PLANT DIVERSITY ASSESSMENT OF MATARBARI AREA OF MOHESHKHALI UPAZILA, COX'S BAZAR

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Abstract

The study presents the status of plant diversity in and around Matarbari, in Moheshkhali Upazila, Cox's Bazar district, situated in the close vicinity of the Bay of Bengal. A total of 248 plant species belonging to 80 families was identified in the study area. For each plant species, the scientific name, local name, family, habit, habitat, origin, status, abundance, and uses are provided. The most dominant family is the Fabaceae, followed by Poaceae, Euphorbiaceae, Verbenaceae, Asteraceae, Convolvulaceae, Malvaceae, Mimosaceae, Moraceae, and Arecaceae. Most of the plant species are herbs, followed by trees, climbers, and shrubs. In the present study, the maximum numbers of plants recorded were from homesteads, followed by roadsides, mangroves, wetland, and sand dune habitats. The most important plant species were medicinal (28%), wildlife-supporting (20%), fruits and grains (10%), and so on. A few exotics (18%), including *Eucalyptus camaldulensis*, *Albizia richardiana*, *Chromolaena odorata*, *Lantana camara*, *etc*., some rare species (37 spp.), some mangrove plants, and 2 keystone species (*Ficus altisimma* and *F. rumphii*) were found in the study area that are of conservation concern. Besides, significant areas such as sand dunes, eco-parks, Jhao plantation area, and mangrove forests have been identified that should be of concern for any development and management projects in and around Matarbari. A number of threats, including infrastructural development activities, land filling, mangrove forest clearing for shrimp and salt cultivation, was also observed during field data collection. The concerned authorities, including the government, should consider the importance of natural plant diversity in implementing different mega projects.

Keyword: Plant diversity; Assessment; Conservation significance; Matarbari; Moheshkhali.

INTRODUCTION

Plant diversity plays a great role in maintaining the sustainability of an ecosystem. The more diversified an ecosystem is, the more sustainable it is. Different types of plants also have different types of benefits. Some plants are eaten as food; some have high fibre qualities; some are used for fuel; some are medicinal. A resource that is diverse is a valuable resource (Grönemeyer and Reinhold-Hurek 2018). Plants help to reduce natural calamities and act as a natural shield. It also acts as a home for wildlife during calamities (Agrawal 1999). For the measurement of biodiversity and quantification of biodiversity, there are now essential tools available in the fields of taxonomy and ecology. Plant diversity assessment provides a fundamental database for future conservation planning to save species from extinction. It also helps to monitor the habitat of the plant (Sharma 2005).

Bangladesh is situated in the oriental region at the crossroads between the Indo-Himalayan and Indo-Chinese sub-regions. This geographical location grants Bangladesh a rich biodiversity, and it is one of the most densely populated countries (Reza and Hasan 2019). It is also a part of the Indo-Burma Biodiversity Hotspot (Myers *et al.* 2000). Bangladesh's current situation is very vulnerable to climate change (Choudhury 2002). Plants are at a great risk of extinction (Khan *et al*. 2001, Ara *et al*. 2013). Hooker (1872–1897) was the first person to record and document plants in undivided British India. After that, an undivided Bengal plant was documented by Prain (1903). After Bangladesh's independence,

Khan and Alam (1977) estimated that the country supported more than 5000 species of angiosperms. Up to date, 3611 angiosperm plant species have been documented (Siddiqui *et al.* 2007, 2007a, 2007b, 2007c and Ahmed *et al.* 2008a, 2008b, 2009b, 2009c, 2009d, and 2009e). Among the listed species, 226 plants are treated as threatened (Khan *et al.* 2001; Ara *et al.* 2013); and 300 species have been recorded as exotic or invasive species in Bangladesh (Hossain and Pasha 2004). To save the flora, more exploration is required and further research must be carried out.

Moheshkhali is the only island that contains hills in the country. It is located at 21°28'-21°46' N latitudes and 91°51'-91°59' E longitudes. Previously, some sporadic studies on plant diversity have been done in this coastal area (Sajib *et al*. 2016) and on Sonadia Island (Arefin *et al*. 2017). But no work has been done in and around the Matarbari area. That is why, an attempt has been made to assess the plant diversity that occurred in and around Matarbari, a rapidly converting zone to an international commercial hub.

MATERIAL AND METHODS

Study area

Moheshkhali, a local island situated in the south-eastern part of Bangladesh, consists of 36,234.01 hectares of land and is connected to the Bay of Bengal through the Kuheliya River. It is detached from mainland Cox's Bazar by the Moheshkhali channel. This island lies within the Bio-ecological Zone 8a: Coastal Plains (Reza *et al.* 2002) and is exceptional in its natural vegetation, such as: homestead/community forest and mangrove forest, Jaw Forest, Hill Forest, *etc*. (Kashem *et al.* 2019). A large part of this island is situated near the Bay of Bengal (3775.29 hectares) and it also contains mangrove forest (4365.90 hectares) (Study of Detailed Coastal Land Zoning with Two Pilot Districts of Plain Land Project under the Government of the People's Republic of Bangladesh, Ministry of Land, field survey 2006-2012, BBS 11, SPARRSO 2013).

Methods

Extensive floristic surveys following the methods of Hyland (1972) and Alexiades (1996) were conducted in the study area by three field visits in 2021, each being lasted for 6 days. The survey area was divided into different habitat types, such as homesteads, roadsides, cultivated wetlands, mangroves, and sand dune habitats. The survey team repeatedly visited each of the habitats for data collection. Special efforts were given to find plant species of conservation concern, including threatened, endemic, and rare. Sample size was determined using a species area curve or species time curve (Goldsmith and Harrison 1976). Observations were made on plant communities during field work and tried to identify different habit of plant communities, including herbs, shrubs, trees, climbers, epiphytes, parasites, and grass-sedge populations. The local or Bengali name of each plant species was collected whenever available at the sampling points. Most of the identification was done at the field site and, in case of confusion in identity, fertile plant specimens were collected and processed using standard herbarium techniques (Hyland 1972) and also took close images of plant species using a DSLR camera for aiding in identification. The identifications of plant species were done by consulting different Floras (Uddin and Hassan 2004, Uddin *et al.* 1998, Siddiqui *et al.* 2007c, and Ahmed *et al.* 2008a, 2008b, 2009b, 2009c, 2009d, 2009e). The updated nomenclature of the species was done following Siddiqui *et al.*

(2007) Siddiqui *et al.* (2007c) and Ahmed *et al.* (2008a, b, 2009b, 2009c, 2009d, 2009e). Threatened categories of plants have been confirmed with the help of Khan *et al.* (2001). Some noxious exotic plant species have also been determined compared with the report of Hossain and Pasha (2004). Medicinal plants have been determined by consulting Yusuf *et al.* 2009. Families have been determined following Cronquist (1981). The relative abundance of plants in the study area was expressed in three categories: Common (C)- species found in their habitats 70-100% of the sampling quadrats. LC- species found in its habitats 40-70% of the sampling quadrats; and Rare (R)- species found in habitats with 40% or less encounter.

