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Aquatic Plants of Bangladesh Agricultural University Botanical Garden: Species Diversity and Potential Uses

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Abstract: Bangladesh Agricultural University Botanical Garden is home to 70 aquatic plant species belonging to 48 genera and 34 families of which Nymphaeaceae has nine species followed by Alismataceae (six); Pontederiaceae and Salviniaceae (four). Convolvulaceae, Cyperaceae, Hydrocharitaceae, Lythraceae, Menyanthaceae, and Onagraceae each are represented by three species. The rest five genera were represented by two and nineteen genera by one species, only. Recorded species are grouped into different ecological habitat categories. A total of seven categories of existing uses were found in the garden. According to the IUCN categories, most of the species 47 (67.14%) are in the least concern category, while only four species were found in the threatened category (one near threatened, two conservation dependent, and one vulnerable) in the natural wetlands. Interestingly, seven rare species (10%) were found in the water garden of BAUBG. Five new aquatic species were documented namely *Nymphoides peltata*, *Sagittaria latifolia*, *Sagittaria montevirdensis*, *Thalia dealbata*, and *Thalia geniculata*. A good number of aquatic species including 7 rare and 5 new species is an indication of richness in the gene pool of aquatic plants at BAUBG.

Keywords: Aquatic plants, Diversity, Ethnobotany, Medicinal plants, Water garden

Aquatic plants that grow naturally or grown artificially in water often form distinct communities depending on their habitats. They are an essential component of aquatic ecosystems and play a significant role in maintaining the ecological balance of freshwater and marine environments and serve as primary producers of oxygen through photosynthesis (Ravi et al 2020, Paul 2022). Some aquatic plants are emergent and rooted on the bottom, while others are submerged. Still, others are free-floating, and some are rooted in the banks of the impoundments, adapting to semi-aquatic habitats. Generally, aquatic macrophytes are herbaceous and very occasionally shrubby in nature. Most of these aquatic plants can grow very fast and directly or indirectly interfere with human activities. There are more than 100 families of vascular aquatic plants on the planet, with around 7.5% of them being dicotyledonous and 11% being monocotyledonous. These plants provide diverse nesting environments for aquatic organisms. They provide a substrate for epiphytic algae and shelter for numerous invertebrates, assist in the cycling of nutrients into sediments, and stabilize river and stream banks (Paul 2022). Aquatic plants or wetland flora has been threatened by several major impacts, such as overexploitation of wetland resources, water pollution from the use of agrochemicals, siltation from flood, wastes from modern agricultural practices, exotic plantations, flow modification including water abstraction, destruction, or degradation of habitat, and invasion by alien species, whose combined and interactive influences are responsible for the decline of water plant populations (Schuyt 2005, Dudgeon et al 2006, Sonal et al 2010). In terms of economic, cultural, artistic, scientific, and educational value, inland waters and freshwater biodiversity is an important natural resource. Their conservation and management are crucial to all human, national, and international interests. But, this priceless heritage is in jeopardy (Dudgeon et al 2006).

In Bangladesh, the most common types of freshwater environments are haor, baor, beel, lake, pond, rivers, and floodplains (Marwat et al 2013). Over 130 angiosperms, six pteridophytes, three bryophytes, and several hundred species of algae have been identified as water plants in Bangladesh. Many authors have well-documented studies on Bangladesh's aquatic and marshland plants (Rahman et al 2007, Mukhopadhyay et al 2017, Uddin and Paul 2020). About 123 aquatic species were meticulously documented and illustrated in previous studies. Many regions of the country have conducted extensive research on aquatic plant distribution. The Bangladesh Agricultural University Botanical Garden (BAUBG) is the second largest and one of the oldest botanical gardens in Bangladesh considering the

number of plant species. It is enriched with the live collection and conservation of diverse plant species of terrestrial and aquatic habitats for educational and research purposes of BAU. Many aquatic plants are rich sources of natural compounds with medicinal properties, including anti-inflammatory, anti-cancer, anti-diabetic, and anti-microbial agents. However, despite their vast potential, most aquatic plants remain underexplored, and their full medicinal potential is yet to be realized. The present study targeted to document the diversity of aquatic plant species that are being conserved at the water garden of BAUBG including their habits, food and medicinal values, and conservation status.

