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 Rauvolfia 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 sylviacum Roxb., Stephania japonica (Thunb.) Miers and Trema orientalis L. have been found to be rare in the investigated area. In order to preserve the 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
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 Areaceae (5 species).

![Fig. 2. Pie-chart showing the habitat analysis of identified taxa in Gafargaon upazila.](image-url)
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).

![Radder diagram showing ten dominant plant families of Gafargaon upazila with number of genera and species.](image)

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, Lemma perpusilla, Ludwigia adscendens* and *Monochoria hastata.*
Table 1. Plant species of Gafargaon upazila of Mymensigh district with their Bengali names, habit, phenology, status of occurrence and vouchers.

| Taxa                      | Bengali name | Habit | Phenology | Status of occurrence | Voucher number |
|---------------------------|--------------|-------|-----------|----------------------|----------------|
| **MAGNOLIOPSIDA**         |              |       |           |                      |                |
| Annonaceae                |              |       |           |                      |                |
| *Annona reticulata* L.   | Ata          | Tree  | Oct-Jan   | Common              | Nusrat 01      |
| *A. squamosa* L.          | Sharifa      | Tree  | Mar-Dec   | Common              | Nusrat 57      |
| *Polyalthia longifolia* (Sonn.) Thw. | Debdaru | Tree  | Mar-Sep   | Common              | Nusrat 02      |
| *Uvaria hamiltonii* Hook. f. | Latkan    | Shrub | May-Oct   | Common              | Nusrat 65      |
| Lauraceae                 |              |       |           |                      |                |
| *Cinnamomum camphora* Prain | Karpur     | Tree  | Mar-Jul   | Common              | Nusrat 28      |
| *C. tamala* Nees & Eberm. | Tejpata   | Tree  | Feb-Oct   | Common              | Nusrat 182     |
| *Lisaea glutinosa* (Lour.) Robinson | Menda | Tree  | Apr-Jan   | Common              | Nusrat 85      |
| Piperaceae                |              |       |           |                      |                |
| *Peperomia pellucida* (L.) Kunth | Luchipata | Herb  | Jul-Sep   | Common              | Nusrat 191     |
| *Piper nigrum* L.         | Goolmorich  | Climber | Aug-Dec | Common              | Nusrat 97      |
| *P. sylvaticum* Roxb.     | Bon pan     | Shrub |           | Rare                | Nusrat 192     |
| Nymphaeaceae              |              |       |           |                      |                |
| *Nymphaea pubescens* Wild. | Saluk      | Herb  | Jan-Dec   | Common              | Nusrat 188     |
| *Nymphaea rubra* Roxb. ex Salisb. | Lalsapla | Herb  | Jul-Jan   | Common              | Nusrat 95      |
| Menispermacae             |              |       |           |                      |                |
| *Stephania japonica* (Thunb.) Miers | Doipata | Climber | Jan-Dec | Rare                | Nusrat 142     |
| *Tinospora crispa* (T.) Hook. f. | Golonchoe | Climber | Jan-Jun  | Common              | Nusrat 90      |
| Papaveraceae              |              |       |           |                      |                |
| *Argemone mexicana* L.    | Sialkanta    | Herb  | Feb-Jun   | Common              | Nusrat 190     |
| Ulmaceae                  |              |       |           |                      |                |
| *Trema orientalis* L.     | Jinal        | Tree  | Dec-Apr   | Rare                | Nusrat 55      |