RESULTS AND DISCUSSION

The study recorded a total of 248 plant species under 80 families from in and around the Matarbari study area. Species abundance in each family showed variations; 44% of species were represented by 10 families and 56% were represented by 70 families in the study area. For each species, the scientific name, local name, family, habit, habitat, origin, status, abundance, and uses are presented in the Table 1.

Table 1. Inventory of plant diversity in and around Matarbari.

Scientific name	Local name	Family	Habit	Habitat	Origin	Status	Abund.	Use
Abelmoschus esculentus (L.) Moench	Derosh	Malvaceae	H	HS	I	P	C	V
Acacia auriculaeformis Benth.	Akashmoni	Mimosaceae	T	HS	E	P	LC	T
Acacia farnesiana L.	Bilati babla	Mimosaceae	T	R	E	P	LC	T
Acacia mangium Willd.	Beljium	Mimosaceae	T	HS	E	P	LC	T
Acanthus ilicifolius L.	Hargoza	Acanthaceae	S	M	I	W	C	M
Achyranthes aspera L.	Upathlenga	Amaranthaceae	H	SD	I	W	LC	M
Acmella calva (DC.) R.K.Jansen	Surjo Konna	Asteraceae	H	R	I	W	LC	M
Aegialitis rotundifolia Roxb.	Dhalchaka	Plumbaginaceae	S	M	I	W	R	WS
Aegiceras corniculatum (L.) Blanco	Khalshi	Myrsinaceae	S	M	I	W	R	WS
Aegle mermelos L.	Bel	Rutaceae	T	HS	I	P	LC	M
Ageratum conyzoides (L.) L.	Uchunti	Asteraceae	H	R	E	W	LC	M
Albizia lebbeck (L.) Benth.	Koroi	Mimosaceae	T	R	I	W	C	T
Albizia procera (Roxb.) Benth.	Sadakoroi	Mimosaceae	T	HS	I	P	R	T
Albizia richardiana (Voigt) King & Prain	Gogon shirish	Fabaceae	T	R	E	P	C	T
Alstonia scholaris (L.) R. Br.	Chatim	Apocynaceae	T	R	I	W	R	WS
Alternanthera sessilis (L.) R.Br. ex DC.	Haisashak	Amaranthaceae	H	HS	I	W	LC	M
Amaranthus spinosus L.	Kantanote	Amaranthaceae	H	HS	I	W	LC	M
Amaranthus tricolor L.	Lal Shak	Amaranthaceae	H	C & W	I	C	LC	V
Amaranthus viridis L.	Note	Amaranthaceae	H	SD	I	W	LC	V
Ananas comosus (L.) Merr.	Anarosh	Bromeliaceae	H	H	E	C	C	F
Anisomeles malabarica (L.) R.Br. ex Sims	Gobura	Lamiaceae	H	R	I	W	LC	M
Annona reticulata L.	Sharifa	Annonaceae	S	HS	I	P	LC	F
Annona squamosa L.	Ata	Annonaceae	T	HS	I	P	LC	F
Areca catechu L.	Supari	Arecaceae	T	R	I	P	C	F
Argyreia nervosa (Burm. F.) Bojer	Bijtarak	Convolvulaceae	C	M	I	W	LC	O
Artocarpus heterophyllus Lam.	Kathal	Moraceae	T	H	I	P	LC	F
Artocarpus lakoocha Roxb.	Deua	Moraceae	T	R	I	P	R	WS
Averrhoa bilimbi L.	Bilimbi	Oxalidaceae	T	H	I	P	LC	WS
Averrhoa carambola L.	Kamranga	Averrhoaceae	T	HS	I	P	LC	WS
Avicennia alba Blume	Kalabaine	Avicenniaceae	T	M	I	W	C	WS
Avicennia marina (Forssk.) Vierh.	Sada Baen	Verbenaceae	T	M	I	W	C	WS
Avicennia officinalis L.	Moriccha bain	Verbenaceae	T	M	I	W	C	WS
Axonopus compressus (Sw.) P.Beauv.	Dhaka grass	Poaceae	H	R	I	W	LC	O
Azadirachta indica A.Juss.	Neem	Meliaceae	T	R	I	P	R	T
Azolla pinnata R. Br .	Azolla	Azollaceae	H	C &W	I	W	LC	O