MATERIAL AND METHODS

A survey on the aquatic and marshland angiosperms that are being grown and conserved in the water garden of BAUBG, Mymensingh, Bangladesh, had been carried out through frequent visits and observation from January 2022 to December 2022. The water garden consists of several concrete water tanks of different sizes (2.5 to 25 m^3) where a water depth of 0.5 to 2 ft is constantly maintained with tap water. It also has Chari, shallow water stagnant ponds, plastic drums, sewerage canals, and marshy places where tap water is supplied as and when required. The aquatic habitats contain many plant species of diverse habits *viz.* free-floating, rooted emergent, rooted submerged, rooted floating, submerged suspended, surface creeper, and near the water edge. The species names of aquatic plant species were used to identify and record them in the field. Specimens of unknown plant species were gathered for herbarium preparation. Herbarium was prepared from the fertile parts of plant specimens and put on a standard-sized sheet of paper (11.5" x 16.5"). Each sheet was labelled with the common name, scientific name, date of collection, habit, habitat, family, and collector's name and stored in Prof. Dr. Arshad Ali Herbarium at Bangladesh Agricultural University (AAHBAU). Taxonomists from the Bangladesh National Herbarium assisted in identifying the unidentified samples. A review of published journals and reference works, such as the Encyclopedia of Flora and Fauna of Bangladesh (Siddiqui et al 2007a, 2007b, Ahmed et al 2009a, 2009b), etc. was also conducted to identify the plant specimens. The dried specimens were put on the herbarium sheet. Identified plants were collected and classified according to their behaviour and environment. The relative fraction of species in various habitats, conservation status (i.e., NT, VU, CD, LC), taxonomic families, etc. were then estimated. All obtained data and information (qualitative and quantitative) were meticulously organized in a Microsoft Excel spreadsheet. Subsequently, we reorganized all the data methodically to obtain the intended research outcomes. We then examined the compiled data using spreadsheets (Microsoft Excel, version: 2019) and presented the results in the form of graphs and tables. The botanical names, common names, family, habitat, availability, the total number of species in each genus, prospective uses, and % distribution of families for various plant species are provided. Moreover, photographs of a few plants were taken and incorporated into the report (Fig. 5-6).

RESULTS AND DISCUSSION

The Bangladesh Agricultural University Botanical Garden is home to an abundance of aquatic species, making it a useful resource for examining the diversity and significance of these water plants. For each species, the scientific name, common name, family, habitat, status, and uses are included (Table 2). During the course of the study, 70 species, 48 genera, and 34 families were recorded in the research region (Table 1, Fig. 1). Nymphaeaceae was the largest contributor with nine species (12.85%), followed by Alismataceae with six species (8.57%), Pontederiaceae and Salviniaceae with four species (5.71% each), Convolvulaceae, Cyperaceae, Hydrocharitaceae, Lythraceae, Menyanthaceae, and Onagraceae with three species (4.28% each); five families with two species (2.85% each); and nineteen families with one species (1.42% each) (Fig. 1).

Recorded species are grouped into different ecological habitat categories. Among them, 12 free-floating (17.14%), 16 rooted floating (22.85%), 14 rooted emergent (20%), 13 species prefer to grow near water edge (18.57%), 7 rooted submerged (10%), 2 rootless submerged (2.85%), 5 species are water surface creeper (7.14%) and only one species as submerged and floating category in the aquatic habitat (Table 1, Fig. 2).

Potential uses: Aquatic plants are traditionally used as human medicine, human food as fruits and vegetables, fish food, and duck food. Some potential species are playing a good role as phytoremediators for pollutant removal from polluted water (Table 2). Out of the 70-plant species identified in the water garden, 56 species have been used for different purposes, such as human medicine 29 species (28%) followed by, fodder (7%), food as fruit & vegetables (14%), green manure & mulch (12%), fish food (7%), duck food (6%), phytoremediator (10%) and 6% as ornamental. There were still 10 species (10%) of aquatic macrophytes untapped for any uses including medicines in our country, though used in other countries of South Asia.

