

ANGIOSPERMIC FLORA OF GAFARGAON UPAZILA OF MYMENSINGH DISTRICT FOCUSING ON MEDICINALLY IMPORTANT SPECIES

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Abstract

Gafargaon upazila has been floristically explored to identify and assess the angiospermic flora that resulted in occurrence of 203 taxa under 174 genera and 75 families. Magnoliopsida is represented by 167 taxa under 140 genera and 62 families, while Liliopsida is constituted by 36 taxa belonging to 34 genera and 13 families. Vegetation analysis shows that herbs are represented by 106 taxa, shrubs 35, trees 54, and climbers by 8 species. In Magnoliopsida, Solanaceae is the largest family possessing 10 species, whereas in Liliopsida, Poaceae is the largest family with 12 species. The study has identified 45 medicinal plants which are used for treatment of over 40 diseases including diabetes, ulcer, diarrhoea, dysentery, fever, cold and cough, menstrual problems, blood pressure and urinary disorders by the local people. Some noticeable medicinal plants used in primary healthcare are *Abroma augusta* (L.) L.f., *Coccinia grandis* (L.) Voigt., *Commelina benghalensis* L., *Cynodon dactylon* (L.) Pers., *Holarrhena antidysenterica* Flem., *Glycosmis pentaphylla* (Retz.) A. DC., *Mikania cordata* (Burm. f.) Robinson, *Ocimum tenuiflorum* L. and *Rauwolfia serpentina* (L.) Benth. A few number of species are also employed in cultural festivals in the study area. *Cardamine flexuosa* With., *Oxystelma secamone* (L.) Karst., *Phaulopsis imbricata* (Forssk.) Sweet, *Piper sylvaticum* Roxb., *Stephania japonica* (Thunb.) Miers and *Trema orientalis* L. have been found to be rare in the investigated area. In order to preserve botanical resources of Gafargaon upazila, particularly the rare, threatened and medicinal plants, conservation measures need to be undertaken through both *in-situ* and *ex-situ* methods for their sustainable use.

Introduction

Gafargaon upazila under Mymensingh district is located in 24°15' to 24°33'N and 90°27' to 90°39'E with an area of 401.16 sq. km. The upazila is bounded by Trishal and Nandail upazilas on the north, Kapasia and Sreepur upazilas on the south, Hossainpur and Pakundia upazilas on the east, and Trishal, Bhaluka, and Sreepur upazilas on the west (Fig. 1). The climate of Gafargaon is moderate as other parts of the district, as it is closer to the Himalayas and in the tropical monsoon zone. The temperature of the area varies from 9°C to 37°C. The maximum monthly average humidity ranges from 81 to 97%, while the minimum monthly average humidity ranges from 47 to 79% illustrates the monthly variations of humidity in the area (BBS, 2018).

The Gafargaon upazila presents diverse habitats and ecosystems comprising wetland, cultivated land, *char*, homestead area, scrub jungles, fallow lands, etc. which support dense formation of angiosperms and play a pivotal role in the local economy, environment and primary healthcare system. However, the ecosystems of Gafargaon have been depleted due to anthropogenic interferences over the years. As a result, many plant species have become rare and

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threatened. Therefore, it is indispensable to explore, identify, document and preserve the plant wealth of the area for the betterment of mankind especially those plant resources which are used for primary healthcare.

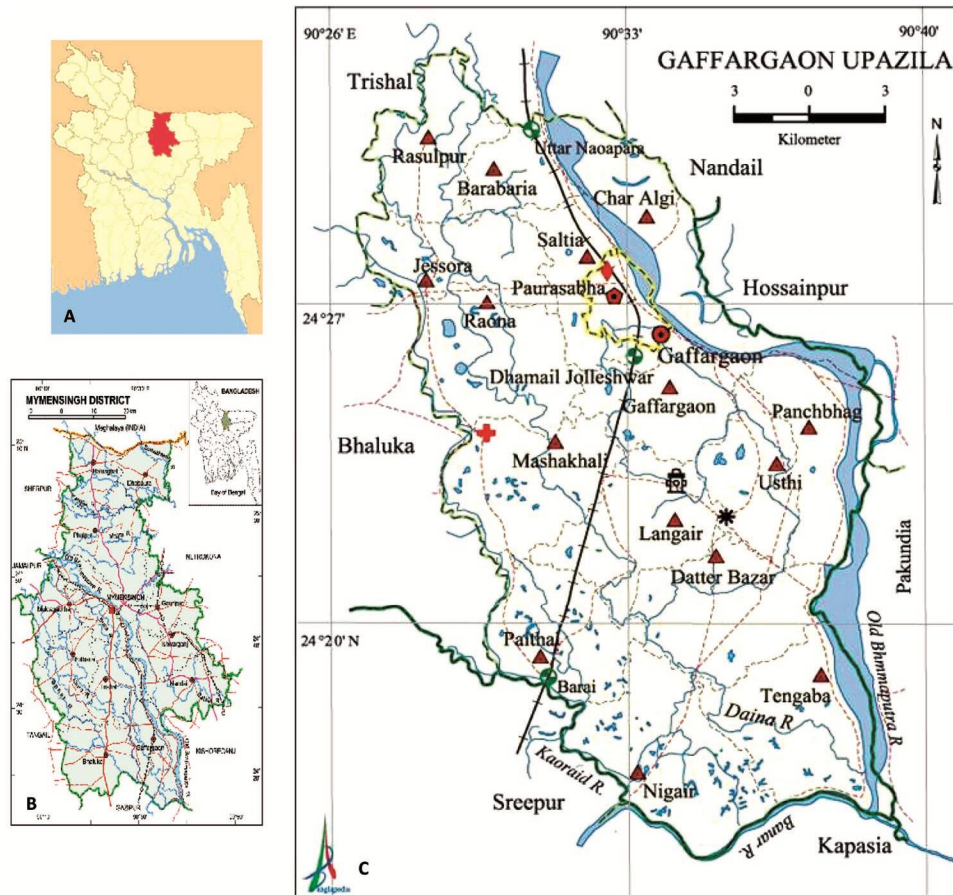


Fig. 1. Map of the study area: A. Map of Bangladesh, B. District map of Mymensingh, C. Map of Gafargaon upazila showing different sampling locations.