Bambusa vulgaris Schrad.	Borakbans	Poaceae	T	HS	I	P	LC	WS
Basella alba L.	Puishak	Basellaceae	C	C & W	I	C	LC	V
Benincasa hispida (Thunb.) Cogn.	Kumra	Cucurbitaceae	C	C &W	I	C	LC	V
Blumea lacera (Burm.f.) DC.	Barigash	Asteraceae	H	M	I	W	LC	M
Boerhavia repens L.	Punornova	Nyctaginaceae	H	SD	I	W	LC	M
Bombax ceiba L.	Tula	Bombacaceae	T	HS	I	P	R	WS
Borassus flabellifer L.	Tal	Arecaceae	T	R	I	P	C	WS
Borreria articularis F.N.Williams	Modnapata	Rubiaceae	H	SD	I	W	LC	O
Bougainvillea glabra Choisy	Bagan bilash	Nyctaginaceae	C	H	E	P	LC	O
Brassica campestris L.	Mustard	Brassicaceae	H	C & W	I	C	LC	M
Butea monosperma (Lam.) Taub.	Palash	Fabaceae	T	H	I	W	R	WS
Caesalpinia bonduc (L.) Roxb.	Nata	Caesalpiniaceae	C	M	I	W	R	WS
Cajanus cajan (L.) Millsp.	Arhar	Fabaceae	H	C & W	I	P	C	M
Calamus tenuis Roxb.	Bet	Arecaceae	H	H	I	W	R	O
Calotropis procera (Aiton) Dryand.	Akondo	Asclepiadaceae	T	R	E	W	LC	M
Calycopteris floribunda (Roxb.) Lam.	Gumochapata	Combretaceae	C	R	I	W	LC	WS
Canavalia maritima Thouars	Shim	Fabaceae	C	M	I	W	LC	O
Canavalia virosa (Roxb.) Wight & Arn.	Kalo sim	Fabaceae	C	C & W	I	C	C	O
Canna indica L.	Kalabati	Cannaceae	H	H	E	P	LC	O
Capsicum annuum L.	Morich	Solanaceae	H	C & W	I	C	LC	V
Carica papaya L.	Pepe	Caricaceae	H	H	I	P	LC	F
Cassia tora L.	Chakunda	Caesalpiniaceae	H	SD	I	W	LC	M
Casuarina equisetifolia L.	Jhau	Casuarinaceae	T	R	E	P	C	T
Catharanthus roseus (L.) G.Don	Noyontara	Apocynaceae	H	H	E	P	LC	M
Ceiba pentandra (L.) Gaertn.	Shet shimul	Bombacaceae	T	HS	I	P	LC	WS
Celosia argentea L.	Morog ful	Amaranthaceae	H	H	E	P	LC	O
Centella asiatica (L.) Urb.	Thankuni	Apiaceae	H	C &W	I	W	LC	M
Centrosema pubescens Benth.	Shankhalata	Fabaceae	C	SD	I	W	LC	WS
Ceriops decandra (Griff.) W.Theob.	Goran	Rhizophoraceae	S	M	I	W	R	WS
Corchorus olitorius L.	Patshak	Tiliaceae	H	HS	I	P	C	O
Chromolaena odorata (L.) R.M.King & H.Rob.	Ujaru lata	Asteraceae	H	R	E	W	C	M
Cissus quadrangularis L.	Harbhanga lota	Vitaceae	C	H	I	W	R	M
Citrus aurantiifolia (Christm.) Swingle	Lebu	Rutaceae	S	HS	I	P	LC	F
Citrus grandis Osbeck	Jambura	Rutaceae	T	HS	I	P	C	F
Clerodendrum viscosum Vent.	Bhat	Verbenaceae	H	R	I	W	LC	M
Cocos nucifera L.	Narikel	Arecaceae	T	HS	I	P	C	F
Codiaeum variegatum (L.) Rumph. Ex A.Juss.	Patabahar	Euphorbiaceae	H	H	E	P	LC	O
Colocasia esculenta (L.) Schott	Kachu	Araceae	H	C & W	I	W	C	V
Commelina benghalensis Wall.	Commelina	Commelinaceae	H	SD	I	W	LC	O
Crateva religiosa G.Forst.	Barun	Capparaceae	T	H	I	W	R	WS
Crotalaria pallida Aiton	Jhunjhuni	Fabaceae	H	R	I	W	LC	O
Croton bonplandianus Baill.	Croton	Euphorbiaceae	H	SD	E	W	LC	O
Cucurbita maxima Duchesne	Misti Kumra	Cucurbitaceae	C	C &W	I	C	LC	V
Cuscuta reflexa Roxb.	Sornolota	Cuscutaceae	C	R	E	W	LC	M
Cynodon dactylon (L.) Pers.	Durbagas	Poaceae	H	M	I	W	LC	M
Cyperus iria L.	Barachancha	Cyperaceae	H	M	I	W	LC	O
Cyperus javanicus Houtt.	Kucha	Cyperaceae	H	M	I	W	LC	O
Cyperus rotundus Hook.f.	Muthaghash	Cyperaceae	H	SD	I	W	C	M
Dalbergia sissoo Roxb.	Shishu	Fabaceae	T	R	E	P	LC	T
Dalbergia spinosa Roxb.	Chulikanta	Fabaceae	S	M	I	W	C	O
Delonix regia (Bojer) Raf.	Krishnachura	Caesalpiniaceae	T	HS	E	P	LC	O
Dendrocalamus giganteus Munro	Budhum bash	Poaceae	T	C & W	I	W	LC	O
Dendrophthoe falcata (L.f.) Ettingsh.	Dhaira	Loranthaceae	H	H	I	W	LC	WS
Derris trifoliata Lour.	Kalilota	Fabaceae	C	M	I	W	R	M
Desmodium triflorum (L.) DC.	Kulaliya	Fabaceae	H	SD	I	W	C	O
Dillenia indica Blanco	Chalta	Dilleniaceae	T	H	I	W	R	F
Dimocarpus longan Lour.	Kath lichu	Sapindaceae	T	H	E	P	LC	F
Dioscorea bulbifera R.Br.	Bon alu	Dioscoreaceae	C	R	I	W	LC	V
Diospyros discolor Willd.	Bilati gab	Ebenaceae	T	R	E	P	LC	F
Diospyros malabarica (Desr.) Kostel.	Gab	Ebenaceae	T	H	I	W	R	F
Eclipta prostrata (L.) L.	Kashoraj	Asteraceae	H	SD	I	W	LC	M

