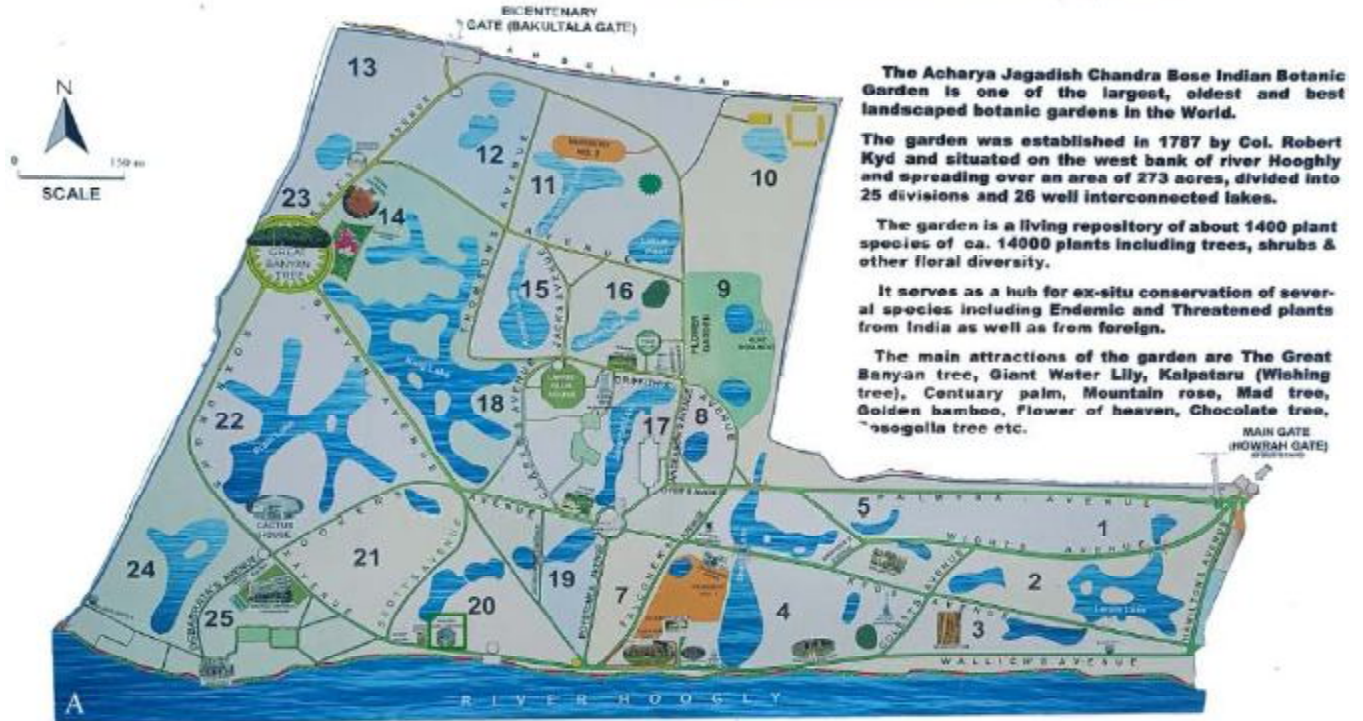
**Aquatic nursery :** Before transfer of seedlings of aquatic plants, they are propagated in the aquatic nursery. Small containers of 2×1.5 ft. are used as nurseries. All the bulbs, rhizomes and tubers are kept in the nursery for initiation of primary leaves. These nurseries play a pivotal role for initiation and regular maintenance of seedlings before transfer into big tanks.