Twenty-five species (33%) are very much popular among rural peoples as medicine for different ailments. Fifteen percent of aquatic plants make important contributions to the

Table 1. List of aquatic plant spices with common names, scientific names, families, habitats, and conservation status

Common name	Scientific name	Family	Habitat	CS
Boch	*Acorus calamus* L.	Acoraceae	RE	VU
Kasuru	*Actinoscirpus grossus* (L.f.) Goetgh. & D.A.Simpson	Cyperaceae	RE	LC
Indian Joint Vetch	*Aeschynomene indica* L.	Leguminosae	NWE	LC
Malancha	*Alternanthera philoxeroides* (Mart.) Griseb.	Amaranthaceae	NWE	LC
Gechu	*Apanogeton natans* (L.) Engl. & Krause	Aponogetonaceae	RS	NT
Mosquito Fern	*Azolla filiculiodes* Lam.	Salviniaceae	FF	LC
Azolla	*Azolla pinnata* R.Br.	Salviniaceae	FF	LC
Thankuni	*Centella asiatica* (L.) Urban	Apiaceae	NWE	LC
Jhanjhi	*Ceratophyllum demersum* L.	Ceratophyllaceae	rs	LC
Umbrella Plant	*Cyperus alternifolius* R.Br.	Cyperaceae	RE	NE
Mexican Sword Lily	*Echinodorus palifolius* (Nees & Mart.) J.F.Macbr	Alismataceae	RE	Rare
Kachuripana	*Eichhornia crassipes* (mart.) solms	Pontederiaceae	FF	LC
Ground Chestnut	*Eleocharis dulcis* (Burm.f.) Trin. ex Hensch.	Cyperaceae	RE	LC
Helencha	*Enhydra fluctuans* Lour	Compositae	WSC	LC
Water Rush Bamboo	*Equisetum hyemale* L.	Equisetaceae	RE	New
Makhna	*Euryale ferox* Salisb.	Nymphaeaceae	RF	Rare
Duck's Footprint Grass	*Floscopa scandens* Lour.	Commelinaceae	NWE	LC
Hydrilla	*Hydrilla verticillata* (L.f.) Royle	Hydrocharitaceae	RS	LC
Water Poppy	*Hydrocleys nymphoides* (Humb. & Bonpl. ex Willd.) Buch.	Alismataceae	RF	Rare
Kulekhara	*Hygrophila auriculata* Schumach.	Acanthaceae	NWE	Rare
Sutki	*Hygroryza aristata* (Retz.) Nees ex Wight & Arn.	Poaceae	FF	LC
Pani Kolmi	*Ipomoea aquatica* Forssk.	Convolvulaceae	WSC	LC
Dol Kolmi	*Ipomoea carnea* Jacq.	Convolvulaceae	NWE	LC
Sagor Kolmi	*Ipomoea pes-caprae* (L.) R. Br.	Convolvulaceae	NWE	LC
Khudipana	*Lemna minor* L.	Araceae	FF	LC
Lettuce Pana	*Limnocharis flava* L.	Limnocharitaceae	RF	LC
Marshweed	*Limnophila heterophylla*	Plantaginaceae	RS	LC
Ambulia	*Limnophila sessiliflora* (Vahl) Blume	Plantaginaceae	RS	LC
Motmotey	*Lippia alba* (Mill.) N.E.Br. ex Britton & P.Wilson	Verbenaceae	NWE	LC
Keshordam	*Ludwigia adscendens* (L.) H.Hara	Onagraceae	WSC	LC
Mexican Primrose-Willow	*Ludwigia octavalvis*	Onagraceae	NWE	LC
Water Mosaic Plant	*Ludwigia sedioides* (Humb. & Bonpl.) H.Hara	Onagraceae	WSC	New
Baranukha	*Monochoria hastata* (L.) Solms	Pontederiaceae	RE	LC
Chuto Nukha	*Monochoria vaginalis* (Burm. f.) Presl	Pontederiaceae	RE	LC
Paddo, Komol	*Nelumbo nucifera* Gaertn.	Nelumbonaceae	RF	LC
Water Mimosa	*Neptunia oleracea* Lour.	Leguminosae	WSC	NE
Sarnokomol	*Nuphar lutea* (L.) Sm.	Nymphaeaceae	RF	NE
Shapla (White)	*Nymphaea alba* L.	Nymphaeaceae	RF	NE
Shapla (Yellow)	*Nymphaea amazonum* Mart. & Zucc.	Nymphaeaceae	RF	CD
Shapla (Cape-Blue)	*Nymphaea capensis* Thunb.	Nymphaeaceae	RF	CD
Shapla (Nil)	*Nymphaea nouchali* Burm. f.	Nymphaeaceae	RF	LC
Shapla, Shaluk	*Nymphaea pubescens* Roxb. Ex Andr.	Nymphaeaceae	RF	LC
Shapla Red	*Nymphaea rubra* Willd.	Nymphaeaceae	RF	LC