In the recent past, several attempts have been made on floristic studies in different parts of the country alongside with some protected areas (Khan and Huq, 2001; Alam *et al.*, 2006; Tutul *et al.*, 2010; Rahman *et al.*, 2015; Arefin *et al.*, 2017; Haque *et al.*, 2018; Rashid *et al.*, 2018). Despite sporadic studies on the flora of some upazilas of the country were carried out earlier (Moniruzzaman *et al.*, 2012; Rahman and Alam, 2013; Rahman *et al.*, 2012, 2013, 2019), the flora of Gafargaon upazila has never been explored and the potential of its existing flora has not been evaluated. Therefore, the present study aimed at exploring and identifying the angiosperm flora of Gafargaon upazila, and to focus on the medicinally important plant resources for meeting up the primary healthcare demand of the local people. The study has the potential to collate primary data on the plant diversity of the upazila which will eventually contribute towards logical understanding and conservation of the biodiversity of this region.

Materials and Methods

Taxonomic inventories were conducted in Gafargaon upazila of Mymensingh district through five botanical expeditions covering all seasons from April 2017 to March 2018. Plant specimens with flowers and/or fruits were collected, critically studied and preserved following standard herbarium technique (Bridson and Forman, 1989; Singh and Subramaniam, 2008). The collected specimens were identified by experts, consulting standard literature, *viz.*, Hooker (1872-1897), Prain (1903), Khan (1972-1987), Dassanayake and Fosberg (1980-1985), Khan and Rahman (1989-2002), and by matching with already identified specimens housed at Dhaka University Salar Khan Herbarium (DUSH). Nomenclature of each taxon has been updated following recent literatures (Ahmed *et al.*, 2008-2009), the nomenclatural databases of The Plant List (2013) and TROPICOS (2017). The recognized families are arranged following Cronquist (1981), and the genera and species under each family have been placed in an alphabetical order (Table 1). Bengali name have been cited based on interview with local people, and Huq (1986). Each species is supplemented by its habit, phenology and representative voucher specimen. The information on the uses of medicinal plants has been gathered through interview of the local people. The voucher specimens are preserved at DUSH.

Results and Discussion

The present study revealed the occurrence of 203 taxa under 174 genera and 75 families in Gafargaon upazila of Mymensingh district. Among them, Magnoliopsida is represented by 62 families, 140 genera and 167 taxa, while Liliopsida (Monocots) is represented by 13 families, 34 genera and 36 taxa. The identified taxa with their Bangla name, family name, habit, status of occurrences and voucher specimen are presented in Table 1.

The present study reveals that largest number of taxa are represented by herbs (106 taxa) followed by trees (54 taxa), shrubs (35 taxa) and climbers (8 taxa). The percentage of identified taxa in Gafargaon upazila is shown in Figure 2. Among the identified taxa 82% has been found as common and 18% as rare. In Magnoliopsida, Solanaceae is the largest family comprising 10 species under 7 genera, followed by Fabaceae (8 species), and Asteraceae and Amranthaceae (7 species each). In contrast, in Liliopsida, Poaceae is the largest family with 12 species under 10 genera followed by Araceae (6 species) and Arecaceae (5 species).

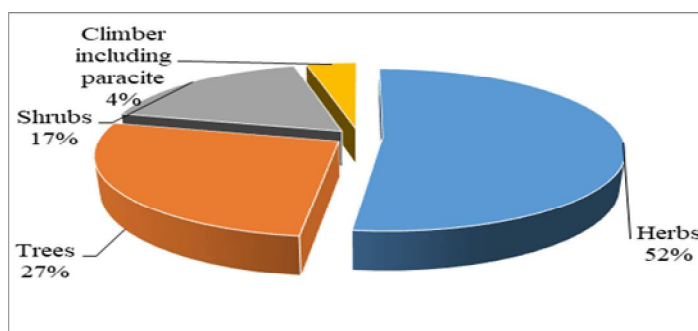


Fig. 2. Pie-chart showing the habitat analysis of identified taxa in Gafargaon upazila.

The families Basellaceae, Bombacaceae, Molluginaceae, Boraginaceae, Bromeliaceae, Capparaceae, Caricaceae, Chenopodiaceae, Commelinaceae, Cuscutaceae, Cyperaceae, Dilleniaceae, Ebenaceae, Elaeocarpaceae, Hydrocharitaceae, Lecythidaceae, Lemnaceae,

Marantaceae, Melastomataceae, Moringaceae, Musaceae, Oleaceae, Onagraceae, Papaveraceae, Pedaliaceae, Punicaceae, Rhamnaceae, Rosaceae, Salicaceae, Sapindaceae, Sapotaceae, Scrophulariaceae, Sterculiaceae, Tiliaceae, Ulmaceae and Vitaceae are represented by a single species. Ten dominant families of the study area are Poaceae, Solanaceae, Fabaceae, Asteraceae, Amaranthaceae, Caesalpiniaceae, Moraceae, Acanthaceae, Polygonaceae and Nymphaeaceae. The family Poaceae is the largest one represented by 12 species followed by Solanaceae with 10 species and Fabaceae with 8 species (Fig. 3).

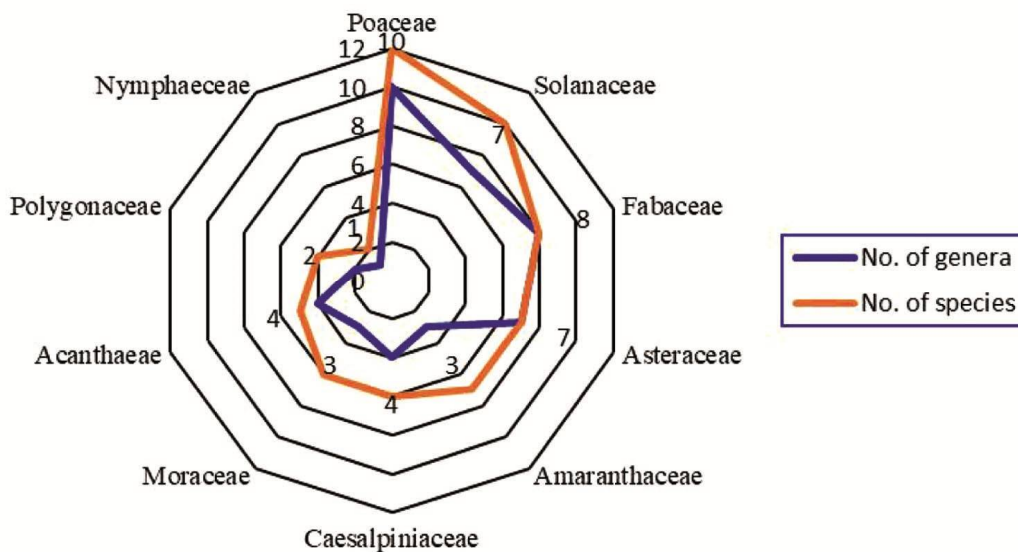


Fig. 3. Rader diagram showing ten dominant plant families of Gafargaon upazila with number of genera and species.