Elaeis guineensis Jacq.	Oilpalm	Arecaceae	T	HS	E	P	LC	O
Eleusine indica Gaertn.	Eleusine Indica	Poaceae	H	R	I	W	LC	O
Enhydra fluctuans Lour.	Helencha	Asterace	H	C & W	I	W	LC	M
Erythrina fusa Lour.	Mandar	Fabaceae	T	R	I	W	LC	WS
Erythrina variegata L.	Mandar	Fabaceae	T	HS	I	P	LC	WS
Eucalyptus camaldulensis Dehnh.	Eucalyptus	Myrtaceae	T	HS	E	P	C	T
Euphorbia hirta L.	Dudia	Euphorbiaceae	H	SD	I	W	LC	M
Evolvulus nummularius (L.) L.	Vui akra	Convolvulaceae	H	R	I	W	LC	O
Excoecaria agallocha L.	Gewa	Euphorbiaceae	T	M	I	W	R	WS
Ficus altissima Blume	Halud bot	Moraceae	T	R	I	W	R	WS
Ficus hispida Roxb. ex Wall.	Kak Dumur	Moraceae	T	R	I	W	C	WS
Ficus infectoria Roxb.,	Pakur	Moraceae	T	HS	I	W	R	WS
Ficus religiosa L.	Ashwattha	Moraceae	T	R	I	W	C	WS
Ficus rumphii Blume	Pakur	Moraceae	T	R	I	W	LC	WS
Flagellaria indica L.	Abetaa	Flagellariaceae	C	M	I	W	R	O
Glycosmis pentaphylla (Retz.) DC.	Asheora/ Matkila	Rutaceae	S	R	I	W	R	M
Gmelina arborea Roxb. ex Sm.	Gamari	Verbenaceae	T	HS	I	P	LC	T
Harrisia simpsonii Small ex Britton & Rose	Beach Cactus	Cactaceae	H	SD	E	W	LC	O
Heliotropium indicum L.	Hatishur	Boraginaceae	H	SD	I	W	LC	M
Hibiscus sabdariffa L.	Mesta	Malvaceae	H	H	I	C	LC	M
Hibiscus schizopetalus (Dyer) Hook.f.	Jhumkoba	Malvaceae	S	H	I	P	LC	O
Hiptage benghalensis (L.) Kurz	Madhabilata	Malphighiaceae	C	R	I	W	R	O
Hyptis suaveolens (L.) Poit.	Tokma	Lamiaceae	H	SD	I	W	LC	M
Imperata cylindrica (L.) P.Beauv.	Durbagas	Poaceae	H	M	I	W	LC	O
Ipomoea aquatica Forssk.	Kalmi	Convolvulaceae	H	HS	I	P	C	V
Ipomoea pes-caprae (L.) R.Br.	Chagalkhuri	Convolvulaceae	C	SD	I	W	C	O
Ipomoea carnea Jacq.	Dhol kami	Convolvulaceae	H	C & W	I	W	C	O
Ipomoea vitifolia Sweet	kolmi	Convolvulaceae	C	M	I	W	LC	O
Ixora coccinea Comm. ex Lam.	Rongon	Rubiaceae	S	H	I	W	LC	O
Jatropha curcas L.	Jatropa	Euphorbiaceae	S	HS	I	P	LC	M
Justicia adhatoda L.	Basok	Acanthaceae	S	H	I	W	LC	M
Justicia gendarussa Burm.f.	Jogot mordon	Acanthaceae	H	H	I	W	LC	M
Kalanchoe pinnata (Lam.) Pers.	Pathor kuchi	Crassulaceae	H	H	E	P	LC	M
Lablab purpureus (L.) Sweet	Deshi sim	Fabaceae	C	C &W	I	C	LC	V
Lagenaria vulgaris Ser.	Lao	Cucurbitaceae	C	HS	I	P	C	V
Lagerstroemia speciosa (L.) Pers.	Jarul	Lythraceae	T	R	I	P	LC	T
Lannea coromandelica (Houtt.) Merr.	Bhadi	Anacardiaceae	T	HS	I	P	C	WS
Lantana camara L.	Lantana	Verbenaceae	H	SD	E	W	C	M
Lawsonia inermis L.	Mehedi	Lythraceae	S	H	I	P	LC	M
Lemna minor Griff.	Lemna	Lemnaceae	H	C & W	I	W	LC	O
Lepisanthes rubiginosa (Roxb.) Leenh.	Guti Jam / Chhagal nadiya	Sapindaceae	T	R	I	W	C	F
Leucaena leucocephala (Lam.) de Wit	Epilipil	Fabaceae	T	R	E	P	C	T
Leucas aspera (Willd.) Link	Shetodron	Lamiaceae	H	SD	I	W	LC	M
Leucas lavandulifolia Sm.	Dandakolosh	Lamiaceae	H	SD	I	W	LC	M
Lindernia ciliata (Colsm.) Pennell	Bhui	Scrophulariaceae	H	C &W	I	W	LC	M
Lindernia pusilla Merr.		Scrophulariaceae	H	M	I	W	LC	M
Lippia alba (Mill.) N.E.Br. ex Britton & P.Wilso	Lippia	Verbenaceae	H	M	I	W	C	O
Litchi chinensis Sonn.	Lichu	Sapindaceae	T	H	I	W	LC	F
Ludwigia adscendens (L.) H.Hara	Keshardam	Onagraceae	H	C & W	I	W	LC	V
Ludwigia hyssopifolia (G.Don) Exell	Pani lang	Onagraceae	H	C &W	I	W	LC	O
Ludwigia octovalvis (Jacq.) P.H.Raven	Bon lbanga	Onagraceae	H	C & W	I	W	LC	O
Luffa acutangula (L.) Roxb.	Jinga	Cucurbitaceae	C	HS	I	P	C	V
Luffa cylindrica M.Roem.	Dundul	Cucurbitaceae	C	HS	I	P	C	V
Lumnitzera racemosa Willd.	Kirpa	Combretaceae	S	M	I	W	R	WS
Macaranga denticulata Müll.Arg.	Macaranga	Euphorbiaceae	S	R	I	W	LC	O
Malvaviscus arboreus Dill. ex Cav.	Lankajaba	Malvaceae	S	H	I	P	LC	M
Mangifera indica Wall.	Aam	Anacardiaceae	T	HS	I	P	LC	F
Manihot esculenta Crantz,	Cassava	Euphorbiaceae	S	H	E	P	LC	V
Marsilea minuta L.	Shushni	Marsileaceae	H	C &W	I	W	LC	O
Melastoma malabathricum L.	Bantejapata	Melastomataceae	S	R	I	W	LC	WS