### Results and Discussion

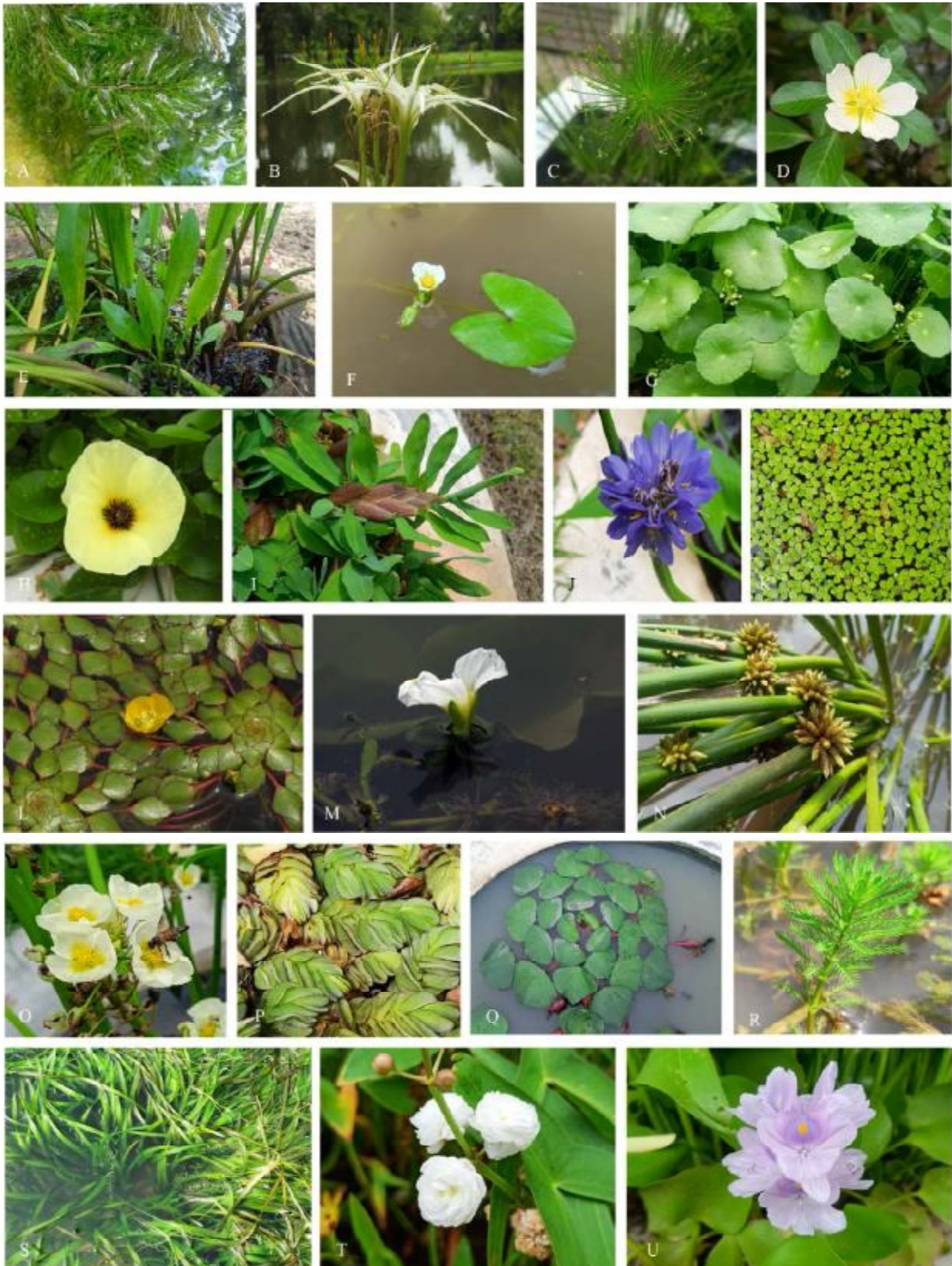
**Aquatic section of AJCBIBG :** The section is located near the banks of Hooghly River in the division no. 20 of the garden (Fig. 1). There are big cemented tanks of 30×5 ft. and 20×5 ft. size surrounded by 88 small tanks (3.5×3 ft.) and 25 big mud bowls planted with 25 types of wild and cultivars of Nelumbo, 26 types of Nymphaea, 39 types of aquatic ferns, hydrophytes and nymphoides and others. The Aquatic Section is endowed with 90 aquatic plants both cultivars and wild species belonging to 25 families (Table 1 and Fig. 2). Many of them are important as food (F), medicine (M), ornamentals (Or) or as fodder, water reclamation (O). These are the clear indications of the importance of the plants in sustainable use and proper management of the ecosystem. Several new aquatic macrophytes and different cultivars have been introduced in the garden which would hope to attract attention of visitors for its aesthetic values and as well as it would make us aware of the food and medicinal values the plants hold and as such the importance of aquatic ecosystem. The cultivars with phenological records and flower colours for Nelumbo (Table 2 and Fig. 3) and Nymphaea (Table 3 and Fig. 4) are also represented.

