

Contribution to floral diversity of Vikramshila Wildlife Sanctuary, Bhagalpur, Bihar

Akanksha Raman¹, H.K. Chourasia^{1*} & Gopal Krishna²

¹University Department of Botany, TMBU, Bhagalpur, Bihar, India

²Botanical Survey of India, CGO Complex, Sector I, Salt Lake City, Kolkata, West Bengal, India

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ABSTRACT

The present article represents the first comprehensive documentation of the floral diversity of the Vikramshila Gangetic Dolphin Sanctuary (VGDS). Based on extensive field surveys and documentation, a total of 93 taxa belonging to 84 genera and 40 families have been enumerated. Among these, 80 species belonging to 36 families and 71 genera are dicotyledons, whereas 13 species belonging to 4 families and 13 genera are monocotyledons. The study provides baseline information on the floristic composition of this unique protected area. Also, we have provided field photographs of some of the selected species for easy identification in the field. The major threats affecting the vegetation of this only aquatic Wildlife Sanctuary include recurrent flooding, habitat degradation, and anthropogenic disturbances, which pose significant challenges to the conservation of its floral diversity.

Key Words - Silk City, National Aquatic Animal, Conservation, Documentation

***Corresponding author** : hkchourasia96@gmail.com

INTRODUCTION

The Vikramshila Gangetic Dolphin Sanctuary (VGDS hereafter) has been notified for the protection and conservation of Gangetic dolphin in the 50 km stretch of the Ganga River from Sultanganj (Ajgaibinath Temple) to Kahalgaon (three hillocks in the middle of the River Ganges) in the year 1991 of the Forest Department, Government of Bihar under the provisions of Wildlife (Protection), Act 1972 (Fig. 1). The sanctuary lies between latitude 25°10'N 25°25'N 86°30'E 87°15'E in Bhagalpur district of Bihar, India. However, being a riverine habitat, its boundary and expanse keep on changing due to changing geomorphology of the Ganga. The sanctuary has been named after the famous archaeological remains of Vikramshila University that was once a famous centre of Buddhist learning across the world, along with Nalanda during the

Pala dynasty. The Vikramshila Gangetic Dolphin Sanctuary comprising a small segment of Ganga River flowing west to east, is located between Sultanganj in the western end and Kahalgaon in the east end. The river landscape comprising the sanctuary is situated within the Bhagalpur district with its banks with 10 of its 16 Blocks namely Sultanganj, Narayanpur, Nathnagar, Kharik, Jagdishpur, Ismailpur, Sabour, Kahalgaon, Gopalpur, Pirpanti, Sanhaula, Sahkund, Bihpur, Naugachia, Gauradih, and Rangra chowk (Sharma, 1995).

River bank vegetation is ecologically termed as riparian flora, and is highly dynamic. It links terrestrial and aquatic habitat, under the influence of waterways such as rivulet banks or riverbanks, is represented by a particular type of vegetation that grows along the sides of rivers, which are

called the river's riparian zone (Dutta *et al.*, 2011). In VGDS along the both sides of the river bank most of the herbaceous followed by shrubby plants are found. Some of the places trees are present which shows it has been planted for the purpose of stop the soil erosion.

The present work has been undertaken to evaluate the Floral Diversity of the sanctuary which has never

been done despite it has National significance. The possible reason might be, there is no such as fully developed forest ecosystem and dynamics nature of shape and size of the sanctuary. First author (AR) has put her best effort to document the floral wealth and also documented the economic, cultural and other importance of the species growing along with this sanctuary.