Melia azedarach L.	Goranim	Meliaceae	T	R	I	P	C	T
Melocanna baccifera Skeels	Muli bash	Poaceae	T	R	I	P	LC	WS
Melochia corchorifolia L.	Melotia	Sterculiaceae	H	SD	I	W	LC	M
Merremia umbellata (L.) Hallier f.	Chainnalota	Convolvulaceae	C	SD	I	W	LC	O
Mikania cordata (Burm.f.) B.L.Rob.	Refugeelata	Asteraceae	C	HS	E	W	LC	M
Millettia pinnata (L.) Panigrahi	Koroch	Fabaceae	T	W	E	W	LC	WS
Mimosa pudica L.	Mimosa	Mimosaceae	H	HS	I	W	LC	M
Momordica charantia Descourt.	Titakorolla	Cucurbitaceae	C	HS	I	P	LC	V
Moringa oleifera Lam.	Sajna	Moringaceae	T	H	E	P	LC	V
Murdannia nudiflora (L.) Brenan	Nakful	Commelinaceae	C	SD	I	W	LC	O
Musa × *paradisiaca* L.	Kola	Musaceae	T	R	I	P	C	F
Neolamarckia cadamba (Roxb.) Bosser	Kodom	Rubiaceae	T	R	I	W	R	WS
Nypa fruticans Wurmb	Golpata	Arecaceae	H	M	I	W	R	O
Ocimum americanum L.	Lelum	Lamiaceae	H	SD	I	W	LC	M
Oldenlandia corymbosa L.	Khet papara	Rubiaceae	H	R	I	W	LC	O
Operculina turpethum (L.) Silva Manso	Sagarkolmi	Convolvulaceae	C	M	I	W	LC	O
Opuntia dillenii Haw.	Fornimomsha	Cactaceae	H	SD	I	W	LC	M
Oroxylum indicum Vent.	Kanai dinga	Bignoniaceae	T	R	I	W	R	M
Oryza sativa L.	Dhan	Poaceae	H	C & W	I	C	C	F
Oxalis corniculata L.	Amrul	Oxalidaceae	H	C & W	I	W	LC	M
Pandanus tectorius Parkinson	Keya	Pandanaceae	S	SD	I	W	C	WS
Paspalum scorbiculatum Steud.	Goicha	Poaceae	H	M	I	W	C	O
Paspalum vaginatum Elliott	Gass	Poaceae	H	M	I	W	C	O
Peltophorum pterocarpum (DC.) Backer ex K.Heyne	Holde chura	Caesalpiniaceae	T	R	E	P	LC	O
Persicaria orientalis (L.) Spach	Bishkatali	Polygonaceae	H	C &W	I	W	LC	O
Phoenix sylvestris (L.) Roxb.	Khejur	Arecaceae	T	R	I	P	LC	F
Phragmites karka (Retz.) Trin. ex Steud	Nol	Poaceae	H	M	I	W	LC	O
Phyla nodiflora (L.) Greene	Phyla	Verbenaceae	H	M	I	W	LC	O
Phyllanthus acidus (L.) Skeels	Orboroi	Euphorbiaceae	T	HS	I	P	LC	WS
Phyllanthus emblica L.	Amloki	Euphorbiaceae	T	R	I	P	R	M
Phyllanthus niruri L.	Bhuiamla	Euphorbiaceae	H	SD	I	W	LC	M
Phyllanthus reticulatus Poir.	Panseuli	Euphorbiaceae	S	M	I	W	LC	M
Piper betle L.	Pan	Piperaceae	C	C & W	I	C	C	M
Pistia stratiotes L.	Topapana	Araceae	H	C &W	E	W	LC	O
Pithecellobium dulce (Roxb.) Benth.	Mokkatetul	Mimosaceae	T	HS	E	P	LC	WS
Plectranthus scutellarioides R.Br.	Koilash	Lamiaceae	H	H	I	W	LC	O
Polyalthia longifolia (Sonn.) Hook.f. & Thomson	Debdaru	Annonaceae	T	H	E	P	LC	WS
Punica granatum L.	Dalim	Lythraceae	S	HS	I	P	LC	F
Pongamia pinnata (L.) Merr.,	Koroz	Fabaceae	T	HS	I	P	LC	WS
Porteresia coarctata (Roxb.) Tateoka	Uri	Poaceae	H	HS	I	W	C	O
Portulaca oleracea L.	Portolaca	Potulacaceae	H	SD	I	W	LC	V
Psidium guajava L.	Peara	Myrtaceae	T	HS	I	P	C	F
Raphanus raphanistrum L.	Mula	Brassicaceae	H	C &W	I	C	LC	V
Rhizophora mucronata Poir.	Jhanna	Rhizophoraceae	T	M	I	W	R	WS
Ricinus communis L.	Lal verenda	Euphorbiaceae	H	R	I	W	LC	M
Samanea saman (Jacq.) Merr.	Raintree	Mimosaceae	T	HS	E	P	LC	T
Sarcolobus globosus Wall.	Bowalilota	Asclepiadaceae	C	M	I	W	LC	O
Schumannianthus dichotomus Gagnep.	Patipata	Marantaceae	H	R	I	C	LC	O
Scoparia dulcis L.	Scoparia	Scrophulariaceae	H	SD	I	W	LC	M
Senna sophera (L.) Roxb.	Kalkasunde	Fabaceae	H	R	I	W	LC	M
Sesbania aculeata (Schreb.) Poir.	Dhincha	Fabaceae	H	R	I	W	LC	M
Setaria glauca (L.) P.Beauv.	Setaria	Poaceae	H	SD	I	W	C	M
Sida acuta Burm.f.	Nakphul	Malvaceae	H	SD	I	W	LC	M
Sida cordifolia Forssk.	Sida	Malvaceae	H	SD	I	W	C	M
Solanum lycopersicum L.	Tometo	Solanaceae	C	C &W	I	C	LC	V
Solanum melongena Wall.	Begun	Solanaceae	H	C &W	I	C	LC	V
Solanum nigrum L.	Tit begun	Solanaceae	H	R	I	W	LC	M
Solanum tuberosum Poepp. ex Walp.	Alu	Solanaceae	C	C &W	I	C	LC	V
Sonneratia alba Griff.	Choila	Sonneratiaceae	T	M	I	W	LC	WS
Sonneratia apetala Banks	Keora	Sonneratiaceae	T	M	I	W	LC	WS