In the study area, some climbers, such as *Cissus adnata*, *Coccinia grandis*, *Cuscuta reflexa*, *Stephania japonica* etc. grow in homestead trees. Some of the most common trees found in the area include *Areca catechu*, *Albizia lebbeck*, *Borassus flabellifer*, *Dalbergia sissoo*, *Cocos nucifera* and *Phoenix sylvestris*. Commonly growing roadside plants are *Phyllanthus reticulatus*, *Glycosmis pentaphylla*, *Heliotropium indicum*, *Solanum nigrum*, *Croton bonplandianum*, *Dalbergia sissoo*, *Senna tora* etc. Most common homestead plants are *Hibiscus rosa-sinensis*, *Litchi chinensis*, *Artocarpus heterophyllus*, *Psidium guajava*, *Lawsonia inermis*, *Averrhoa carambola*, *Swietenia mahagoni* and *Punica granatum*. In the investigated area *Cardamine flexuosa*, *Oxystelma secamone*, *Phaulopsis imbricata*, *Piper sylvaticum*, *Stephania japonica* and *Trema orientalis* have been found as rare based on field observation. Gafargaon upazila is also endowed with different aquatic habitats including *beels*, ponds, tanks and other low-lying areas with seasonal water. Some of the important aquatic angiosperms are *Pistia stratiotes*, *Oxystelma secamone*, *Enhydra fluctuans*, *Ipomoea fistulosa*, *Ipomoea aquatica*, *Ottelia alismoides*, *Nymphaea pubescens*, *Nymphaea rubra*, *Lemna perpusilla*, *Ludwigia adscendens* and *Monochoria hastata*.

Table 1. Plant species of Gafargaon upazila of Mymensingh district with their Bengali names, habit, phenology, status of occurrence and vouchers.

Taxa	Bengali name	Habit	Phenology	Status of occurrence	Voucher number
MAGNOLIOPSIDA					
Annonaceae					
<i>Annona reticulata</i> L.	Ata	Tree	Oct-Jan	Common	Nusrat 01
<i>A. squamosa</i> L.	Sharifa	Tree	Mar-Dec	Common	Nusrat 57
<i>Polyalthia longifolia</i> (Sonn.) Thw.	Debdaru	Tree	Mar-Sep	Common	Nusrat 02
<i>Uvaria hamiltonii</i> Hook. f.	Latkan	Shrub	May-Oct	Common	Nusrat 65
Lauraceae					
<i>Cinnamomum camphora</i> Prain	Karpur	Tree	Mar-Jul	Common	Nusrat 28
<i>C. tamala</i> Nees & Eberm.	Tejpata	Tree	Feb-Oct	Common	Nusrat 182
<i>Litsea glutinosa</i> (Lour.) Robinson	Menda	Tree	Apr-Jan	Common	Nusrat 85
Piperaceae					
<i>Peperomia pellucida</i> (L.) Kunth	Luchipata	Herb	Jul-Sep	Common	Nusrat 191
<i>Piper nigrum</i> L.	Goolmorich	Climber	Aug-Dec	Common	Nusrat 97
<i>P. sylvaticum</i> Roxb.	Bon pan	Shrub		Rare	Nusrat 192
Nymphaeaceae					
<i>Nymphaea pubescens</i> Willd.	Saluk	Herb	Jan-Dec	Common	Nusrat 188
<i>Nymphaea rubra</i> Roxb. ex Salisb.	Lalsapla	Herb	Jul-Jan	Common	Nusrat 95
Menispermaceae					
<i>Stephania japonica</i> (Thunb.) Miers	Doipata	Climber	Jan-Dec	Rare	Nusrat 142
<i>Tinospora crispa</i> (T.) Hook. f.	Gulonchoe	Climber	Jan-Jun	Common	Nusrat 90
Papaveraceae					
<i>Argemone mexicana</i> L.	Sialkanta	Herb	Feb-Jun	Common	Nusrat 190
Ulmaceae					
<i>Trema orientalis</i> L.	Jinal	Tree	Dec-Apr	Rare	Nusrat 55
Moraceae					
<i>Artocarpus heterophyllus</i> Lamk.	Kanthal	Tree	Feb-Jun	Common	Nusrat 92
<i>A. laucha</i> Buch.-Ham.	Dewa	Tree	Apr-Aug	Common	Nusrat 145
<i>Ficus benghalensis</i> L.	Bot	Tree	May-Aug	Common	Nusrat 38
<i>F. hispida</i> L. f.	Dumur	Shrub	Apr-Sep	Common	Nusrat 186
<i>F. religiosa</i> L.	Ashwatha	Tree	Mar-Sep	Common	Nusrat 37
<i>Sreblus asper</i> Lour.	Sheora	Tree	Feb-Jun	Common	Nusrat 160
Urticaceae					
<i>Laportea crenulata</i> Gaud.	Churapata	Shrub	May-Sep	Common	Nusrat 112
<i>L. interrupta</i> L.	Bichuti	Herb	Aug-Nov	Rare	Nusrat 53
Nyctaginaceae					
<i>Boerhavia diffusa</i> L.	Punarnava	Herb	Apr-Aug	Common	Nusrat 39
<i>Bougainvillea spectabilis</i> Willd.	Baganbilash	Shrub	Jan-Dec	Common	Nusrat 94
<i>Mirabilis jalapa</i> L.	Shandhamalati	Herb	Mar-May	Common	Nusrat 147
Chenopodiaceae					
<i>Chenopodium album</i> L.	Bathua-shak	Herb	Dec-Mar	Common	Nusrat 20

Table 1 contd.