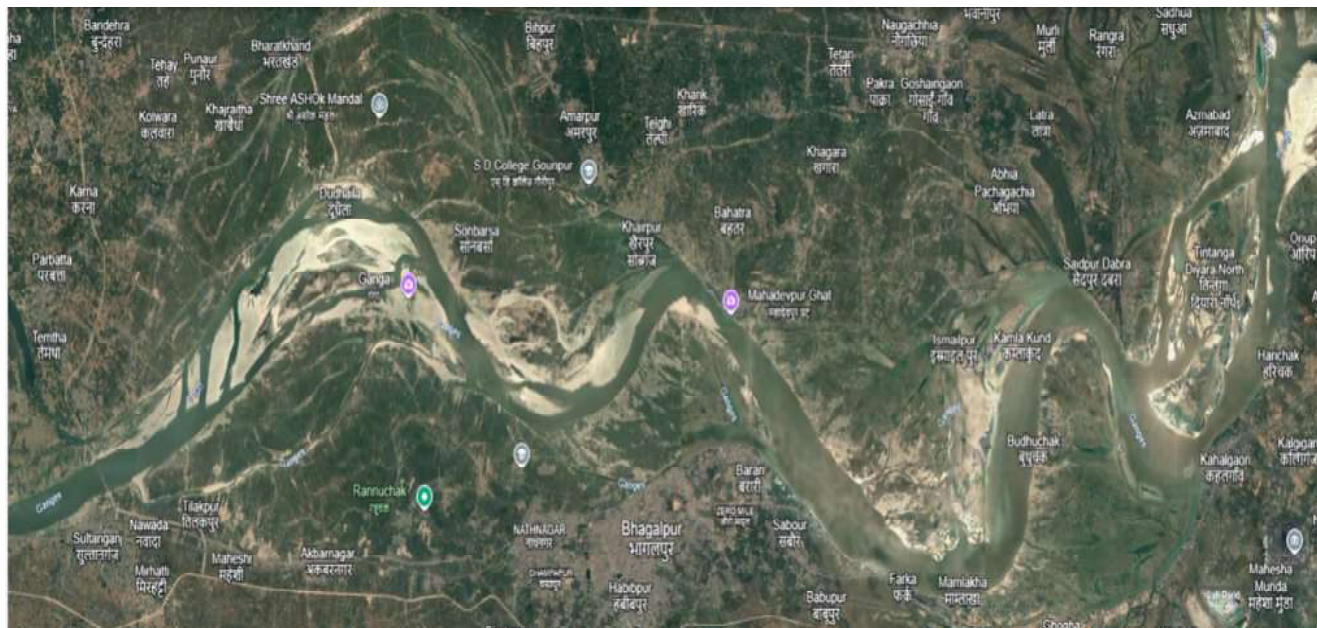


Fig. 1: Satellite map of Vikramshila WLS, Bhagalpur showing their course from Sultanganj to Kahalgaoon (source: Google Earth)

MATERIAL AND METHODOLOGY

For documentation of floristic account of the Vikramshila Gangetic Dolphin Sanctuary (VGDS) of different vegetation types and seasonal variations, with average time of 7-10 days, during pre-monsoon (March-April), post-monsoon (October-November) and during monsoon (June-August) seasons has been taken and specimens collected were collected in triplicate for each species. The field trips were arranged so as to cover all the three topographical zone viz. Ganga, and vast fields West and East of the city. The data recorded includes field numbers, locality, habit and habitat, associations and frequency (by visual estimation) as well as colour of flowers and fruits, scent, local name and uses and other features which could not be studied from the preserved specimens. Specimen were processed following Jain & Rao

(1977). The collected specimens were identified with help available literature viz. Varma 1981, Haines (1921-1925). First author (AR) also collected data on its uses based upon the semi-structural interview from local people follow the Jain (1987). All identified specimens are deposited to Bhagalpur University Herbarium (BHAG). All names are updated and current and accepted names are followed by POWO, 2026.

ENUMERATION

As a result, the preliminary study reported 94 plant species in total. The list includes their current and accepted Botanical names along with their family name, common names (if any), habit, uses, and voucher numbers along with locality. The species names are arranged alphabetically in Table 1. Fig. 1, 2, 3, 4, 5.