Spondias pinnata (L.f.) Kurz	Amra	Anacardiaceae	T	HS	I	P	R	F
Sterculia foetida L.	Basket badam	Sterculiaceae	T	R	I	P	R	F
Streblus asper Lour.	Sheora	Moraceae	S	HS	I	P	LC	WS
Suaeda maritima (L.) Dumort.	Nuina jao	Chenopodiaceae	S	M	I	W	R	WS
Synedrella nodiflora (L.) Gaertn.	Relanodi	Asteraceae	H	R	E	W	LC	M
Syzygium cumini (L.) Skeels	Jam	Myrtaceae	T	H	I	W	C	WS
Tabernaemontana divaricata (L.) R.Br. ex Roem. & Schult.	Togor	Apocynaceae	S	H	I	P	LC	O
Tagetes erecta L.	Gada	Asteraceae	H	H	E	P	LC	M
Tamarix gallica Sieber ex Nyman	Nona jau	Tamaricaceae	T	M	I	W	C	WS
Tectona grandis L.f.	Segun	Verbenaceae	T	R	E	P	LC	T
Tephrosia purpurea (L.) Pers.	Bonneel	Fabaceae	H	SD	I	W	C	M
Terminalia arjuna (Roxb. ex DC.) Wight & Arn.	Arjun	Combretaceae	T	R	I	P	R	M
Terminalia catappa L.	Katbadam	Combretaceae	T	HS	E	P	LC	T
Thevetia peruviana (Pers.) K.Schum.	Holde korobi	Apocynaceae	T	H	E	P	LC	M
Thunbergia grandiflora Roxb.	Jermani lota	Acanthaceae	C	M	I	W	LC	O
Thysanolaena latifolia (Roxb. ex Hornem.) Honda	Fuljharu	Poaceae	H	C &W	I	W	LC	O
Toona ciliata M.Roem.	Toon	Meliaceae	T	HS	I	P	R	T
Trema orientale (L.) Blume	Jibon	Ulmaceae	T	R	I	W	LC	WS
Trewia nudiflora Wight	Pitali	Euphorbiaceae	T	R	I	W	LC	WS
Triticum aestivum L.	Gom	Poaceae	H	C &W	I	C	LC	F
Triumfetta rhomboidea Jacq.	Bon okra	Malvaceae	H	R	E	W	LC	M
Typha domingensis Pers.	Hogla	Typhaceae	H	C &W	I	W	R	O
Urena lobata L.	Jogagota	Malvaceae	H	SD	I	W	LC	O
Urginea indica Kunth	Bon pias	Liliaceae	H	SD	I	W	R	M
Vernonia patula Mart. ex DC.	Fulkuri	Asteraceae	H	R	E	W	LC	M
Vigna unguiculata (L.) Walp.	Borboti	Fabaceae	C	C & W	I	C	LC	V
Vitex negundo L.	Nishinda	Verbenaceae	T	R	I	W	LC	M
Vitex pubescens Vahl	Goda	Verbenaceae	T	SD	I	W	R	T
Vitex trifolia L.	Nil-nishinda	Verbenaceae	H	SD	I	W	C	M
Zea mays L.	Vutta	Poaceae	H	C & W	I	C	LC	F
Ziziphus mauritiana Lam.	Boroi	Rhamnaceae	T	HS	I	P	C	F

Note: In case of habit group H = herb, T = tree, S = shrub, C = climber, In case of habitat, HS- homestead, R- roadside, SD-sand-dune, M-mangrove, In case of origin I = indigenous, E = exotic, in case of status C = cultivated, W = wild, P = Planted, in case abundance LC = less common, C = common, R = rare, in case of uses V = vegetable, O = others, M = medicinal, F = fruits and grains, T = timber, WS = wildlife supporting, Abund = Abundance.

The most dominant family is the Fabaceae (9%), followed by Poaceae, Euphorbiaceae, Verbenaceae, Asteraceae, Convolvulaceae, Malvaceae, Mimosaceae, Moraceae, and Arecaceae (Fig. 1a). The species recorded from the study area showed different habits of the plants. The leading life form of plant species is herbs (43%), followed by trees (34%), climbers (13%), and shrubs (10%) (Fig. 1b). The study area is not a very old human habitat area. Once, temporary houses were built by the fishermen in this area for their fishing in the Bay of Bengal. After different infrastructural project initiations, new homes started to be built and many people gathered there for livelihood reasons. Plantation has also started in and around homesteads in the study area. In the present survey, the maximum number of plants was recorded at the homestead, followed by roadsides, mangroves, wetland, and sand dune habitats (Fig. 1c).

The study found that the maximum plants in the area were wild, followed by plantations and cultivated (Fig. 2a). The abundance of plant species in the study area is not uniform. Based on observations and discussions with local people, the plant species of the study area have been categorized into three groups. According to the assessment, majority of the species are less common (LC) in the study area, followed by common (C) and rare (R) (Fig. 2b). The majority of the species recorded belonged to the native flora, with only a few being exotic (Fig. 2c).