Taxa	Bengali name	Habit	Phenology	Status of occurrence	Voucher number
Amaranthaceae					
<i>Achyranthus aspera</i> L.	Apang	Herb	Jan-Dec	Rare	Nusrat 117
<i>Alternanthera philoxeroides</i> (Mart) Griseb.	Malancha shak	Herb	Mar-Jun	Common	Nusrat 163
<i>A. sessilis</i> (L.) DC.	Sachi-shak	Herb	Jan-Dec	Common	Nusrat 59
<i>Amaranthus blitum</i> L.	Natiyashak	Herb	Oct-Nov	Common	Nusrat 118
<i>A. spinosus</i> L.	Katanotay	Herb	Jan-Dec	Common	Nusrat 05
<i>A. tricolor</i> L.	Denga	Herb	Jan-Dec	Common	Nusrat 164
<i>A. viridis</i> L.	Notay-shak	Herb	Jan-Dec	Common	Nusrat 60
Basellaceae					
<i>Basella rubra</i> L.	Puishak	Herb	Nov-Mar	Common	Nusrat 173
Molluginaceae					
<i>Glinus oppositifolius</i> (L.) A. DC.	Ghema shak	Herb	Jan-Dec	Common	Nusrat 203
Polygonaceae					
<i>Persicaria flaccida</i> (Meissn.) H. Gross ex Loeseen	Lal bishkatali	Herb	Apr-Aug	Common	Nusrat 152
<i>P. hydropiper</i> (L.) Spach.	Biskatali	Herb	Apr-Aug	Common	Nusrat 101
<i>P. stagnina</i> (Buch-Ham. ex Meissn.) M.A. Hassan	Bara bishkatali	Herb	Apr-Dec	Common	Nusrat 102
<i>Rumex dentatus</i> L.	Daton	Herb	Jan-May	Common	Nusrat 196
Dilleniaceae					
<i>Dillenia indica</i> L.	Chalta	Tree	May-Feb	Common	Nusrat 23
Elaeocarpaceae					
<i>Elaeocarpus floribundus</i> Bl.	Jalpai	Tree	Mar-Dec	Common	Nusrat 77
Tiliaceae					
<i>Corchorus capsularis</i> L.	Deshipat	Herb	Jun-Nov	Common	Nusrat 111
Sterculiaceae					
<i>Abroma augusta</i> (L.) L. f.	Ulatkombal	Shrub	Jun-Dec	Rare	Nusrat 159
Bombacaceae					
<i>Bombax ceiba</i> L.	Shimultula	Tree	Jan-Apr	Common	Nusrat 127
Malvaceae					
<i>Abelmoschus esculentus</i> (L.) Moench	Dheros	Herb	Jan-Dec	Common	Nusrat 87
<i>Abutilon indicum</i> L.	Petari	Herb	Jul-Apr	Common	Nusrat 140
<i>Hibiscus rosa-sinensis</i> L.	Joba	Shrub	Jan-Dec	Common	Nusrat 202
<i>Sida cordata</i> (Burm.f.) Borss.	Junka	Herb	Aug-Feb	Common	Nusrat 184
<i>Urena lobata</i> L.	Bon okra	Shrub	Jan-Dec	Common	Nusrat 31
Lecythidaceae					
<i>Barringtonia acutangula</i> (L.) Gaertn.	Hijal	Tree	May-Sep	Common	Nusrat 138
Caricaceae					
<i>Carica papaya</i> L.	Pape	Herb	Jan-Dec	Common	Nusrat 19
Cucurbitaceae					
<i>Benincasa hispida</i> (Thunb.) Cogn.	Chalkumra	Climber	May-Nov	Common	Nusrat 21
<i>Coccinia grandis</i> (L.) Voigt.	Telakucha	Climber	Mar-Dec	Common	Nusrat 132

Table 1contd.

Taxa	Bengali name	Habit	Phenology	Status of occurrence	Voucher number
<i>Cucumis melo</i> L.	Baangi	Climber	Mar-Oct	Rare	Nusrat 177
<i>C. sativus</i> L.	Khira	Herb	Apr-Oct	Common	Nusrat 74
<i>Cucurbita maxima</i> Duch. ex Lamk.	Mistikumra	Herb	Apr-Oct	Common	Nusrat 75
Salicaceae					
<i>Salix tetrasperma</i> Roxb	Panihijal	Tree	Nov-Mar	Rare	Nusrat 51
Capparaceae					
<i>Crateva magna</i> (Lour.) DC.	Barun	Tree	Feb-May	Common	Nusrat 130
Brassicaceae					
<i>Cardamine flexuosa</i> With.	Not known	Herb	Feb-Jul	Rare	Nusrat 173
<i>Brassica napus</i> L.	Sorisha	Herb	Mar-Jul	Common	Nusrat 128
<i>Raphanus sativus</i> L.	Mula	Herb	Jan-May	Common	Nusrat 16
<i>Rorippa indica</i> (L.) Hiern	Bansarisa	Herb	Apr-Jan	Common	Nusrat 69
Moringaceae					
<i>Moringa oleifera</i> Lamk.	Sajna	Tree	Oct-Mar	Common	Nusrat 40
Sapotaceae					
<i>Manilkara zapota</i> (L.) P. Van Royen	Sofeda	Tree	Jan-Dec	Common	Nusrat 156
Ebenaceae					
<i>Diospyros malabarica</i> (Desr.) Kostel	Deshi gab	Tree	May-Aug	Rare	Nusrat 133
Rosaceae					
<i>Rosa chinensis</i> Jacq.	Golap	Shrub	Nov-Mar	Common	Nusrat 47
Mimosaceae					
<i>Acacia auriculiformis</i> A. Cunn. ex Benth.	Akashmoni	Tree	Jun-Feb	Common	Nusrat 185
<i>A. nilotica</i> (L.) Willd. ex Del.	Babla	Tree	Aug-May	Common	Nusrat 143
<i>Albizia lebbek</i> L.	Koroi	Tree	Apr-Oct	Common	Nusrat 35
<i>A. procera</i> (Roxb.) Benth	SilKoroi	Tree	Jun-Nov	Common	Nusrat 91
<i>Leucaena leucocephala</i> (Lam.) De Wit.	Ipl-ipl	Tree	Mar-Nov	Common	Nusrat 204
<i>Mimosa pudica</i> L.	Lajjaboti	Herb	Sep-Dec	Common	Nusrat
Caesalpinaceae					
<i>Cassia fistula</i> L.	Banarlathi	Tree	Mar-Jun	Common	Nusrat 175
<i>Delonix regia</i> Rafin.	Krisnochura	Tree	Apr-Sep	Common	Nusrat 70
<i>Senna occidentalis</i> Roxb.	Borakalkasuna	Herb	May-Oct	Common	Nusrat 129
<i>S. sophora</i> (L.) Roxb.	Kalkashunda	Shrub	Sep-Jul	Common	Nusrat 174
<i>S. tora</i> (L.) Roxb.	Chakunda	Herb	Jul-Dec	Common	Nusrat 18
<i>Tamarindus indica</i> L.	Tentul	Tree	Apr-Dec	Common	Nusrat 205
Fabaceae					
<i>Arachis hypogaea</i> L.	Badam	Herb	Mar-Dec	Common	Nusrat 25
<i>Cajanus cajan</i> (L.) Millsp.	Orhor	Shrub	Dec-Apr	Common	Nusrat 79
<i>Crotalaria pallida</i> Ait.	Jhun-jhuni	Herb	May-Dec	Rare	Nusrat 180
<i>Dalbergia sissoo</i> Roxb.	Sisso	Tree	Mar-Jun	Common	Nusrat 135
<i>Desmodium heterophyllum</i> (Willd.) DC.	Kodalia	Herb	Jan-Dec	Rare	Nusrat 26