Sl.no.	Name of the species	Family	Local name	Habit	Uses	Locality and Voucher no.
1.	<i>Abutilon indicum</i> (L.) Sweet	Malvaceae		Under-shrub	Fever, Leukorrhea, Rheumatism & mumps, Urinary issues, Heal wounds	Barari AR01
2.	<i>Acmella paniculata</i> (Wall. ex DC.) R.K.Jansen	Asteraceae			Antianalgesic Anti-inflammatory	Oriup Kahalgaon AR02
3.	<i>Argemone mexicana</i> L.	Papaveraceae			Used as adulterant of Mustard seeds	Barari AR06
4.	<i>Amaranthus viridis</i> L.	Amaranthaceae			Used as leafy green vegetable	Baria AR08
5.	<i>Ammannia baccifera</i> L.	Lythraceae			Not known	Oriup Kahalgaon AR12
6.	<i>Lysimachia loeflingii</i> F.J.Jiménez & M.Talavera	Primulaceae	Blue scarlet	Herb	Not known	Barari AR17
7.	<i>Artemisia japonica</i> Thunb.	Asteraceae	Japanese worm wood	Herb	Treat skin disease; Fever issue	Rattipur AR03
8.	<i>Avena fatua</i> L.	Poaceae	Wild oat	Herb	Seeds are used for making flour.	Baria AR11
9.	<i>Alangium salviifolium</i> (L.f.) Wangerin	Cornaceae	Dhera	Medium size tree	Rheumatism Skin diseases (leprosy, scabies) Diarrhoea	Oriup Kahalgaon AR04
10.	<i>Biophytum sensitivum</i> (L.) DC.	Oxalidaceae	Lakshman, Lajjalu	Herb	Treatment of wounds; Stomach-aches	Parbatta AR20
11.	<i>Centella asiatica</i> (L.) Urb.	Apiaceae		Herb	As leafy vegetable	Baria AR07
12.	<i>Cardiospermum halicacabum</i> L.	Sapindaceae	Kapalphodi, Kanphuti, Chirputa	Herb	Treatment of joint pains	Rattipur AR05
13.	<i>Catharanthus roseus</i> (L.) G. Don	Apocynaceae	Sadababar, Nayantara	Herb	Diabetes, High blood Pressure; also used as pot herbs	Parbatta AR21
14.	<i>Cannabis sativa</i> L.	Cannabaceae	Bhang, Ganja, Charas	Herb	Chronic pain, Asthma, Epilepsy, Glaucoma, Insomnia	Parbatta AR09
15.	<i>Calotropis gigantea</i> (L.) W.T. Aiton	Apocynaceae	Aak, Akwan	Shrub to medium size tree	Latex is used in cut; Skin disease; fruit yields cotton used in making pillow	Barari AR14
16.	<i>Chrozophora rottleri</i> (Geiseler) Spreng.	Euphorbiaceae	Suryavart	Herb	Skin infections, Wound healing	Baria AR18
17.	<i>Cirsium arvense</i> (L.) Scop.	Asteraceae	Kandai, Leh	Herb	Haemorrhages, Tuberculosis, Toothaches	Barari AR10
18.	<i>Clerodendrum cordatum</i> L.	Lamiaceae	Bhant	Shrub	Constipation, Intestinal worms	Barari AR27
19.	<i>Croton bonplandianus</i> Baill.	Euphorbiaceae	Ban Tulsi	Herb	Treat jaundice swelling Malaria and rheumatism	Oriup Kahalgaon AR34
20.	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Doob durva	Herb	Control soil erosion, forage for livestock	Oriup Kahalgaon AR13
21.	<i>Cyperus rotundus</i> L.	Cyperaceae	Motha	Herb	Tubers are aromatic, used in treat menstrual, irregularities.	Barari AR15
22.	<i>Cyperus michelianus</i> (L.) Delile	Cyperaceae	Flat sedge	Herb	Not known	Rasidpur AR43
23.	<i>Cucumis melo</i> L.	Cucurbitaceae	Gurmi	Herb	Raw used as vegetable	Jagatpur AR53
24.	<i>Datura innoxia</i> Mill.	Solanaceae	Dhatura	Herb	Treat asthma, Cough, Skin infection, Pain insomnia	Sabour AR28
25.	<i>Digera muricata</i> (L.) Mart.	Amaranthaceae	Lehsua, Chanchali	Herb	Cooling mild astringent and laxative properties	Baria AR21
26.	<i>Didiplera paniculata</i> (Forssk.) I.Darbysh.	Acanthaceae	Kakjangha	Herb	Traditional folk and pain, fever, pain relief, wound care	Bateshwar kahalgaon AR62
27.	<i>Dentella repens</i> (L.) J.R.Forst. & G.Forst.	Rubiaceae		Herb	Treat skin infection (eczema), constipation and diarrhea	Bateshwar Kahalgaon AR35
28.	<i>Echinochloa colona</i> subsp. <i>edulis</i> (Honda) Banfi & Galasso	Poaceae	Sawa	Herb	Fodder for livestock	Barari AR29