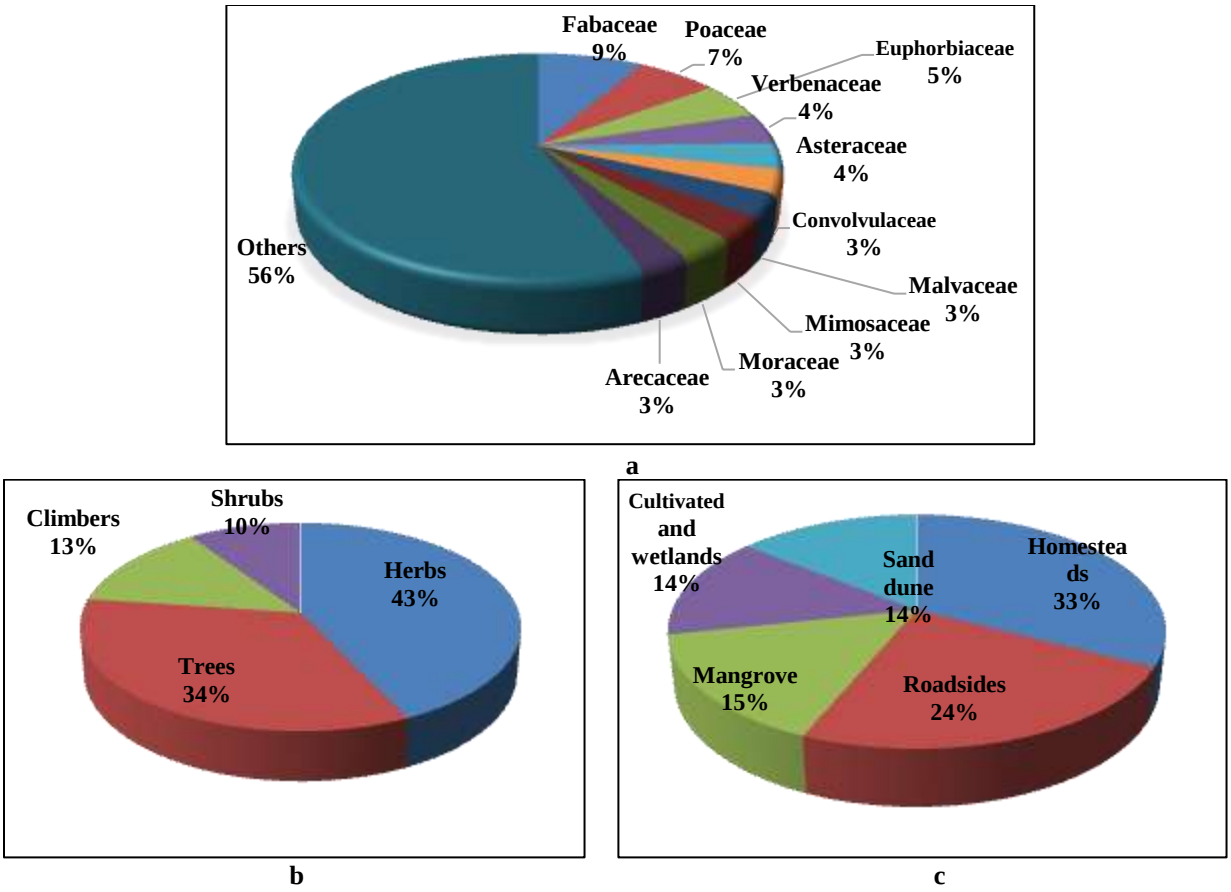
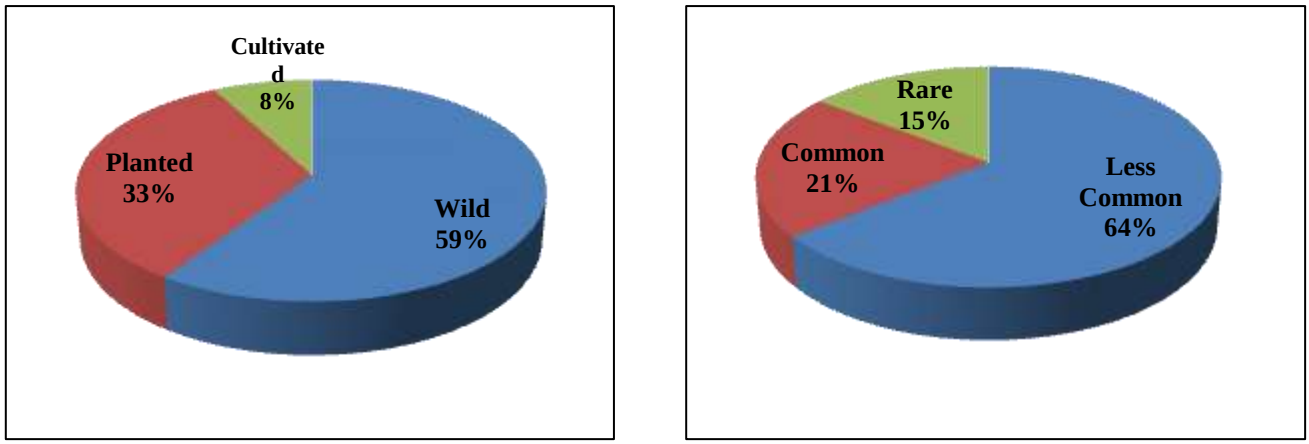


Fig. 1. Relative status of plants: **a**. the number of plant species distributed in different families; **b.** Different habits of plant species; and **c.** Different habitats with species percentage.

Exotic species may pose huge threats to native biodiversity, the environment, human health, and the economy. People use plants for different purposes in the study area. The plants recorded in the present study are classified into different use categories. The majority of plants recorded are used for medicinal purposes, followed by wildlife support, fruit and grain crops, vegetables, timber, and other uses (Fig. 2d).



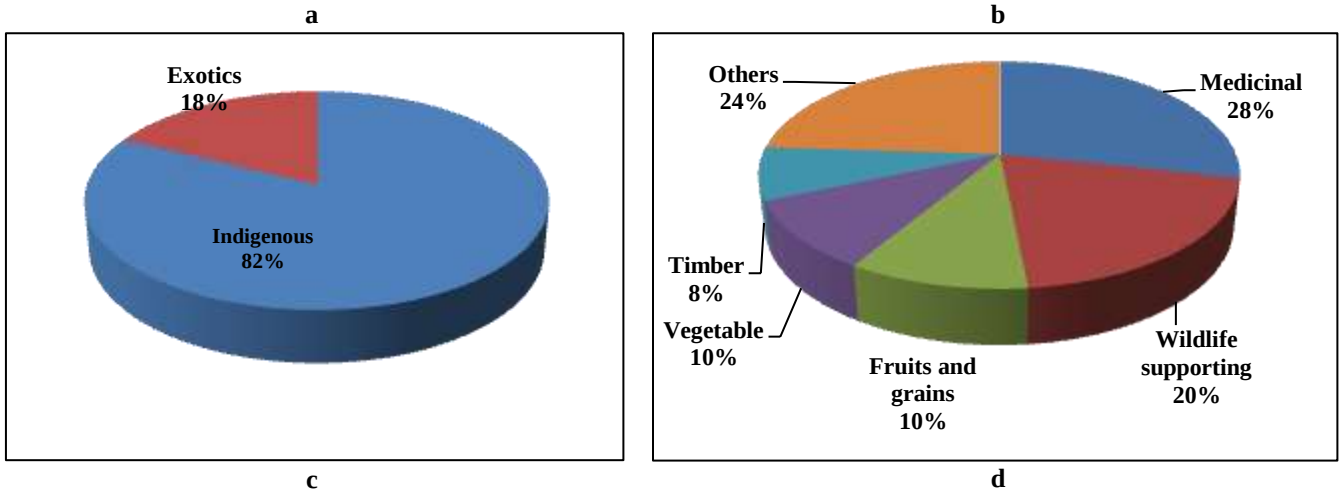


Fig. 2. **a**. Status of plant species; **b**. Abundance of plant species, **c**. Origin of plant species; and **d**. Different use categories of plant species.