Table 1 contd.

Taxa	Bengali name	Habit	Phenology	Status of occurrence	Voucher number
<i>Lablab purpureus</i> (L.) Sweet	Shim	Herb	Nov-Mar	Common	Nusrat 80
<i>Sesbania grandiflora</i> L.	Bakful	Tree	Oct-Feb	Common	Nusrat 179
<i>Vigna mungo</i> (L.) Hepper	Mashkalai	Herb	Nov-Jan	Common	Nusrat 136
Lythraceae					
<i>Lawsonia inermis</i> L.	Mahendi	Shrub	Jun-Dec	Common	Nusrat 30
Myrtaceae					
<i>Psidium guajava</i> L.	Payara	Tree	Apr-Sep	Common	Nusrat 187
<i>Syzygium cumini</i> L.	Kalojam	Tree	Apr-Jul	Common	Nusrat 93
Punicaceae					
<i>Punica granatum</i> L.	Dalim	Shrub	Jan-Dec	Common	Nusrat 197
Onagraceae					
<i>Ludwigia adscendens</i> (L.) Hara	Kesardam	Herb	Mar-Dec	Common	Nusrat 42
Melastomataceae					
<i>Melastoma malabathricum</i> L.	Ban tezpata	Shrub	Jan-Dec	Rare	Nusrat 88
Euphorbiaceae					
<i>Baccaurea ramiflora</i> Lour.	Lotkon/Bobi	Tree	Jun-Sep	Common	Nusrat 24
<i>Croton bonplandianus</i> Baill.	Croton	Herb	Jan-Dec	Common	Nusrat 178
<i>Phyllanthus reticulatus</i> Poir.	Chitki	Shrub	Mar-Oct	Common	Nusrat 134
<i>Ricinus communis</i> L.	Verenda	Shrub	Jan-Dec	Rare	Nusrat 78
Rhamnaceae					
<i>Ziziphus mauritiana</i> Lamk.	Boroi	Tree	Sep-Mar	Common	Nusrat 153
Vitaceae					
<i>Cissus adnata</i> Roxb.	Alingolata	Climber	Mar-Aug	Common	Nusrat 115
Sapindaceae					
<i>Litchi chinensis</i> Sonn.	Lichu	Tree	Apr-Jun	Common	Nusrat 107
Anacardiaceae					
<i>Mangifera indica</i> L.	Aam	Tree	Jan-Jun	Common	Nusrat 06
<i>Spondias pinnata</i> (L.f.) Kurz	Amra	Tree	Feb-Aug	Common	Nusrat 119
Meliaceae					
<i>Aphanamixis polystachya</i> (Wall.) R.N. Parker	Baididiraj	Tree	Feb-May	Rare	Nusrat 33
<i>Azadirachta indica</i> A. Juss.	Neem	Tree	Mar-Jul	Common	Nusrat 89
<i>Melia azedarach</i> L.	Ghoranim	Tree	Mar-Feb	Common	Nusrat 141
<i>Swietenia mahagoni</i> Jacq.	Mahagoni	Tree	Apr-Nov	Common	Nusrat 34
Rutaceae					
<i>Aegle marmelos</i> (L.) Correa	Bel	Tree	Apr-Dec	Common	Nusrat 48
<i>Citrus aurantifolia</i> (Christm. & Panzer) Swingle	Lebu	Shrub	Mar-Sep	Common	Nusrat 105
<i>Glycosmis pentaphylla</i> (Retz.) A.DC.	Motkila	Shrub	Jan-Dec	Common	Nusrat 155
<i>Zanthoxylum rhetsa</i> (Roxb.) DC.	Bajna	Tree	Mar-Sep	Common	Nusrat 106
Oxalidaceae					
<i>Averrhoa carambola</i> L.	Kamranga	Tree	Sep-Mar	Common	Nusrat 96
<i>Oxalis corniculata</i> L.	Amrul	Herb	Sep-May	Common	Nusrat 108

Table 1 contd.