29.	<i>Eclipta prostrata</i> (L.) L.	Asteraceae	Bhringaraj	Herb	Promote hair, Growth, treat, skin, useful in Jaundice.	Rattipur AR72
30.	<i>Echinochloa colona</i> (L.) Link	Poaceae	Jungle rice	Herb	Fodder for livestock	Rattipur AR22
31.	<i>Euphorbia hypericifolia</i> L.	Euphorbiaceae	Chhoti Dudhi	Herb	Anti-inflammatory properties	Rattipur AR19
32.	<i>Euphorbia heterophylla</i> L.	Euphorbiaceae		Herb	Treat skin infection	Rattipur AR16
33.	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Dudhi	Herb	Diarrhoea, Digestive problem, Dengue fever	Oriup Kahalgaon AR34
34.	<i>Evolvulus nummularius</i> (L.) L.	Convolvulaceae	Morning glory	Herb	Anthelmintic	Parbatta AR23
35.	<i>Fimbristylis bisumbellata</i> (Forssk.) Bubani	Cyperaceae		Herb	Anti-diarrheal properties	Sultanganj AR30
36.	<i>Ipomoea aquatica</i> Forssk.	Convolvulaceae	Water spinach	Herb	Treat diabetes, Constipation, Liver malfunction and piles	Sabour AR41
37.	<i>Justicia diffusa</i> Wild.	Acanthaceae		Herb	Anti-inflammatory, diuretic and anti-spasmodic	Mirzapur AR37
38.	<i>Glycosmis pentaphylla</i> (Retz.) DC.	Rutaceae	Ban Nimbu	Shrub	The small, pinkish-orange berries are edible and have a unique flavor.	Rattipur AR24
39.	<i>Grangea maderaspatana</i> (L.) Desf.	Asteraceae	Madras Carpet	Herb	Treat rheumatism, respiratory issues and menstrual cramp.	Mirzapur AR87
40.	<i>Heliotropium indicum</i> L.	Boraginaceae	Hathisundh, Siriari	Herb	Anti-inflammatory, anti-bacterial and wound healing	Dildarpur AR92
41.	<i>Launaea acaulis</i> (Roxb.) Babc. ex Kerr	Asteraceae		Herb	Diuretic, anti-inflammatory and hepatoprotective	Oriup Kahalgaon AR35
42.	<i>Dinebra chinensis</i> (L.) P.M. Peterson & N. Snow	Poaceae		Herb	Antitumor, Quite, Oesophageal cancer, lymphocytukemia	Mirzapur AR94
43.	<i>Dinebra panicea</i> (Retz.) P.M.Peterson & N.Snow	Poaceae	Chinise sprangle top	Herb	Used as fodder	Rattipur AR51
44.	<i>Melilotus albus</i> Medik.	Fabaceae		Herb	Anti-inflammatory, Anticoagulant and sedative properties	Barari AR81
45.	<i>Lindenbergia indica</i> (L.) Vatke	Orobanchaceae		Herb	Used in cuts and wound.	Rasidpur AR68
46.	<i>Lippia alba</i> (Mill.) N.E.Br. ex Britton & P.Wilson	Verbenaceae		Herb	Grows as weed	Baria AR25
47.	<i>Martynia annua</i> L.	Pedaliaceae	Hathjori, Ulaanta, Bagnakh	Herb	Roots, leaves, and seeds are widely utilized in traditional medicine	Dildarpur AR69
48.	<i>Melochia corchorifolia</i> L.	Malvaceae		Sub-shrub	a fibrous resource for weaving and construct	Jagatpur AR31
49.	<i>Momordica charantia</i> L.	Cucurbitaceae	Karela	Climbing or scrambling	Used as vegetable. Also control sugar level.	Oriup Kahalgaon AR57
50.	<i>Bergera koenigii</i> L.	Rutaceae	Meeta Neem, curry Patta	Shrubs/ medium size tree	Leaves used in making curry; Seeds are said to be useful in diabetes.	Sultanganj AR89
51.	<i>Murraya paniculata</i> (L.) Jack	Rutaceae	Madhu-kamini	Shrub, small tree	Uses as hedge plant; flowers are fragrant	Mirzapur AR40
52.	<i>Nicotiana plumbaginifolia</i> Viv.	Solanaceae	Jangli khaini	Herb	Treating cuts, wounds, Toothaches,	Dildarpur AR90
53.	<i>Nelumbo nucifera</i> Gaertn.	Nelumbonaceae	Kamal	Aquatic perennial	Flowers are offered for worship	Parbatta AR46
54.	<i>Nymphoides hydrophyllum</i> (Lour.) Kuntze	Menyanthaceae		Floating herb	Not known	Barari AR56
55.	<i>Ocimum tenuiflorum</i> L.	Lamiaceae	Tulsi	Herb	Cold and cough	Parbatta AR33
56.	<i>Oxypetalum turpethum</i> (L.) Silva Manso	Convolvulaceae		Herb	Grows as weed	Jagatpur AR32
57.	<i>Oxalis corniculata</i> L.	Oxalidaceae		Herb	Acts as an appetizer, astringent, and liver stimulant.	Rasidpur AR47