Cont...

Table 1. List of aquatic plant spices with common names, scientific names, families, habitats, and conservation status

Common name	Scientific name	Family	Habitat	CS
White Snowflake	*Nymphoides hydrophylla* (Lour.) Kuntze	Menyanthaceae	RF	DD
Panchuli	*Nymphoides indica* (L.) Kuntze	Menyanthaceae	RF	LC
Holud Panchuli	*Nymphoides peltata* (S.G. Gmel.) Kuntze	Menyanthaceae	RF	New
Panikola	*Ottelia alismoides* (L.) Pers.	Hydrocharitaceae	RS	LC
Amrul	*Oxalis corniculata* Linn.	Oxalidaceae	NWE	LC
Bishkatali	*Persicaria hydropiper* (L.) Spach	Polygonaceae	NWE	LC
Chinese Money Plant	*Pilea peperomioides* Diels	Urticaceae	NWE	LC
Topapana	*Pistia stratiotes* L.	Araceae	FF	LC
Pickerel Weed	*Pontederia cordata* L.	Pontederiaceae		
Curly Pondweed	*Potamogeton crispus* L.	Potamogetonaceae	RS	LC
Floating Pondweed	*Potamogeton natans* L	Potamogetonaceae	SF	Rare
Swamp Potato	*Sagittaria guayanensis* Kunth	Alismataceae	RF	LC
Broadleaf Arrowhead	*Sagittaria latifolia* Willd.	Alismataceae	RE	Rare
Giant Arrowhead	*Sagittaria montevidensis* Cham. & Schltdl.	Alismataceae	RE	New
Muyamuya	*Sagittaria sagittifolia* L.	Alismataceae	RE	LC
Indurkani	*Salvania cucullata* Rexlo	Salviniaceae	FF	LC
Giant Salvania	*Salvania molesta* D.Mitch.	Salviniaceae	FF	LC
Hardy Water Canna	*Thalia dealbata* Fraser ex Roscoe	Marantaceae	RE	New
Red Stemmed Thalia	*Thalia geniculata* f. rheumoides	Marantaceae	RE	New
Kantasingra	*Trapa incisa* Siebold& Zucc.	Lythraceae	FF	LC
Water Chestnut	*Trapa natans* L.	Lythraceae	FF	Rare
Paniphal/Singra	*Trapa natans* var. *bispinosa* (Roxb.) Makino	Lythraceae	FF	LC
Hogla	*Typha domingensis* Pers.	Typhaceae	NWE	LC
Pata Zajhi	*Utricularia flexuosa* Vahl.	Lentibulariaceae	rs	LC
Patseola	*Vallisneria spiralis* L.	Hydrocharitaceae	RS	LC
Amazon Lily	*Victoria amazonica* (Poeppig) Sowerby	Nymphaeaceae	RF	NE
Shujipana	*Wolffia arrhiza* (L.) Horkel ex Wimmer	Lemnaceae	FF	LC

Habitat: RE- Rooted Emergent; RF- Rooted Floating; FF- Free-Floating; NWE- Near The Water Edge; RS- Rooted Submerged; Rs- Rootless Submerged; WSC- Water Surface Creeper; SF- Submerged And Floating. Conservation Status (CS): CD= Conservation Dependent, DD= Data Deficient, LC= Least Concerned, NE= Not Evaluated, NT= Near Threatened, VU= Vulnerable