Taxa	Bengali name	Habit	Phenology	Status of occurrence	Voucher number
Apiaceae					
<i>Centella asiatica</i> (L.) Urban	Thankuni	Herb	Apr-Dec	Rare	Nusrat 61
<i>Coriandrum savitum</i> L.	Dhony	Herb	Dec-Feb	Common	Nusrat 165
<i>Foeniculum vulgare</i> Mill.	Pan-mouri	Herb	Nov-Feb	Common	Nusrat 07
Apocynaceae					
<i>Alstonia scholaris</i> (L.) R.Br.	Chatim	Tree	Oct-Jun	Rare	Nusrat 166
<i>Carissa carandus</i> L.	Karamcha	Shrub	Apr-Oct	Common	Nusrat 167
<i>Catharanthus roseus</i> (L.) G. Don	Noyontara	Herb	Jan-Dec	Common	Nusrat 127
<i>Holarrhena antidysenterica</i> Flem.	Kurchi	Shrub	Apr-Dec	Common	Nusrat 08
<i>Rauvolfia serpentina</i> (L.) Benth.	Sarpagandha	Herb	Apr-Oct	Rare	Nusrat 62
<i>Tabernaemontana divaricata</i> (L.) R. Br. ex Roem. & Schult.	Togor	Shrub	May-Jan	Common	Nusrat 121
Asclepiadiaceae					
<i>Calotropis gigantea</i> L.	Akondo	Shrub	Jan-Dec	Rare	Nusrat 124
<i>Oxystelma secamone</i> (L.) Karst.	Dudhialata	Herb	Aug-Oct	Rare	Nusrat 12
Solanaceae					
<i>Capsicum frutescens</i> L.	Kacha-morich	Herb	Jan-Dec	Common	Nusrat 108
<i>Cestrum nocturnum</i> L.	Hasnahena	Shrub	Jan-Dec	Common	Nusrat
<i>Datura metel</i> L.	Datura	Shrub	Jan-Dec	Rare	Nusrat 201
<i>Lycopersicon esculentum</i> Mill.	Tomato	Herb	Oct-Apr	Common	Nusrat 50
<i>Nicotiana plumbaginifolia</i> Willd.	Ban-tamak	Herb	Mar-Dec	Common	Nusrat 109
<i>Physalis angulata</i> L.	Fotka	Herb	Feb-Aug	Common	Nusrat 52
<i>P. minima</i> L.	Chotofotka	Herb	Jan-Dec	Common	Nusrat 202
<i>Solanum melongena</i> L.	Begun	Herb	Oct-Mar	Common	Nusrat 158
<i>S. torvum</i> Swartz.	Gotabegun	Shrub	Jan-Dec	Common	Nusrat 110
<i>S. tuberosum</i> L.	Gol-alu	Herb	Jan-Mar	Common	Nusrat 54
Convolvulaceae					
<i>Ipomoea aquatica</i> Forssk.	Kolmishak	Herb	Jan-Dec	Common	Nusrat 176
<i>I. batatas</i> (L.) Lamk.	Misti-alu	Herb	Dec-May	Rare	Nusrat 73
<i>I. fistulosa</i> Mart. ex Choisy	Dholkolmi	Shrub	Jan-Dec	Common	Nusrat 131
Cuscutaceae					
<i>Cuscuta reflexa</i> Roxb.	Shornolata	Parasite	Aug-Mar	Rare	Nusrat 22
Boraginaceae					
<i>Heliotropium indicum</i> L.	Hatisur	Herb	Jan-Dec	Common	Nusrat 15
Verbenaceae					
<i>Clerodendrum viscosum</i> Vent.	Vat	Shrub	Jan-Jul	Common	Nusrat 199
<i>Lippia alba</i> (Mill.) Briton et Wilson	Gondhapata	Shrub	Jan-Dec	Common	Nusrat 113
<i>Tectona grandis</i> L.f.	Shegun	Tree	Jul-Nov	Common	Nusrat 56
Lamiaceae					
<i>Anisomeles indica</i> L.	Gobura	Herb	Oct-Jun	Rare	Nusrat 181
<i>Hyptis suaveolens</i> Poit.	Bilatitulsi	Herb	Jan-Dec	Common	Nusrat 27
<i>Leonurus sibiricus</i> Linn.	Roktodron	Herb	Jan-Dec	Rare	Nusrat 137
<i>Leucas aspera</i> (Willd.) Link	Dondokolos	Herb	Jan-Dec	Common	Nusrat 82
<i>Mentha viridis</i> L.	Pudinapata	Herb	Jul-Jun	Common	Nusrat 84
<i>Ocimum tenuiflorum</i> L.	Tulsi	Herb	Oct-Mar	Common	Nusrat 83

Table 1 contd.

Taxa	Bengali name	Habit	Phenology	Status of occurrence	Voucher number
Oleaceae					
<i>Jasminum sambac</i> (L.) Ait.	Beli	Shrub	Mar-Jul	Common	Nusrat 189
Scrophulariaceae					
<i>Scoparia dulcis</i> L.	Bandhony	Herb	Jan-Dec	Common	Nusrat 49
Acanthaceae					
<i>Andrographis paniculata</i> (Burm.f.) Wall.	Kalomegh	Herb	Nov-May	Common	Nusrat 116
<i>Justicia gendarussa</i> Burm. f.	Jagatmadan	Shrub	Dec-May	Common	Nusrat 162
<i>J. adhatoda</i> L.	Basok	Shrub	Jan-Apr	Common	Nusrat 03
<i>Nelsonia canescens</i> (Lamk.) Spreng.	Para-mul	Herb	Jan-Dec	Common	Nusrat 58
<i>Phaulopsis imbricata</i> (Forssk.) Sweet	Not known	Herb	Dec-Mar	Rare	Nusrat 04
Pedaliaceae					
<i>Sesamum indicum</i> L.	Til	Herb	Feb-Oct	Common	Nusrat 190
Rubiaceae					
<i>Ixora coccinea</i> L.	Rangon	Shrub	Jan-Dec	Common	Nusrat 198
<i>Morinda citrifolia</i> L.	Haldi kachu	Tree	May-Nov	Rare	Nusrat 104
<i>Neolamarckia cadamba</i> (Roxb.) Merr.	Kadom	Tree	Jul-Nov	Common	Nusrat 154
Asteraceae					
<i>Ageratum conyzoides</i> L.	Fulkuri	Herb	Nov-Jun	Common	Nusrat 13
<i>Blumea lacera</i> (Burm.f.) DC	Barakukshima	Herb	Nov-Jul	Common	Nusrat 170
<i>Chromolaena odorata</i> (L.) King & Robinson	Asamlata	Herb	Nov-May	Common	Nusrat 171
<i>Enhydra fluctuans</i> Lour.	Helencha	Herb	Jan-Apr	Common	Nusrat 125
<i>Mikania cordata</i> (Burm. f.) Robinson	Taralota	Herb	Oct-Feb	Common	Nusrat 68
<i>Spilanthes calva</i> DC.	Marhatatiga	Herb	Jan-Dec	Common	Nusrat 14
<i>Synedrella nodiflora</i> (L.) Gaertn.	Shialmoti	Herb	Jan-Dec	Common	Nusrat 126
LILIOPSIDA					
Hydrocharitaceae					
<i>Ottelia alismoides</i> (L.) Pers.	Panikola	Herb	June-Dec	Common	Nusrat 81
Arecaceae					
<i>Areca catechu</i> L.	Supari	Tree	Jan-Dec	Common	Nusrat 11
<i>Borassus flabellifer</i> L.	Tal	Tree	Jan-Oct	Common	Nusrat 123
<i>Calamus gracilis</i> Roxb.	Raton	Tree	Apr-Oct	Rare	Nusrat 66
<i>Cocos nucifera</i> L.	Narikel	Tree	Mar-Jul	Common	Nusrat 169
<i>Phoenix sylvestris</i> Roxb.	Khejur	Tree	Dec-Jul	Common	Nusrat 67
<i>Alocasia macrorrhizos</i> (L.) G. Don	Mankachu	Herb	Jul-Oct	Common	Nusrat 09
<i>Amorphollus bulbifer</i> Bl.	Ul kachu	Herb	May-Oct	Rare	Nusrat 63
<i>Colocasia esculenta</i> Schott	Kochu	Herb	May-Oct	Common	Nusrat 122
<i>Pistia stratiotes</i> L.	Topa-pana	Herb	Oct-Mar	Common	Nusrat 168
<i>Typhonium trilobatum</i> (L.) Schott.	Ghetkachu	Herb	Apr-Oct	Common	Nusrat 64
<i>Xanthosoma violaceum</i> Schott.	Dastorkachu	Herb	Apr-Oct	Common	Nusrat 10