58.	<i>Panicum maximum</i> Jacq.	Poaceae		Herb	Diuretic and laxative, treat heartburn	Bateshwar Kahalgaon AR36
59.	<i>Passiflora foetida</i> L.	Passifloraceae		Herb	Treat anxiety, Insomnia Skin infection, Digestive issue diarrhea	Bateshwar Kahalgaon AR40
60.	<i>Leptopetalum biflorum</i> (L.) Neupane & N.wikstr	Rubiaceae	Parpataka		Grows as weed	Jagatpur AR91
61.	<i>Phyllanthus reticulatus</i> Poir.	Euphorbiaceae		Shrub	Treat Anemia, Diabetes Diarrhea	Sabour AR38
62.	<i>Persicaria glabra</i> (Willd.) M.Gómez	Polygonaceae			Treat fever, colic pain inflammatory diarrhea and skin infections	Oriup Kahalgaon AR50
63.	<i>Phyla nodiflora</i> (L.) Greene	Verbenaceae		Herb	As fodder for cattle. It is said it keep colon healthy	Rasidpur AR42
64.	<i>Panicum miliaceum</i> L.	Poaceae		Herb	Seeds are edible.	Dildarpur AR55
65.	<i>Parthenium hysterophorus</i> L.	Asteraceae	Gajar Ghas	Herb	Grows as weed. The leaves cause irritation on skin.	Rasidpur AR44
66.	<i>Physalis minima</i> L.	Solanaceae	Tulatipati, Avagutha	Herb	Anti inflammatory, anti microbial and antioxidant	Dildarpur AR65
67.	<i>Pleurolobus gangeticus</i> (L.) J.St.-Hil. ex H.Ohashi & K.Ohashi	Fabaceae	Salparni, Sarivan	Herb	Respiratory, gastrointestinal and urinary disorder, soil improvement and weed control	Barari AR26
68.	<i>Polygonum barbatum</i> L.	Polygonaceae	Bekhanjabaj	Herb	Traditional and modern medicine	Sabour AR48
69.	<i>Polygonum plebeium</i> R.Br.	Polygonaceae	Common knotweed	Herb	Anti-inflammatory antioxidant and digestive	Dildarpur AR93
70.	<i>Pontederia crassipes</i> Mart.	Pontederiaceae	Kumbhi	Herb	Used in fishing	Dildarpur AR83
71.	<i>Pouzolzia zeylanica</i> (L.) Benn.	Urticaceae		Herb	Treat skin Infection Fever, dysentery indigestion	Rasidpur AR49
72.	<i>Peperomia pellucida</i> (L.) Kunth	Piperaceae	Poori patta, Luchipata, Varshabhoo	Herb	Not known	Baria AR88
73.	<i>Phyllanthus virgatus</i> G.Forst.	Phyllanthaceae	Bhuiamla	Herb	often used in local folk medicine for liver issues	Oriup Kahalgaon AR70
74.	<i>Phyllanthus urinaria</i> L.	Phyllanthaceae	Bhuiamla	Herb	Supporting liver health, urinary and kidney stone, antiinflammatory	Parbatta AR78
75.	<i>Portulaca oleracea</i> L.	Portulacaceae		Herb	Used as leafy green	Bateshwar Kahalgaon AR80
76.	<i>Polygonum plebeium</i> R.Br.	Polygonaceae	Mumiara	Herb	Dietary staple, traditional folk	Dildarpur AR85
77.	<i>Rumex dentatus</i> L.	polygonaceae	Toothed dock	Herb	Digestive disorder, Skin infection (eczema, dermatitis) and pain	Jagatpur AR90
78.	<i>Saccharum spontaneum</i> L.	Poaceae	Kans	Perennial herb	ecological soil binding, traditional Ayurvedic medicine, and rural handicraft production	Barari AR22
79.	<i>Solanum diphyllum</i> L.	Solanaceae	Pili makoe, Two leaf nightshade	Shrub	Grows as weed.	Rasidpur AR59
80.	<i>Solanum lycopersicum</i> L.	Solanaceae	Tomato	Herb	Used as vegetable	Dildarpur AR89
81.	<i>Solanum sisymbirifolium</i> Lam.	Solanaceae	Litchi tomato	Herb	Grow as weed.	Barari AR64
82.	<i>Solanum virginianum</i> L.	Solanaceae	Kantkari	Herb	Not known	Sultanganj AR76
83.	<i>Sonchus oleraceus</i> L.	Asteraceae		Herb	Traditional medicine	Sultanganj AR60
84.	<i>Sesamum indicum</i> L.	Pedaliaceae	Til	Herb	Seeds are edible and yields oil	Mirzapur AR39
85.	<i>Sesbania bispinosa</i> (Jacq.) W.Wight	Fabaceae	Dhaincha	Shrub	Adaptability to poor, water logged and saline soils	Rattipur AR54
86.	<i>Senna occidentalis</i> (L.) Link	Fabaceae		Shrub	Laxative, diuretic anti-inflammatory	Dildarpur AR86
87.	<i>Tridax procumbens</i> L.	Asteraceae	Ghamra, Jayanti veda	Herb	Wound healing	Rattipur AR63