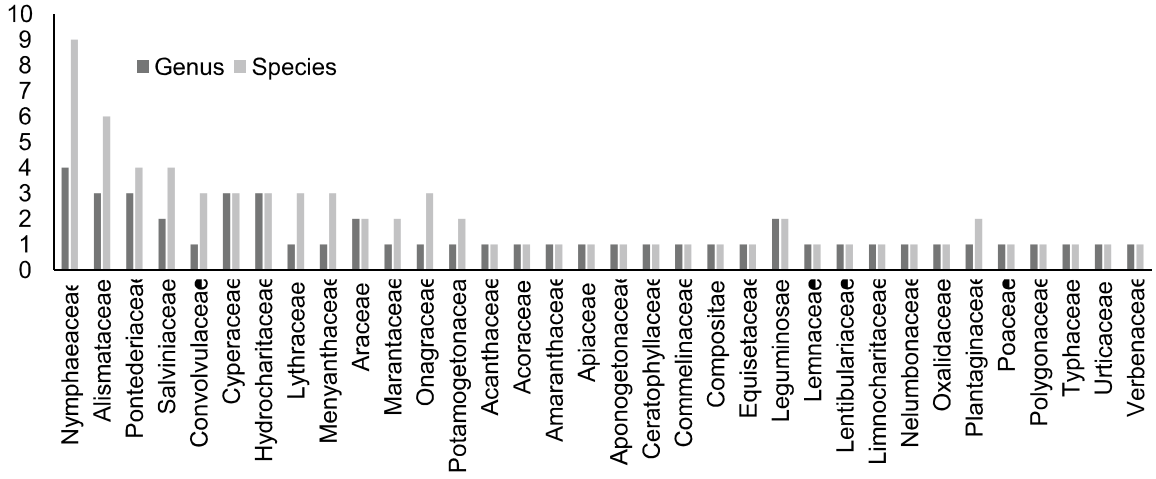

Fig. 1. Genus and species wise distribution of aquatic plant families

food of human beings e.g. Panifol, Panikola, Bet, Makna, and Poddo. Some of them are used as fruit either raw or after some processing. Azolla, shujipana, and kutipana are used for duckweed and fish food. Kachuripana, Topapana, Indurkani, and Giant salvania are very much useful as green manure and as mulch to conserve soil moisture and control weeds in crop fields (Tyagi and Agardwal 2014). Nonetheless, some of these plants pose a threat to aquatic ecosystems, as their rapid multiplication frequently clogs waterways, creates barriers for navigation, and kills fish by deoxygenating the water (e.g., Water Hyacinth, Duckweed, etc). Others transmit Cholera, Shigellosis, and other infections from one location to another. Pani Kolmi, Helencha, Maloncha, Keshordam, Water mimosa, and Lettuce pana are used both as vegetables and medicines for diabetes, stomach pain, and dysentery (Uddin et al 2014, Shethi and Uddin 2018). There is still a good number of aquatic plants untapped for any category of known uses.

Conservation status: The conservation status of the 70 aquatic plants in the water garden of BAUBG was assessed (Table 1 and Fig. 4). The most notable points arising from this study are a large number of species 47 (67.14%) assessed as least concern (LC) and 5.71% (1 Near Threatened, 2 Conservation dependent, and 1 Vulnerable) taxa assigned to a threatened category. Six (8.57%) species such as Equisetum hyemale, *Thalia dealbata* and *T. geniculata* (water canna), *Sagitaria montevidensis* (Giant arrowhead), *Ludwigia sedioides* and *Nymphoides peltata* (Halde Panchulimala) were found as new for the aquatic angiosperms of Bangladesh. Probably these are exotic species though they are very much naturalized to our aquatic environment. They are very much attractive for the water garden. Seven species (10%) were categorized as rare species as they are not frequently found in the natural wetlands. Conservation measures should be taken to save from the more threatened category. Five species (7.14%) were assessed as not evaluated category. White Snowflake has been assessed as Data Deficient because of this lack of information on threats or distribution. There is not enough information to assess whether they are threatened or not, and they are considered Data Deficient.