Table 1 contd.

Taxa	Bengali name	Habit	Phenology	Status of occurrence	Voucher number
Lemnaceae					
<i>Lemna purpusilla</i> Torrey	Khudipana	Herb	Sep-Dec	Common	Nusrat 29
Commelinaceae					
<i>Commelina bengalensis</i> L.	Dholpata	Herb	Feb-Dec	Common	Nusrat 72
Cyperaceae					
<i>Cyperus compressus</i> L.	Chanch	Herb	Jan-Dec	Rare	Nusrat 76
Poaceae					
<i>Brachiaria kurzii</i> (Hook. f.) A. Camus	Not known	Herb	Jan-Dec	Rare	Nusrat 43
<i>B. mutica</i> Stapf	Para gash	Herb	Nov-Mar	Common	Nusrat 149
<i>Chrysopogon aciculatus</i> (Retz.) Trin.	Premkanta	Herb	Jan-Dec	Common	Nusrat 98
<i>Cynodon dactylon</i> (L.) Pers.	Durbaghas	Herb	Jul-Dec	Common	Nusrat 169
<i>Imperata cylindrica</i> (L.) P. Beauv	Ulookash	Shrub	Oct-Jan	Common	Nusrat 150
<i>Isachne globosa</i> (Thunb.) Kuntze	Not known	Herb	Jan-Dec	Rare	Nusrat 194
<i>Oryza latifolia</i> Desv.	Jangli dhan	Herb	Jul-Feb	Rare	Nusrat 99
<i>O. sativa</i> L.	Dhan	Herb	Sep-Jun	Common	Nusrat 44
<i>Panicum repens</i> L.	Dhanighas	Herb	Jan-Dec	Common	Nusrat 195
<i>Paspalum scrobiculatum</i> L.	Goicha	Herb	Jan-Dec	Common	Nusrat 46
<i>Saccharum spontenum</i> L.	Kash	Herb	Jan-Dec	Common	Nusrat 100
<i>Thysanolaena maxima</i> (Roxb.) Kuntze	Jharu phul	Herb	Sep-Apr	Rare	Nusrat 151
Bromeliaceae					
<i>Ananas comosus</i> (L.) Merr.	Anarosh	Herb	Feb-Jul	Common	Nusrat 17
Musaceae					
<i>Musa paradisiaca</i> L.	Kola	Herb	Jan-Dec	Common	Nusrat 146
Zingiberaceae					
<i>Curcuma longa</i> L.	Holud	Herb	Aug-Oct	Common	Nusrat 200
<i>Zingiber officinale</i> Rosc.	Ada	Herb	Sep-Nov	Common	Nusrat 161
Marantaceae					
<i>Schumannianthus dichotomus</i> (Roxb.) Gagnep.	Patibet	Shrub	Dec-Mar	Rare	Nusrat 32
Pontederiaceae					
<i>Eichhornia crassipes</i> (Mart.) Solms	Kachuripana	Herb	Jan-Dec	Common	Nusrat 45
<i>Monochoria hastata</i> (L.) Solms	Jolpana	Herb	Jan-Dec	Common	Nusrat 103
Liliaceae					
<i>Allium cepa</i> L.	Piyaj	Herb	Feb-Jun	Common	Nusrat 183
<i>A. sativum</i> L.	Rosun	Herb	Feb-Apr	Common	Nusrat 139
<i>Zephyranthes tubispatha</i> L.	Rain lily	Herb	Jun-Aug	Rare	Nusrat 86

Potential of the angiospermic flora

Medicinal Plants

Potential of plant species of Gafargaon upazila has been assessed and medicinal uses of the angiospermic flora by the local people have been recorded during field investigation. The study has identified 45 medicinal plants used for treatment of several diseases by the local people. The medicinal plant species with their part(s) used and uses are presented in Table 2.

Table 2. Medicinal plants of Gafargaon upazila along with their part(s) used and diseases.