*Euryale ferox* Salisb. is a native to eastern Asia and considered as one of the underutilized cash crops of India. In the last decade the consumption of seeds has increased due to its high food value (Kumar *et al.*, 2015). Bihar is

# ACHARYA JAGADISH CHANDRA BOSE INDIAN BOTANIC GARDEN



**Fig. 1 :** Aquatic section of Acharya Jagadish Chandra Bose Indian Botanic garden. A. Map showing the location of aquatic garden; B, C & D. Different view of aquatic garden.



**Fig. 2 :** A. *Ceratophyllum submersum* L.; B. *Crinum bulbisperrum* (Burn. f.) Milne-Redh. & Schwick; C. *Cyprus papyrus* L.; D. *Ludwigia adscendens* (L.) H.Hara; E. *Cryptocoryne ciliata* (Roxb.) Schott; F. *Hydrocharis morsus-ranae* L.; G. *Hydrocotyle verticillata* Thumb.; H. *Hydrocleys nymphoides* (Humb. & Bonpl. ex Willd.) Buchenan; I. *Hygroryza aristata* (Retz) Nees ex Weight & Ar.; J. *Pontederia hastata* L.; K. *Lemna minor* L.; L. *Ludwigia sedioides* (Humb. & Bonpl.) H. Hara; M. *Ottelia alismoides* (L.) Pers.; N. *Schoenoplectiella praelongata* (Poir.) Lye; O. *Sagittaria trifolia* L.; P. *Salvinia molesta* D.Mitch.; Q. *Trapa natans* L.; R. *Myriophyllum aquaticum* (Vell.) Verdc.; S. *Vallisneria natans* (Lour.) H.Hara; T. *Sagittaria japonica* E.Vilm.; U. *Pontederia crassipes*.