In BAUBG, some species can withstand waterlogged condition**s** but are not included in the list of aquatic plants. *Barringtonia acutangula* (Hizol), *Barringtonia asiatica* (L.) Kurz (Fish poison tree), *Calamus guruva* (Jalibet), *Crataeva nurvala* (Barun), *Cynometra ramiflora* L. (Singra), *Heritiera fomes* Buch.-Ham.(Sundori) *Nypa fruticans* Wurmb (Golpata), *Pongamia pinnata* (Karoj), *Trewia nudiflora* (Pidali), *Salix tetrasperma* Roxb.(Panijama), *Sonneratia caseolaris* (L.) Engl (Choila), and *Syzygium fruticossum* (Bhutijam) are the best example of such species. These species are thriving in proximity to and within water bodies.

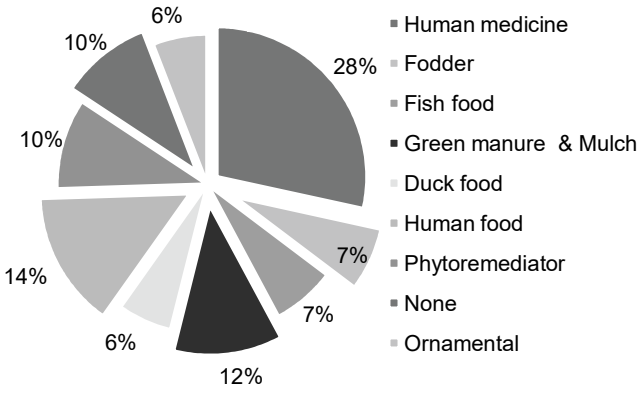

Fig. 3. Potential use wise distribution of aquatic plant species

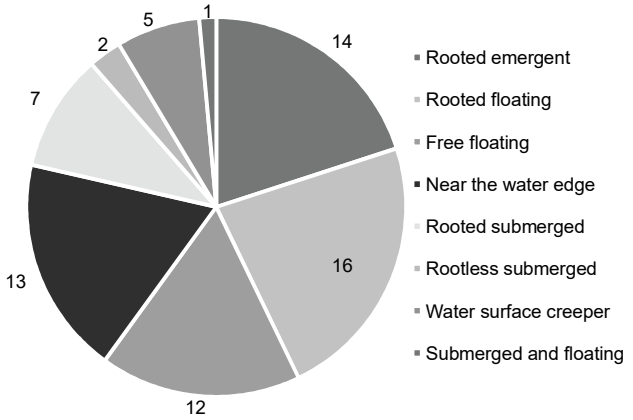

Fig. 2. Habitat-wise distribution of aquatic plant species

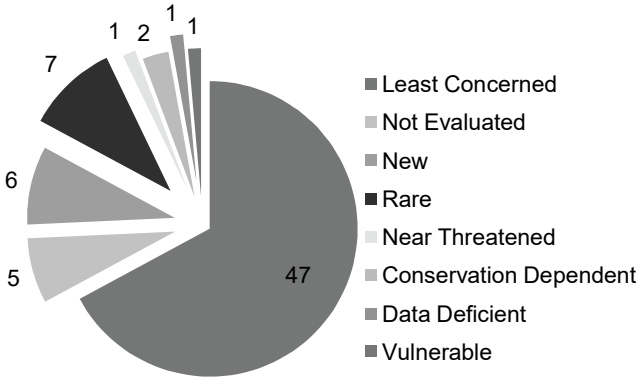

Fig. 4. Conservation status of aquatic plant species

Fig. 5. A. *Hydrocleys nymphoides* B. *Hygrophila auriculata* C. *Ipomoea pes-caprae* D. *Limnocharis flava* E. *Ludwigia adscendens* F. *Ludwigia sedioides* G. *Monochoria hastata* H. *Monochoria vaginalis* I. *Neptunia oleracea* J. *Nuphar lutea* K. *Nymphaea amazonum* L. *Nymphaea capensis*