88.	<i>Trianthema portulacastrum</i> L.	Aizoaceae		Herb	Not known	Sultanganj AR71
89.	<i>Triumfetta rhomboidea</i> Jacq.	Malvaceae		Herb	Fiber yielding plants	Jagatpur AR93
90.	<i>Torenia crustacea</i> (L.) Cham. & Schltdl.	Linderiaceae		Herb	Food and emergent medical research	Parbatta AR75
91.	<i>Typha angustifolia</i> L.	Typhaceae	Cattail	Herbaceous	The leaves and stems can be woven into mats	Rasidpur AR67
92.	<i>Vicia lens</i> (L.) Coss. & Germ.	Fabaceae	Masoor Dal	Herb	Used as dal, livestock fodder, soil-enriching green manure	Oriup Kahalgaon AR84
93.	<i>Utricularia aurea</i> Lour.	Lentibulariaceae		Free floating submerged	Not known	Jagatpur AR92
94.	<i>Xanthium strumarium</i> L.	Asteraceae	Chota Dhatura, Ghaghra	Herb	Used in traditional chinese medicine	Parbatta AR74

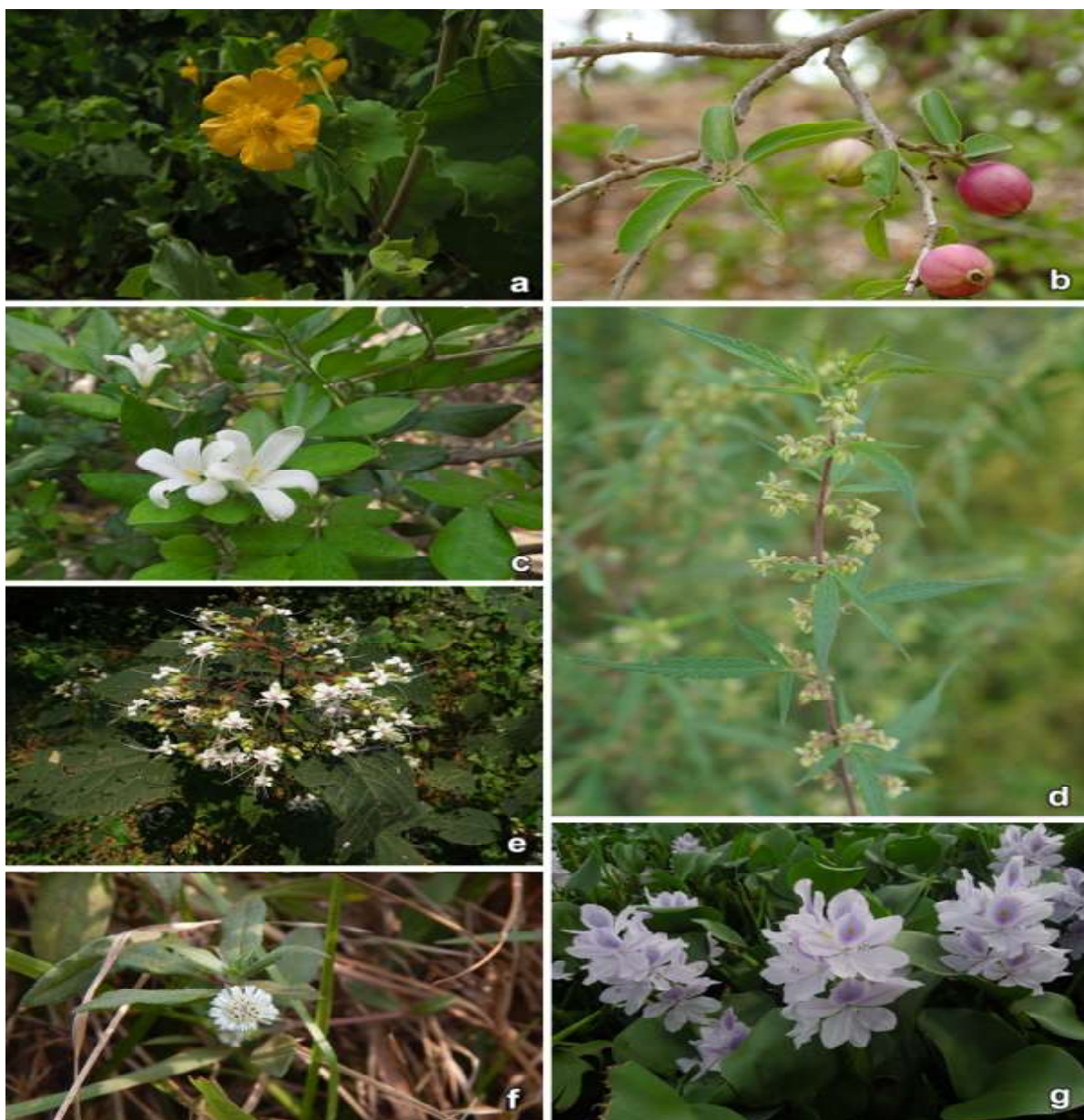


Fig. 1. a. *Abutilon indicum*; b. *Alangium salviifolium*; c. *Bergera koenigii*; d. *Cannabis sativa*; e. *Clerodendrum cordatum*; f. *Eclipta prostrata*; g. *Eichhornia crassipes*.



Fig. 2. a. *Euphorbia heterophylla*; b. *Euphorbia hirta*; c. *Glycosmis pentaphylla*; d. *Grangea maderaspatana*; e. *Justicia adhatoda*; f-g. *Martynia annua*.



Fig. 3. a. *Melochia corchorifolia*; b. *Momordica charantia*; c. *Murraya koenigii*; d. *Nymphoides hydrophyllum*; e. *Oxalis corniculata*; f. *Argemone maxicana*; g-h. *Passiflora foetida*.



Fig. 4. a-b. *Peperomia pellucida*; c. *Persicaria glabra*, d. *Phyla nodiflora*; e. *Phyllanthus reticulatus*; f. *Phyllanthus urinaria*; g. *Phyllanthus virgatus*; h. *Polygonum plebeium*.