**Table 1 :** Aquatic plant collection of AJC Bose Indian Botanic Garden.

Name of the plant	Uses	Habitat and phenology
<i>Acorus calamus</i> L. (Acoraceae)	M	Emergent aromatic herb Fl. February — June
<i>Alternanthera sessilis</i> (L.) DC. (Amaranthaceae)	F	Emergent, ascending herb Fl. Throughout the year
<i>Aquarius palifolius</i> (Nees & Mart.) Christenh. & Byng (Alismataceae)	Or	Emergent, perennial herb Fl. June — October
<i>Azolla nilotica</i> Decne. (Salviniaceae)	Or	Floating, aquatic fern
<i>Azolla pinnata</i> R.Br. (Salviniaceae)	Or	Floating, aquatic fern
<i>Centella asiatica</i> (L.) Urb. (Apiaceae)	M	Emergent, prostrate herb Fl. Throughout the year
<i>Ceratophyllum submersum</i> L. (Ceratophyllaceae)	O	Submerged, free floating herb Fl. Augst-September
<i>Commelina paludosa</i> Blume (Commelinaceae)	O	Emergent, subshrub Fl. June - August
<i>Crinum bulbispermum</i> (Burm.f.) Milne-Redh. & Schweick. (Amaryllidaceae)	M	Emergent, perennial herb Fl. July — September
<i>Cryptocoryne ciliata</i> (Roxb.) Schott (Araceae)	Or	Emergent, perennial herb Fl. July-August
<i>Cyperus alternifolius</i> L. (Cyperaceae)	Or	Emergent, perennial herb in marshy places Fl. June — December
<i>Cyperus papyrus</i> L. (Cyperaceae)	O	Emergent, perennial shrub Fl. July – October
<i>Euryale ferox</i> Salisb. (Nymphaeaceae)	F	Emergent, aquatic perennial herb Fl. June — August
<i>Hydrilla verticillata</i> (L.f.) Royle (Hydrocharitaceae)	O	Submerged, aquatic herbs; good oxygenators, cultivated
<i>Hydrocharis laevigata</i> (Humb. & Bonpl. ex Willd.) Byng & Christenh. (Hydrocharitaceae)	Or	Floating- Aquatic herb Fl. May- July
<i>Hydrocharis morsus-ranae</i> L. (Hydrocharitaceae)	Or	Floating, aquatic herb Fl. July-September
<i>Hydrocleys nymphoides</i> (Humb. & Bonpl. ex Willd.) Buchenau (Alismataceae)	Or	Emergent, perennial herb Fl. November-May
<i>Hydrocotyle verticillata</i> Thunb. (Araliaceae)	O	Emergent Hydro perennial herb Fl. June- October
<i>Hygrophila auriculata</i> Schumach. (Acanthaceae)	M	Emergent, annual subshrub, in swampy areas Fl. October – January
<i>Hygroryza aristata</i> (Retz.) Nees ex Wight & Arn. (Poaceae)	O	Floating, aquatic grass Fl. October-November
<i>Ipomoea aquatica</i> Forssk. (Convolvulaceae)	F, M	Emergent, perennial creeper Fl. October — April
<i>Lemna minor</i> L. (Araceae)	O	Floating, perennial aquatic
<i>Lemna valdiviana</i> Phil. (Araceae)	O	Floating, perennial aquatic
<i>Ludwigia adscendens</i> (L.) H. Hara (Onagraceae)	O	Floating, aquatic creeper Fl. June — September

Table 1 continued...

Table 1 continued...

<i>Ludwigia sedioides</i> (Humb. & Bonpl.) H. Hara (Onagraceae)	Or	Floating, aquatic herb Fl. October — February
<i>Marsilea minuta</i> L. (Marsileaceae)	F	Emergent, aquatic herb
<i>Myriophyllum aquaticum</i> (Vell.) Verdc. (Haloragaceae)	Or	Emergent, aquatic herb, invasive Fl. May – September
<i>Nelumbo nucifera</i> Gaertn. (Nelumbonaceae)	F	Emergent, perennial herb Fl. March — October
<i>Nymphaea alba</i> L. (Nymphaeaceae)	M	Emergent, perennial herb Fl. Throughout the year
<i>Nymphaea capensis</i> Thunb. (Nymphaeaceae)	Or	Emergent, perennial herb Fl. Throughout the year
<i>Nymphaea nouchali</i> Burm. f. (Nymphaeaceae)	F, M	Emergent, perennial herb Fl. Throughout the year
<i>Nymphaea pubescens</i> Roxb. Ex Andr. (Nymphaeaceae)	M	Emergent, perennial herb Fl. August – October
<i>Nymphaea rubra</i> Willd. (Nymphaeaceae)	F	Emergent, perennial herb Fl. Throughout the year
<i>Nymphoides hydrophylla</i> (Lour.) Kuntze (Menyanthaceae)	F	Emergent, perennial herb Fl. July – September
<i>Ottelia alismoides</i> (L.) Pers. (Hydrocharitaceae)	F, M	Submerged, annual shrub Fl. August – September
<i>Pistia stratiotes</i> L. (Araceae)	M	Floating, annual herb Fl. August — October
<i>Pontederia crassipes</i> Mart. (Pontederiaceae)	Or, O	Floating, aquatic herb, high growth rate forms a mat over water, reduces oxygen in water Fl. June – August
<i>Pontederia hastata</i> L. (Pontederiaceae)	Or, O	Emergent, aquatic herb Fl. May – September
<i>Sagittaria japonica</i> E. Vilm. (Alismataceae)	Or, O	Emergent, perennial subshrub Fl. July – November
<i>Sagittaria sagittifolia</i> L. (Alismataceae)	F, Or	Emergent, perennial subshrub Fl. May – September
<i>Sagittaria trifolia</i> L. (Alismataceae)	Or	Emergent, perennial subshrub Fl. June – October
<i>Salvinia molesta</i> D. Mitch. (Salviniaceae)	O	Floating, perennial fern
<i>Schoenoplectiella praelongata</i> (Poir.) Lye (Cyperaceae)	Or, O	Emergent, annual shrub Fl. August – December
<i>Trapa natans</i> L. (Lythraceae)	F	Floating, annual herb Fl. August – January
<i>Typha angustifolia</i> L. (Typhaceae)	E	Emergent, perennial shrub Fl. March – May
<i>Vallisneria natans</i> (Lour.) H. Hara (Hydrocharitaceae)	M	Submerged, perennial herbs; good oxygenators Fl. March – April
<i>Victoria amazonica</i> (Poeppig) Sowerby (Nymphaeaceae)	E	Emergent, annual subshrub Fl. July – November
<i>Wolffia arrhiza</i> (L.) Horkel ex Wimmer (Lemnaceae)	F, O	Floating, annual