Fig. 6. A. *Nymphoides indica* B. *Nymphoides peltata* C. *Ottelia alismoides* D. *Pontederia cordata* E. *Sagittaria guayanensis* F. *Sagittaria montevidensis* G. *Sagittaria sagittifolia* H. *Salvania cucullata* I. *Salvania molesta* J. *Thalia geniculata* K. *Trapa incisa* L. *Trapa natans*

Table 2. List of plants along with their scientific name, potential use(s), references(s)

Scientific name	Potential uses
Acorus calamus	Neurological, gastrointestinal, respiratory, metabolic, kidney, and liver disorders (Ranjan et al 2016; Sharma et al 2020).
Actinoscirpus grossus	Fodder (Uddin and Paul 2020), anti-diarrheal, anti-emetic, and liver tonic (Ganapathi et al 2017)
Aeschynomene indica	Hepatitis, enteritis, dysentery, nyctalopia, conjunctivitis, urticaria, and furuncle (Lei et al 2019)
Alternanthera philoxeroides	Vegetables; measles, influenza, and hemorrhagic fever (Nahar et al 2022)
Apanogeton natans	None
Azolla filiculiodes	Fish food, duck food, green manure (Dhawan et al 2010)
Azolla pinnata	Green manure in the rice fields (Jone et al 2022); fodder and duck food (Niroula and Singh 2011)
Centella asiatica	Human medicine, food, veterinary medicine (Dongol 2002), Fodder (Shrestha 1996)
Ceratophyllum demersum	Human medicine (Sarmah et al 2013); fish food (Joshi and Joshi 2007); duck food, green manure (Misra et al 2012)
Cyperus alternifolius	Forage, ornamental, human medicine
Echinodorus palifolius	None
Eichhornia crassipes	Manure and fodder, remediation of water pollution (De Laet et al 2019)
Eleocharis dulcis	None
Enhydra fluctuans	Inflammation, skin diseases, laxatives, bronchitis, nervous affection, leucoderma, biliousness, and smallpox. (Ali et al 2013)
Equisetum hyemale	Kidney pain, Urination
Euryale ferox	Raw or roasted seeds are both edible. The seed flour is nutritious and simple to digest
Floscopa scandens	Leaf paste is used for the treatment of bone fracture, and poisonous stings (Biswas et al 2010)
Hydrilla verticillata	Fish food, duck food; fodder; green manure
Hydrocleys nymphoides	None
Hygrophila auriculata	Human medicine (Niroula and Singh 2011); food (Misra et al 2012)
Hygroryza aristata	Fodder (Misra et al 2012)
Ipomoea aquatica	Human medicine (Niroula and Singh 2011); food (Sarmah et al 2013), fish food; duck food
Ipomoea carnea	Wound healing, anti-inflammatory, anti-fungal, hepatoprotective, anti-diabetic, antimicrobial, cardiovascular, anti-oxidant, immunomodulatory, and anti-cancer properties (Fatima et al 2014, Bhalerao and Teli 2016).
Ipomoea pes-caprae	Inflammation, gastrointestinal disorders, pain, and hypertension (Bragadeeswaran et al 2010, Akinniyi et al 2022).
Lemna minor	Fish food; duck food; green manure. Traditional uses included antipruritic, antiscorbutic, astringent, depurative, diuretic, febrifuge, and soporific. It was also used to treat colds, measles, oedema, and urinary incontinence (Al-Snafi 2019).
Limnocharis flava	Vegetables; feed for swine, cattle, and fish; green manure (Man 2022).
Limnophila heterophylla	None
Limnophila sessiliflora	None
Lippia alba	Antimalarial, spasmolytic, sedative, hypotensive, and anti-inflammatory; used to treat stomachic, nervine, gastrointestinal, and respiratory ailments, as well as a seasoning (Pascuala et al 2001)
Ludwigia adscendens	Vegetables; treat dysentery (Uddin and Paul 2020)
Ludwigia octavalvis	Oedema, nephritis, hypotension, and diabetes (Lin et al 2017)
Ludwigia sedioides	Ornamental, Edible
Monochoria hastata	Human medicine (Niroula and Singh 2011)
Monochoria vaginalis	Human medicine (Niroula and Singh 2011)
Nelumbo nucifera	Human medicine (Sarmah et al 2013); food (Misra et al 2012)
Neptunia oleracea	Food, human medicine, and green manure (Sagolshemcha and Singh 2017)
Nuphar lutea	Dysentery, gonorrhoea, and leucorrhoea. The leaves and roots have been applied to boils and inflamed skin as a poultice, while an infusion has been used as a gargle for oral and pharyngeal ulcers. (Kaur and Mukhtar 2016)
Nymphaea alba	Food
Nymphaea amazonum	Ornamental