| Moraceae                  |              |       |           |                      |                |
| *Artocarpus heterophyllus* Lamk. | Kanthal | Tree  | Feb-Jun   | Common              | Nusrat 92      |
| *A. laucha* Buch.-Ham.    | Dewa         | Tree  | Apr-Aug   | Common              | Nusrat 145     |
| *Ficus bengalensis* L.    | Bot          | Tree  | May-Aug   | Common              | Nusrat 38      |
| *F. hispida* L. f.        | Dumur        | Shrub | Apr-Sep   | Common              | Nusrat 186     |
| *F. religiosa* L.         | Ashwatha     | Tree  | Mar-Sep   | Common              | Nusrat 37      |
| *Sreblus asper* Lour.     | Sheora       | Tree  | Feb-Jun   | Common              | Nusrat 160     |
| Urticaceae                |              |       |           |                      |                |
| *Laportea crenulata* Gaud. | Churapata | Shrub | May-Sep   | Common              | Nusrat 112     |
| *L. interrupta* L.        | Bichuti      | Herb  | Aug-Nov   | Rare                | Nusrat 53      |
| Nyctaginaceae             |              |       |           |                      |                |
| *Boerhavia diffusa* L.    | Punamava     | Herb  | Apr-Aug   | Common              | Nusrat 39      |
| *Bougainvillea spectabilis* Wild. | Baganilash | Shrub | Jan-Dec   | Common              | Nusrat 94      |
| *Mirabilis jalapa* L.     | Shandhamalati | Herb  | Mar-May   | Common              | Nusrat 147     |
| Chenopodiaceae            |              |       |           |                      |                |
| *Chenopodium album* L.    | Bathua-shak  | Herb  | Dec-Mar   | Common              | Nusrat 20      |
| Taxa                  | Bengali name | Habit | Phenology | Status of occurrence | Voucher number |
|----------------------|--------------|-------|-----------|----------------------|----------------|
| **Amaranthaceae**    |              |       |           |                      |                |
| Achyranthus aspera L.| Apang        | Herb  | Jan-Dec   | Rare                 | Nusrat 117     |
| Alternenthera philoxeroides (Mart) Griseb. | Malancha shak | Herb  | Mar-Jun   | Common               | Nusrat 163     |
| A. sessilis (L.) DC. | Sachi-shak   | Herb  | Jan-Dec   | Common               | Nusrat 59      |
| Amaranthus blitum L. | Natiyashak   | Herb  | Oct-Nov   | Common               | Nusrat 118     |
| A. spinosus L.       | Katanotay    | Herb  | Jan-Dec   | Common               | Nusrat 05      |
| A. tricolor L.       | Dengta       | Herb  | Jan-Dec   | Common               | Nusrat 164     |
| A. viridis L.        | Notay-shak   | Herb  | Jan-Dec   | Common               | Nusrat 60      |
| **Basellaceae**      |              |       |           |                      |                |
| Basella rubra L.     | Puishak      | Herb  | Nov-Mar   | Common               | Nusrat 173     |
| **Molluginaceae**    |              |       |           |                      |                |
| Glinus oppositifolius (L.) A. DC. | Ghema shak | Herb  | Jan-Dec   | Common               | Nusrat 203     |
| **Polygonaceae**     |              |       |           |                      |                |
| Persicaria flaccida (Meissn.) | Lal bishkatali | Herb  | Apr-Aug   | Common               | Nusrat 152     |
| H. Gross ex Loeseen  |              |       |           |                      |                |
| P. hydropiper (L.) Spach. | Biskatali    | Herb  | Apr-Aug   | Common               | Nusrat 101     |
| P. stagnina (Buch-Ham. ex Meissn.) | Bara bishkatali | Herb  | Apr-Dec   | Common               | Nusrat 102     |
| M.A. Hassan          |              |       |           |                      |                |