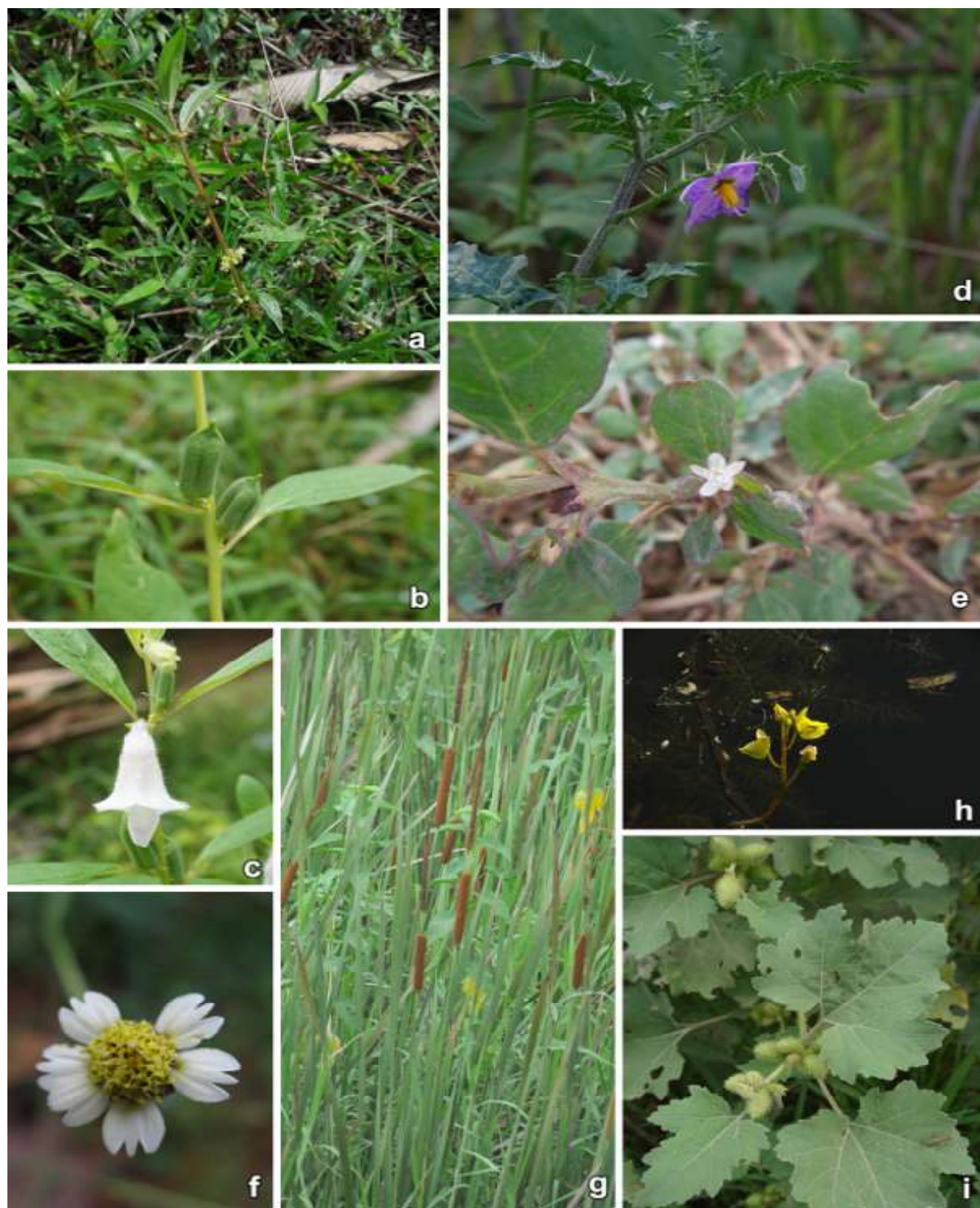


Fig. 5. a. *Pouzolzia zeylanica* var. *zeylanica*; b-c. *Sesamum indicum*; d. *Solanum virginianum*; e. *Trianthema portulacastrum*; f. *Tridax procumbens*; g. *Typha angustifolia*; h. *Utricularia aurea*; i. *Xanthium strumarium*.

CONCLUSION

The present study documented 94 plant species from the sanctuary, constituting the first floristic account of the area. The Sanctuary exhibits considerable spatial and ecological variability owing to fluctuations in river discharge and inundation patterns. Agricultural activities are common in the peripheral zones, where local communities cultivate cereals and vegetables. As a result, a number of cultivated species were recorded as escaped or naturalized populations within the Sanctuary ecosystem.

Based on extensive field surveys and documentation, a total of 94 taxa belonging to 84 genera and 40 families have been enumerated from the sanctuary area. Of these, 50 species are reported to possess medicinal value, while one species is commonly used as an adulterant. Ten species serve as fodder resources for cattle. One species holds cultural significance among local communities. Among the recorded taxa, *Clerodendrum cordatum* and *Eclipta prostrata* were observed to be the most dominant species within the sanctuary area.

CONSERVATION STATUS

Our study revealed that the Vikramshila Gangetic Dolphin Sanctuary (VGDS) harbours a rich and diverse floral assemblage, highlighting its significance as an important biodiversity repository. However, the ecological integrity of the River Ganga has been undergoing rapid deterioration in recent decades. Various forms of pollution, coupled with increased siltation and sedimentation, as well as extensive water withdrawals for irrigation and other anthropogenic purposes, have substantially altered the river's physiography and ecological dynamics. These environmental changes pose significant threats to the sanctuary's biodiversity and may adversely affect the long-term sustainability of its flora and associated ecosystems. Therefore, effective conservation measures and continuous monitoring are urgently required to preserve the ecological health and biodiversity of the Vikramshila Gangetic Dolphin Sanctuary.

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