**Table 2 :** Cultivars of Nelumbo at AJC Bose Indian Botanic Garden.

Name of the cultivar	Flower colour	Pnenology of flowering
Affection 16	Dark pink	Perennial (2 years) April –August
Ameri Camelia	Creamy white to pinkish white	May – August
Ameri Peony	Dwarf pinkish white	April - August
Buddha Seat	Creamy white with light pink margin	March – june
Buddha Sound	Double petalled, white	May – August
Charming lips	Double petalled, yellow in centre to pink at the edges	June – August
Cloud in Yaochi	Double petalled, pink with dark pink edges	May – July
Feather skirt	Petals small, pink turning peach and yellow in the following days	July – August
Foreigner	White with double petalled	April – August
Gold apple	Double petalled, white to yellow green	June – July
Green peace	White with green stripe petals	May – August
Kaveri	Double petalled, dark pink	Throughout the year
N42 S red	Dwarf, red	June – July
Pastel blood	Double petalled, red	May – July
Pink Meadow	Dwarf variety for small areas, pink	June – August
Pretty woman	Double petalled, dark pink with yellow centre	June – September
Red Commander	Dark pink	May – August
Red Pear	Pink, sharp edged petals	June – September
Red Philip	Double petalled, dark pink to red	May – August
Satta	Double petalled, white with pink tinge	May – August
Tai hu deep love	Double petalled, creamy white	June – July
Thammo	Pink with white tips	August – September
White puff	Bright white	May – August
Yellow peony	Double petalled, bright yellow, needs bright day light for growth	May – August
Yellow Pror Pink	Creamy yellow with yellow centre, needs bright day light for growth	May – August

the largest producer of fox nut. The plant was introduced in the garden especially in the aquatic plant section with the view of initiating awareness amongst the local farmers of West Bengal and to up-lift the economy. The prickly leaves are the biggest hindrance in harvesting the seeds.

Zhizun Qianban is a rare cultivar of lotus having 800-1000 petals produced by Dr. Daike Tian in South China in 2009 (Tian and Nau, 2010). The plant is about 156-207 cm. from base; leaf 41-76 × 31-66 cm.; the flower is pink with red or deep red in margins and tip. The basal part of the petal is white to light yellow. It appears to be a giant red violet ball once it matures. Strong fragrance is yet another feature of this species.