| Rumex dentatus L.    | Daton        | Herb  | Jan-May   | Common               | Nusrat 196     |
| **Dilleniaceae**     |              |       |           |                      |                |
| Dillenia indica L.   | Chalta       | Tree  | May-Feb   | Common               | Nusrat 23      |
| **Elaeocarpaceae**   |              |       |           |                      |                |
| Elaeocarpus floribundus Bl. | Jalpai   | Tree  | Mar-Dec   | Common               | Nusrat 77      |
| **Tiliaceae**        |              |       |           |                      |                |
| Corchorus capsularis L. | Deshiput    | Herb  | Jun-Nov   | Common               | Nusrat 111     |
| **Sterculiaceae**    |              |       |           |                      |                |
| Abroma augusta (L.) f. | Ulatkombal | Shrub  | Jun-Dec   | Rare                 | Nusrat 159     |
| **Bombacaceae**      |              |       |           |                      |                |
| Bombax ceiba L.      | Shimultula   | Tree  | Jan-Apr   | Common               | Nusrat 127     |
| **Malvaceae**        |              |       |           |                      |                |
| Abelmoschus esculentus (L.) Moench | Dheros | Herb  | Jan-Dec   | Common               | Nusrat 87      |
| Abutilon indicum L.  | Petari       | Herb  | Jul-Apr   | Common               | Nusrat 140     |
| Hibiscus rosa-sinensis L. | Joba | Shrub  | Jan-Dec   | Common               | Nusrat 202     |
| Sida cordata (Burm.f.) Borss. | Junka | Herb  | Aug-Feb   | Common               | Nusrat 184     |
| Urena lobata L.      | Bon okra     | Shrub  | Jan-Dec   | Common               | Nusrat 31      |
| **Lecythidaceae**    |              |       |           |                      |                |
| Barringtonia acutangula (L.) Gaertn. | Hijal | Tree  | May-Sep   | Common               | Nusrat 138     |
| **Caricaceae**       |              |       |           |                      |                |
| Carica papaya L.     | Pape         | Herb  | Jan-Dec   | Common               | Nusrat 19      |
| **Cucurbitaceae**    |              |       |           |                      |                |
| Benincasa hispida (Thunb.) Cogn. | Chalkumra | Climer  | May-Nov   | Common               | Nusrat 21      |
| Coccinia grandis (L.) Voigt. | Telakuchia | Climer  | Mar-Dec   | Common               | Nusrat 132     |
| Taxa | Bengali name | Habit | Phenology | Status of occurrence | Voucher number |
|------|-------------|-------|-----------|----------------------|---------------|
| *Cucumis melo* L. | Baangi | Climber | Mar-Oct | Rare | Nusrat 177 |
| *C. sativus* L. | Khira | Herb | Apr-Oct | Common | Nusrat 74 |
| *Cucurbita maxima* Duch. ex Lamk. | Mistikumra | Herb | Apr-Oct | Common | Nusrat 75 |
| *Salix tetrasperma* Roxb | Panihijal | Tree | Nov-Mar | Rare | Nusrat 51 |
| *Capparaceae* | | | | | |
| *Crateva magna* (Lour.) DC. | Barun | Tree | Feb-May | Common | Nusrat 130 |
| *Brassicaceae* | | | | | |
| *Cardamine flexuosa* With. | Not known | Herb | Feb-Jul | Rare | Nusrat 173 |
| *Brassica napus* L. | Sorisha | Herb | Mar-Jul | Common | Nusrat 128 |
| *Raphanus sativus* L. | Mula | Herb | Jan-May | Common | Nusrat 16 |
| *Rorippa indica* (L.) Hiern | Bansarisa | Herb | Apr-Jan | Common | Nusrat 69 |
| *Moringaceae* | | | | | |
| *Moringa oleifera* Lamk. | Sajna | Tree | Oct-Mar | Common | Nusrat 40 |
| *Sapotaceae* | | | | | |
| *Manilkara zapota* (L.) P. Van Royen | Sofeda | Tree | Jan-Dec | Common | Nusrat 156 |
| *Ebenaceae* | | | | | |
| *Diospyros malabarica* (Desr.) Kostel | Deshi gab | Tree | May-Aug | Rare | Nusrat 133 |
| *Rosaceae* | | | | | |