Conservation significance of local plant species

Out of all the plant species, 37 are found to be rare in the study area. Among them, some species showed conservation significance. These species need to be cared and monitored. The population of such rare species should be considered under conservation and management efforts. Otherwise, they may be lost forever from the nature of that area. The most rare plant species in all kinds of habitats are: *Alstonia scholaris* (Chatim), *Vitex pubescens* (Goda), *Azadirachta indica* (Neem), *Urginea indica* (Bon piaj), *Typha domingensis* (Hogla), *Terminalia arjuna* (Arjun), *Suaeda maritima* (Nuina jhao), *Albizia lebbeck* (Koroi), *Sterculia foetida* (Basket Badam), *Rhizophora mucronata* (Jhanna), *Oroxylum indicum* (Kanai Dinga), *Nypa fruticans* (Gol Pata), *Toona ciliata* (Toon), *Phyllanthus emblica* (Amloki), *Sonneratia alba* (Choilla), *Butea monosperma* (Polash), *Caesalpinia bonduc* (Nata), *Flagellaria indica* (Abetaa), *Calamus tenuis* (Bet), *Ceriops decandra* (Goran), *Cissus quadrangularis* (Harbhanga lota), *Dillenia indica* (Chalta), *Diospyros malabarica* (Gab), *Ficus altissima* (Haludbot), *Excoecaria agallocha* (Geoa), *Ficus rumphii* (Pakur), *Hiptage benghalensis* (Madhabilota), *Spondias pinnata* (Amra), *Derris trifoliata* (Kaliota), *Lumnitzera racemosa* (Kirpa) and *Neolamarckia cadamba* (Kadam).

These plants were not compared with the IUCN status of threatened or Red List because the IUCN Red List is yet to be finalized and published. *Ficus altissima* (Halud bot) and *Ficus rumphii* (Pakur), two figs considered keystone species (Compton and Greeff 2020) are located in the study area. A good number of wildlife species, particularly birds, use such rare plant species as feeding, nesting, and resting sites. Some are medicinally important, including *Terminalia arjuna* (Arjun), *Phyllanthus emblica* (Amloki), *Cissus quadrangularis* (Harbanga lota), *Neolamarckia cadamba* (Kadam) and *Alstonia scholaris* (Chatim) (Fig. 3). The study did not locate any globally threatened plant species in the study area.

Important protected areas

The study area was explored thoroughly to find protected and ecologically significant areas, and consultations were also done with forest people and other concerned stakeholders to detect any habitat of conservation significance. A number of sensitive habitats is found in and around the study area of

Matarbari. For example, the Sonadia sand dune, located in the southern part of Matarbari, is an ecologically important habitat that breaks the forces of oceanic currents during high tides and storms. One eco-park was found in the southern part of Sonadia island. This is a sensitive area in a sand dune habitat dominated by Jhao plantation. Natural mangrove vegetation was found in Sonadia island, as well as at the upstream and downstream of the Kuheliya river, and in the Moheshkhali channel. Such mangroves are ecologically and environmentally very significant. Many shorebirds, such as *Calidris alba*, *Eurynorhynchus pygmeus* (Chowdhury 2011) mangroves as feeding sites as well as nesting and resting sites. Mangrove vegetation also plays an important role during cyclonic storms and saves human society near the coast line.

Fig. 3. Pictorial presentation of some rare plant species in the study area.

Identified threats to local plant diversity

Observations in the field and consulting with people belonging to all walks of life from the local community revealed a number of threats to plant diversity. Besides, some developmental projects were observed in the Moheshkhali area during the field survey. For these projects, infrastructures were being made, lands were being filled and many more areas were being cleared, which once contained many trees. Local people are in favour of these developments, but they also share their concern about the environment. Besides, a number of exotics was also identified during the field surveys that include *Eucalyptus camaldulensis*, *Albizia richardiana*, *Chromolaena odorata* and *Lantana camara* the cutting of mangrove forest for shrimp and salt cultivation, and wetland fillings as threats.

Based on the present survey and informal discussion with the local people, some recommendations are provided here for the augmentation of plant diversity and the rare species in the study area. Such recommendations are provided here for wise consideration. First of all, rare plant species should be considered for conservation and no developmental activities should hamper their distribution (if necessary, translocation of the species and other means can be followed). Enrichment plantations should be undertaken using these rare species. Secondly, local nurseries should be developed to increase the number of native rare species, wildlife-supporting species, and medicinal plant species. Thirdly, the eco-park should be managed efficiently and no foreign plant intrusion and introduction should be strictly maintained. Mangrove forest formation should be maintained with high care. Sand dune formations should not be disturbed. Besides, exotic and invasive species should be removed from the study area. Long-term monitoring should be done during and after any construction activities. Awareness should be created among the local stakeholders to conserve rare plant species and their habitats.

The results of the present assessment of plant species diversity in and around Matarbari provide a basis for future conservation and management action plans. The record of 248 plant species under 80 families in the study area is an indication of the richness in plant diversity. Among the plant species, 37 locally rare species were found in the study area. Unfortunately, a few exotic plant species were also recorded, which provides a grim picture of alien species intrusion or introduction in the area. Still, the high quantity of native species, of which most are medicinally important, is a positive sign. Anyway, the area is a future hub of the economy, energy, tourism, and port system of Bangladesh. Currently, some construction activities, including mega projects, are going on and many more are in the pipeline. The concerned authorities, including the government, should consider the importance of natural plant diversity in implementing different projects.

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