Cont...

Table 2. List of plants along with their scientific name, potential use(s), references(s)

Scientific name	Potential uses
Nymphaea capensis	Food, Ornamental
Nymphaea nouchali	Food, Ornamental
Nymphaea pubescens	Food (Misra et al 2012)
Nymphaea rubra	Ornamental
Nymphoides hydrophylla	Leaves treat fever, jaundice, and snake/insect bite, powered seed is used for worm infestation,
Nymphoides indica	Human medicine (Sarmah et al 2013); food (Misra et al 2012, Niroula and Singh 2011), fodder
Nymphoides peltata	None
Ottelia alismoides	Fruit, Vegetable
Oxalis corniculata	Alternative vegetables; anti-cancer, anti-ulcer, anti-inflammatory, anti-fungal, anti-amoebic, and anti-microbial (Mukherjee 2019).
Persicaria hydropiper	Leaf juice for menstruation pain, leaf paste to halt bleeding, and leaf paste with black pepper for headaches; the entire plant as a pesticide for stored grains (Rahmatullah et al 2009).
Pilea peperomioides	Ornamental
Pistia stratiotes	Mulch, Human medicine (Sarmah et al 2013); duck food, green manure (Niroula and Singh 2011)
Potamogeton crispus	None
Potamogeton natans	None
Pontederia cordata	Ornamental
Sagittaria guayanensis	A good oxygenator of water (Rahman et al 2007)
Sagittaria latifolia	A good oxygenator of water (Rahman et al 2007)
Sagittaria montevidensis	A good oxygenator of water (Rahman et al 2007)
Sagittaria sagittifolia	A good oxygenator of water (Rahman et al 2007)
Salvania cucullata	Efficient phytoremediators in the treatment of industrial wastewater (Alam and Hoque 2017), Mulch
Salvania molesta	Mulch, considered for the bioremediation of polluted and contaminated water
Thalia dealbata	Ornamental. Insecticide or insect repellant. Absorbs excess nutrients of nitrogen and phosphorous.
Thalia geniculata	Ornamental. Insecticide or insect repellant. Absorbs excess nutrients of nitrogen and phosphorous.
Trapa incisa	Human medicine (Mohammad et al 2011), food
Trapa natans	Human medicine (Mohammad et al 2011), food
T. natans var. bispinosa	Human medicine (Mohammad et al 2011), food
Typha domingensis	To make mat, fence, and roof thatch, and to cover the pile of fish in a box that keeps them fresh. Root holds soil.
Utricularia flexuosa	None
Vallisneria spiralis	Fish food, a good oxygenator of water (Sambamurty 2005).
Victoria amazonica	Ornamental
Wolffia arrhiza	Fish Food

CONCLUSION

The study led to the conclusion that the water garden of BAUBG is enriched with diverse aquatic plant species while most of them are severely threatened in their original/native wetland habitats. In addition to the native species, some new species are being conserved in the garden. Rare, endangered, vulnerable, and new species should be multiplied and reintroduced to the wetlands of the country because of their importance in food, medicine, and livelihood development of rural peoples. Therefore, there is a need for continued research and development to identify and characterize novel bioactive compounds from aquatic plants and explore their potential applications in the pharmaceutical industry. In collaboration with government and/or non-government organizations, educating and motivating the common people about the significance of aquatic plants and their habitats (wetlands) is an effective method for conserving natural wetland habitats and enhancing native aquatic species for the sustainability of wetland ecosystems.

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