| *Rosa chinensis* Jacq. | Golap | Shrub | Nov-Mar | Common | Nusrat 47 |
| *Mimosaceae* | | | | | |
| *Acacia auriculiformis* A. Cunn. ex Benth. | Akashmoni | Tree | Jun-Feb | Common | Nusrat 185 |
| *A. nilotica* (L.) Willd. ex Del. | Babla | Tree | Aug-May | Common | Nusrat 143 |
| *Albizia lebbeck* L. | Koroi | Tree | Apr-Oct | Common | Nusrat 35 |
| *A. procera* (Roxb.) Benth | SilKoroi | Tree | Jun-Nov | Common | Nusrat 91 |
| *Leucaena leucocephala* (Lam.) De Wit. | Ipl-ipl | Tree | Mar-Nov | Common | Nusrat 204 |
| *Mimosa pudica* L. | Lajjaboti | Herb | Sep-Dec | Common | Nusrat |
| *Caesalpinaceae* | | | | | |
| *Cassia fistula* L. | Banarlathi | Tree | Mar-Jun | Common | Nusrat 175 |
| *Delonix regia* Rafin. | Krisnochura | Tree | Apr-Sep | Common | Nusrat 70 |
| *Senna occidentalis* Roxb. | Borakalkasuna | Herb | May-Oct | Common | Nusrat 129 |
| *S. sophera* (L.) Roxb. | Kalkashunda | Shrub | Sep-Jul | Common | Nusrat 174 |
| *S. tora* (L.) Roxb. | Chakunda | Herb | Jul-Dec | Common | Nusrat 18 |
| *Tamarindus indica* L. | Tentul | Tree | Apr-Dec | Common | Nusrat 205 |
| *Fabaceae* | | | | | |
| *Arachis hypogaea* L. | Badam | Herb | Mar-Dec | Common | Nusrat 25 |
| *Cajanus cajan* (L.) Millsp. | Orhor | Shrub | Dec-Apr | Common | Nusrat 79 |
| *Crotalaria pallida* Ait. | Jhun-jhuni | Herb | May-Dec | Rare | Nusrat 180 |
| *Dalbergia sissoo* Roxb. | Sisso | Tree | Mar-Jun | Common | Nusrat 135 |
| *Desmodium heterophyllum* (Willd.) DC. | Kodalia | Herb | Jan-Dec | Rare | Nusrat 26 |
| Taxa | Bengali name | Habit | Phenology | Status of occurrence | Voucher number |
|------|--------------|-------|-----------|----------------------|---------------|
| Lablab purpureus (L.) Sweet | Shim | Herb | Nov-Mar | Common | Nusrat 80 |
| Sesbania grandiflora L. | Bakful | Tree | Oct-Feb | Common | Nusrat 179 |
| Vigna mungo (L.) Hepper | Mashkalai | Herb | Nov-Jan | Common | Nusrat 136 |
| Lythraceae | Lawsonia inermis L. | Mahendi | Shrub | Jun-Dec | Common | Nusrat 30 |
| Myrtaceae | Psidium guajava L. | Payara | Tree | Apr-Sep | Common | Nusrat 187 |
| Syzygium cumini L. | Kalojam | Tree | Apr-Jul | Common | Nusrat 93 |
| Punicaceae | Punica granatum L. | Dalim | Shrub | Jan-Dec | Common | Nusrat 197 |
| Onagraceae | Ludwigia adscendens (L.) Hara | Kesardam | Herb | Mar-Dec | Common | Nusrat 42 |
| Melastomataceae | Melastoma malabathricum L. | Ban tezpata | Shrub | Jan-Dec | Rare | Nusrat 88 |
| Rhamnaceae | Ziziphus mauritiana Lamk. | Boroi | Tree | Sep-Mar | Common | Nusrat 153 |
| Vitaceae | Cissus adnata Roxb. | Alingolata | Climber | Mar-Aug | Common | Nusrat 115 |
| Sapindaceae | Litchi chinensis Sonn. | Lichu | Tree | Apr-Jun | Common | Nusrat 107 |
| Anacardiaceae | Mangifera indica L. | Aam | Tree | Jan-Jun | Common | Nusrat 06 |
| Spondias pinnata (L.f.) Kurz | Amra | Tree | Feb-Aug | Common | Nusrat 119 |
| Meliaceae | Aphananxixis polystachya (Wall.) R.N. Parker | Baiddiraj | Tree | Feb-May | Rare | Nusrat 33 |
| Azadirachta indica A. Juss. | Neem | Tree | Mar-Jul | Common | Nusrat 89 |
| Melia azedarach L. | Ghoranim | Tree | Mar-Feb | Common | Nusrat 141 |
| Swietenia mahagoni Jacq. | Mahagoni | Tree | Apr-Nov | Common | Nusrat 34 |
| Rutaceae | Aegle marmelos (L.) Correa | Bel | Tree | Apr-Dec | Common | Nusrat 48 |
| Citrus aurantiifolia (Christm. & Panzer) Swingle | Lebu | Shrub | Mar-Sep | Common | Nusrat 105 |
| Glycosmis pentaphylla (Retz.) A.DC. | Motkila | Shrub | Jan-Dec | Common | Nusrat 155 |
| Zanthoxylum rhetsa (Roxb.) DC. | Bajna | Tree | Mar-Sep | Common | Nusrat 106 |
| Oxalidaceae | Averrhoa carambola L. | Kamranga | Tree | Sep-Mar | Common | Nusrat 96 |
| Oxalis corniculata L. | Amrul | Herb | Sep-May | Common | Nusrat 108 |
Table 1 contd.