*Victoria amazonica* (Poepp.) Klotzsch. is a native of Amazon River basin and is highly priced as an ornamental. It has very large floating orbicular leaves, 1.75-2 mt. in diameter and carry weight upto 40 kg.

Flowers are about 12 inches in diameter (Smith *et al.*, 2022). *V. amazonica* and *V. cruziana* was first introduced in the garden by George King in 1873. After Amphan cyclone in May 2020 the plants was not come out as it is seasonal in our country. Again, to re-introduce, seeds were obtained from YVU, Kadappa, Andhra Pradesh and subjected to different treatments to induce rooting. The vegetative growth in maximum during monsoon and flower commence during September. It is learned that soil type and temperature is crucial for survival of the plant.

**Maintenance and conservation :** In development of aquatic section, priority has been given to choose the right spot (Hagen, 1996). Since aquatic plants require adequate sunlight, the preferred site would be away from tall shrubs and trees to avoid shade and to prevent the accumulation of leaf debris. In aquatic gardening proper



**Fig. 3 :** A. *Nymphaea* 'Blue capensis'; B. *Euryale ferox* Salisb.; C. *Nymphaea* 'Dauben'; D. *Nymphaea* 'Pink Pubescens'; E. *Nymphaea colorata* Peter; F. *Nymphaea* 'Mexicana'; G. *Nymphaea* 'Indiana'; H. *Nymphaea* 'Purple Joy'; I. *Nymphaea* 'Nang Kwak - Orange'; J. *Victoria amazonica* (Poepp.) Klotzsch; K. *Nymphaea nouchali* Burm. f.; L. *Nymphaea* 'White Pubescens'; M. *Nymphaea* 'Poosub cross'; N. *Nymphaea* 'Spiral galaxy'; O. *Nymphaea* 'Colorado'; P. *Nymphaea rubra* Roxb. ex Andrew; Q. *Nymphaea* 'Islamorada'; R. *Nymphaea* 'Lindsey woods'; S. *Nymphaea* 'Pink pearl'; T. *Nymphaea* 'Pink Capensis'; U. *Nymphaea* 'Super moon'; V. *Nymphaea* 'White capensis'; W. *Nymphaea* 'Panama pacific'; X. *Nymphaea* 'Pink zane'.





**Fig. 4 :** A. *Nelumbo nucifera* 'Ameri Camelia'; B. *Nelumbo nucifera* 'Ameri Peony'; C. *Nelumbo nucifera* 'Buddha Seat'; D. *Nelumbo nucifera* 'Foreigner'; E. *Nelumbo nucifera* 'Charming Lips'; F. *Nelumbo nucifera* 'Feather Skirt'; G. *Zhizun Quinban*-' Ultimate Thousand Petals'; H. *Nelumbo nucifera* 'Yellow Pror Pink'; I. *Nelumbo nucifera* Gaertn.; J. *Nelumbo nucifera* 'Kaveri'; K. *Nelumbo nucifera* 'Red philip'; L. *Nelumbo nucifera* 'Green Peace'; M. *Nelumbo nucifera* 'White Puff'; N. *Nelumbo nucifera* 'Thammo'; O. *Nelumbo nucifera* 'Yellow Peony'.

soil conditions, size of pond, proper planting techniques, and after planting care, depth of water, all affects the growth of aquatic plants.