Species	Part(s) used	Diseases
<i>Abroma augusta</i>	Root	Urinary problem & menstrual problems
<i>Achyranthus aspera</i>	Root	Jaundice
<i>Adhatoda zeylanica</i>	Leaf	Cold and cough
<i>Aegle marmelos</i>	Fruit, root	Dysentery and diarrhoea
<i>Ageratum conyzoides</i>	Leaf, stem, root	Fever, chronic ulcers and pneumonia
<i>Albizia procera</i>	Leaf, bark	Insecticide and fish poisoning
<i>Alstonia scholaris</i>	Bark	Asthma and fever
<i>Amaranthus spinosus</i>	Leaf, root, stem	Rheumatism, blood purifier and irregular menstruation
<i>A. viridis</i>	Whole plant	Snake-bite
<i>Annona reticulata</i>	Bark	Diarrhoea
<i>Aphanamixis polystachya</i>	Bark	Liver diseases and spleen
<i>Artocarpus heterophyllus</i>	Root	Asthma and diarrhoea
<i>Averrhoa carambola</i>	Fruit	Piles
<i>Blumea lacera</i>	Root	Mouth diseases
<i>Cajanus cajan</i>	Leaf	Diabetes and jaundice.
<i>Centella asiatica</i>	Whole plant	Ulcer and dysentery
<i>Clerodendrum viscosum</i>	Leaf, roots	Skin diseases, tumors and snake-bite
<i>Coccinia grandis</i>	Leaf	Skin diseases and diabetes
<i>Colocasia esculenta</i>	Leaf, corm	Astringent, scorpion bites and stimulant
<i>Commelina bengalensis</i>	Whole plant	Urinary burning, sores and itches
<i>Cuscuta reflexa</i>	Stem	Jaundice
<i>Cynodon dactylon</i>	Whole plant	Stop bleeding and toothache.
<i>Dillenia indica</i>	Fruit	Diarrhoea and dysentery
<i>Ficus hispida</i>	Fruit	Diabetes
<i>F. religiosa</i>	Bark	Toothache and skin diseases
<i>Glycosmis pentaphylla</i>	Leaf, stem	Jaundice and toothache
<i>Heliotropium indicum</i>	Leaf	Fever
<i>Holarrhena antidysenterica</i>	Bark	Dysentery and elephantiasis
<i>Hypis suaveolens</i>	Leaf, seed	Stomachache
<i>Litsia glutinosa</i>	Bark	Dysentery and diarrhoea
<i>Melia azedarach</i>	Leaf	Small pox, fever and antiseptic
<i>Mikania cordata</i>	Leaf	Wounds, itches and dyspepsia
<i>Mimosa pudica</i>	Root	Jaundice, blood pressure and ulcer
<i>Moringa oleifera</i>	Leaf, fruit, bark	Dysentery, vomiting, cold and cough and abscesses.
<i>Ocimum tenuiflorum</i>	Leaf	Gastric disorder, cold, cough and ring worm
<i>Oxalis corniculata</i>	Leaf	Antiscorbutic and antidote
<i>Peperomia pellucida</i>	Leaf	Asthma
<i>Phoenix sylvestris</i>	Fruit	Fever, Heart disease and abdominal complaints
<i>Piper nigrum</i>	Fruit	Fever and bronchitis
<i>Rauwolfia serpentina</i>	Root	Nervous agitation, high blood pressure and sound sleeping
<i>Scoparia dulcis</i>	Whole plant	Kidney problems and diabetes
<i>Sida cordata</i>	Fruit, flower	Burning complaints
<i>Solanum torvum</i>	Root	Cough and toothache
<i>Spilanthes calva</i>	Root	Toothache
<i>Syzygium cumini</i>	Leaf, seed, bark	Diabetes, chronic diarrhoea and sore throats

Economically and culturally important plant species

The present study shows the role of angiospermic flora in the local communities. The local people rely on surrounding plant wealth not only for their health care, but also for food and other life accessories. Apart from medicinal uses several species are economically and culturally important. The species having economic and cultural importance are documented in Table 3.

Table 3. Plant species of Gafargaon upazila having economic and cultural importance.

Species	Parts used	Economic and cultural importance
<i>Aegle marmelos</i>	Fruit, leaf	Fruits are edible. Leaves are used by Hindu community in religious festival
<i>Alstonia scholaris</i>	Wood	Used as furniture
<i>Annona squamosa</i>	Fruit	Fruits are edible
<i>Artocarpus heterophyllus</i>	Wood	Used as furniture
<i>Borassus flabellifer</i>	Fruit, leaf	Fruits are edible. Fibre is used in making mats, hats, brushes and brooms
<i>Cocos nucifera</i>	Fruit, leaf	As drinks. Fibre is used in making brushes and brooms. Also in religious festival fruits are used by the Hindu community
<i>Colocasia esculenta</i>	Whole plant	Used as vegetables
<i>Curcuma longa</i>	Rhizome	The Hindu community uses the rhizome in their religious festival
<i>Dillenia indica</i>	Fruit	Fruits are used as vegetable, also used in making pickles
<i>Ficus banghalensis</i>	Leaf	Leaves are employed by the Hindu people in their religious festival
<i>F. hispida</i>	Leaf	Leaves are used as vegetable
<i>F. religiosa</i>	Leaf	Leaves are employed by the Hindu people in their religious festival
<i>Glycosmis pentaphylla</i>	Twig	Young twigs are used as tooth-brush.
<i>Lawsonia inermis</i>	Leaf	Leaves are employed by the Hindu people in their religious festival
<i>Mangifera indica</i>	Leaf	Fruits edible. Leaves are used by the Hindu people in their religious festival
<i>Musa paradisiaca</i>	Fruit, leaf	Fruits edible. Leaves are employed by the Hindu people in their religious festival
<i>Ocimum tenuiflorum</i>	Whole plant	In religious festival the Hindu community used this whole plant
<i>Oxalis corniculata</i>	Whole plant	Used as leafy vegetables
<i>Phoenix sylvestris</i>	Fruit, leaf	Fruits are edible. Fibre is used in making mats, hats, brushes and brooms
<i>Solanum torvum</i>		Used as vegetables
<i>Syzigium cumini</i>	Wood	Used for high class furniture

The present study revealed a number of threats based on the observations and group discussion with local people which might lead to cause angiospermic flora to diminish. Some of the important threats to the flora are habitat degradation, modern agriculture, urbanization, over-exploitation of medicinal plants, lack of knowledge of collection technique, lack of awareness on biodiversity, and exotic plantation. Consequently, some species are extinct in the wild and many of them are at the verge of extinction. In order to save the plant resources from further annihilation urgent measures to be adopted for their conservation and sustainable uses including protection of

habitats, public awareness on biodiversity conservation, and applying both *ex-situ* and *in-situ* conservation approaches for the medicinal and threatened species.

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