| Taxa                     | Bengali name | Habit   | Phenology      | Status of occurrence | Voucher number |
|--------------------------|--------------|---------|----------------|----------------------|----------------|
| Apiaceae                 |              |         |                |                      |                |
| Centella asiatica (L.) Urban | Thankuni     | Herb    | Apr-Dec        | Rare                | Nusrat 61      |
| Coriandrum sativum L.    | Dhony        | Herb    | Dec-Feb        | Common              | Nusrat 165     |
| Apocynaceae              |              |         |                |                      |                |
| Alstonia scholaris (L.) R.Br. | Chitim       | Tree    | Oct-Jun       | Rare                | Nusrat 166     |
| Carissa carandas L.      | Karamcha     | Shrub   | Apr-Oct       | Common              | Nusrat 167     |
| Catharanthus roseus (L.) G. Don | Noyontara  | Herb  | Jan-Dec       | Common              | Nusrat 127     |
| Holarrhena antidysenterica Flem. | Kurchi    | Shrub   | Apr-Dec       | Common              | Nusrat 08      |
| Rauvolfia serpentina (L.) Benth. | Sarpagandha | Herb  | Apr-Oct       | Rare                | Nusrat 62      |
| Tabernaemontana divaricata (L.) R. Br. ex Roem. & Schult. | Togor       | Shrub   | May-Jan       | Common              | Nusrat 121     |
| Asclepiadaceae           |              |         |                |                      |                |
| Calotropis gigantea L.   | Akondo       | Shrub   | Jan-Dec       | Rare                | Nusrat 124     |
| Oxytostima secamone (L.) Karst. | Duddhialata | Herb  | Aug-Oct       | Rare                | Nusrat 12      |
| Solanaceae               |              |         |                |                      |                |
| Capsicum frutescens L.   | Kacha-morich | Herb    | Jan-Dec       | Common              | Nusrat 108     |
| Cestrum nocturnum L.     | Hasnahena    | Shrub   | Jan-Dec       | Common              | Nusrat         |
| Datura metel L.          | Datura       | Shrub   | Jan-Dec       | Rare                | Nusrat 201     |
| Lycopersicon esculentum Mill. | Tomato     | Herb    | Oct-Apr       | Common              | Nusrat 50      |
| Nicotiana plumbaginifolia Willd. | Ban-tamak  | Herb   | Mar-Dec       | Common              | Nusrat 109     |
| Physalis angulata L.     | Fotka        | Herb    | Feb-Aug       | Common              | Nusrat 52      |
| P. minima L.             | Chotofotka   | Herb    | Jan-Dec       | Common              | Nusrat 202     |
| Solanum melongena L.     | Begun        | Herb    | Oct-Mar       | Common              | Nusrat 158     |
| S. torvum Swartz.        | Gotabegun    | Shrub   | Jan-Dec       | Common              | Nusrat 110     |
| S. tuberosum L.          | Gol-alu      | Herb    | Jan-Mar       | Common              | Nusrat 54      |
| Convolvulaceae           |              |         |                |                      |                |
| Ipomoea aquatica Forssk. | Kolmishak    | Herb    | Jan-Dec       | Common              | Nusrat 176     |
| I. batatas (L.) Lamk.    | Misti-alu    | Herb    | Dec-May       | Rare                | Nusrat 73      |
| I. fistulosa Mart. ex Choisy | Dholkolmi   | Shrub   | Jan-Dec       | Common              | Nusrat 131     |
| Cuscutaceae              |              |         |                |                      |                |
| Cuscuta reflexa Roxb.    | Shornolata   | Parasite | Aug-Mar      | Rare                | Nusrat 22      |
| Boraginaceae             |              |         |                |                      |                |