Snails, algal blooms, tadpoles, egg mass and aquatic weeds hampers the growth of *Nymphaea*, *Victoria* and *Euryale ferox* for which regular monitoring and cleaning is essential. In case *Nelumbo*, algal bloom, presence of

**Table 3 :** Cultivars of *Nymphaea* at AJC Bose Indian Botanic Garden.

Name of the cultivar	Flower colour	Phenology of Flowering
Blue capensis	Tropical, blue flowers	Throughout the year
Blue whistle	Tropical, violet blue flowers with 26 petals;leaves green above, with maroon flecks underneath	Throughout the year
Bulls eye	Tropical, crimson red flowers with nearly 70 petals	Throughout the year
Colorado	Hardy, salmon-coloured flowers, light fragrance	August – February
Colorata	Tropical, purple with 13-15 pointed petals, purple stamens	March – October
Dauben	Tropical, white with lavender edges, fragrant	Throughout the year
Innocence	Tropical, white flowers with purple tips	Throughout the year
Islamorada	Tropical, pale purple flowers with white dots, fragrant	Throughout the year
Key largo	Tropical, lavender flowers	Throughout the year
Lindsey wood	Tropical, purple flowers with dark purple stripes, sepals black, fragrant, leaves green with purple spots underneath	Throughout the year
Mexicana	Hardy, pale yellow flowers	May – November
Nangkwak	Tropical, orange flowers, 24-32 petals, fragrant	September – October
Panama pacific	Tropical, dark purple flowers, fragrant, deep green leaves with purple spots underneath	April – October
Pink capensis	Tropical, pink flowers, fragrant	Throughout the year
Pink Night Bloomer	Tropical, light to medium pink flowers, fragrant	May – October
Pink pearl	Tropical, pink flowers with a white throat, fragrant	April – October
Poonsub cross	Tropical, yellow shade with pink tips, fragrant	June- November
Spiral Galaxy cross	Tropical, dark pink flowers with multipetals, fragrant	May- September
Sultan	Hardy, Cherry red flowers with coppery tones	July – September
Super moon cross	Tropical, pink flowers with yellow stamens, fragrant	June - September
White capensis	Tropical, white flowers	Throughout the year

*Lemna*, *Hydrilla* or other fast growing aquatic weeds are the major hindrance in growth. Temperature (28<sup>o</sup>-35<sup>o</sup>C), quality of water also plays an important role (Hagen, 1996). Since standing water results in eutrophication the water is pumped out and fresh water is filled in every 45-60 days interval. This section was initiated to aware students and public about the aquatic plants and its importance, both commercial and economic.

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### References

- Chowdhery, H.J. and Pandey D.S. (2007). *Plants of Indian Botanic Garden*. Botanical Survey of India, India.
- Ferreira, V., Bini L.M., Ángeles M., Sagrario G., Kovalenko K.E., Naselli-Flores L., Padial A.A. and Padisák J. (2023). Aquatic ecosystem services: an overview of the Special Issue. *Hydrobiologia*, **850**, 2473-2483.
- Hagen, A. (1996). *A Guide to Establishing Aquatic Plant*. Environment Canada's Environmental Conservation Branch - Ontario Region, Minister of the Environment, Canada.
- Kumar, L., Choudhary A., Bhatt B. and Singh K. (2015). Genetic divergence in makhana (*Euryale ferox* Salisb). *Indian J. Hort.*, **72**, 365-369.
- Mustafa, H.M. and Hayder G. (2021). Recent studies on applications of aquatic weed plants in phytoremediation of wastewater: A review article. *Ain Shams Eng. J.*, **12(1)**, 355-365.

- Nolting, E. (2010). *Water Gardening: Plants for the Water Garden*. Kansas State University. Kansas.
- Smith, L.T., Magdalena C., Przelomska N.A.S., Pérez-Escobar O.A., Melgar-Gómez D.G, Beck S., Negro R., Mian S., Leitch I.J., Dodsworth S., Maurin O., Ribero-Guardia G, Salazar C.D., Gutierrez-Sibauty G, Antonelli A. and Monro A.K. (2022). Revised Species Delimitation in the Giant Water Lily Genus *Victoria* (Nymphaeaceae) confirms a New Species and has Implications for its Conservation. *Front. Plant Sci.*, **13**, 883151.
- Tian, D. and Nau L. (2010). Long-lost Ancient *Nelumbo* cultivar Discovered – Rare Lotus Produces 1000 Petals. *Water Gard. J.*, **25**, 6-8.