| Heliotropium indicum L.  | Hatisur      | Herb    | Jan-Dec       | Common              | Nusrat 15      |
| Verbenaceae              |              |         |                |                      |                |
| Clerodendrum viscosum Vent. | Vat          | Shrub   | Jan-Jul       | Common              | Nusrat 199     |
| Lippia alba (Mill.) Briton et Wilson | Gondhapata | Shrub   | Jan-Dec       | Common              | Nusrat 113     |
| Tectona grandis L.f.     | Shegun       | Tree    | Jul-Nov       | Common              | Nusrat 56      |
| Lamiaceae                |              |         |                |                      |                |
| Anisomeles indica L.     | Gobura       | Herb    | Oct-Jun       | Rare                | Nusrat 181     |
| Hymis suaveolens Poit.   | Bilatitulsi  | Herb    | Jan-Dec       | Common              | Nusrat 27      |
| Leonurus sibiricus Linn. | Roktedron    | Herb    | Jan-Dec       | Rare                | Nusrat 137     |
| Leucas aspera (Willd.) Link | Dondokolos  | Herb    | Jan-Dec       | Common              | Nusrat 82      |
| Mentha viridis L.        | Pudinapata   | Herb    | Jul-Jun       | Common              | Nusrat 84      |
| Ocimum tenuiflorum L.    | Tulsi        | Herb    | Oct-Mar       | Common              | Nusrat 83      |
Table 1 contd.

| Taxa                      | Bengali name | Habit | Phenology  | Status of occurrence | Voucher number |
|---------------------------|--------------|-------|------------|----------------------|----------------|
| Oleaceae                  |              |       |            |                      |                |
| *Jasminum sambac* (L.) Ait. | Beli         | Shrub | Mar-Jul    | Common               | Nusrat 189     |
| Scrophulariaceae          |              |       |            |                      |                |
| *Scoparia dulcis* L.      | Bandhony     | Herb  | Jan-Dec    | Common               | Nusrat 49      |
| Acanthaceae               |              |       |            |                      |                |
| *Andrographis paniculata* (Burm.f.) Wall. | Kalomegh | Herb | Nov-May    | Common               | Nusrat 116     |
| *Justicia gendarussa* Burm. f. | Jagatmadan | Shrub | Dec-May    | Common               | Nusrat 162     |
| *Nelosonia canescens* (Lamk.) Spreng. | Para-mul   | Herb  | Jan-Dec    | Common               | Nusrat 58      |
| *Phaulopsis imbricata* (Forssk.) | Not known   | Herb  | Dec-Mar    | Rare                 | Nusrat 04      |
| Pedaliaceae               |              |       |            |                      |                |
| *Sesamum indicum* L.      | Rangon       | Shrub | Jan-Dec    | Common               | Nusrat 198     |
| Rubiaceae                 |              |       |            |                      |                |
| *Ixora coccinea* L.       | Haldi kachu  | Tree  | May-Nov    | Rare                 | Nusrat 104     |
| *Morinda citrifolia* L.   | Kadam        | Tree  | Jul-Nov    | Common               | Nusrat 154     |
| *Neolamarckia cadamba* (Roxb.) Merr. |       |       |            |                      |                |
| Asteraceae                |              |       |            |                      |                |
| *Ageratum conyzoides* L.  | Fullkuri     | Herb  | Nov-Jun    | Common               | Nusrat 13      |
| *Blumea lacera* (Burm.f.) DC | Barakukshima | Herb | Nov-Jul    | Common               | Nusrat 170     |
| *Chromolaena odorata* (L.) King & Robinson | Asamulata | Herb | Nov-May    | Common               | Nusrat 171     |
| *Enhydra fluctuans* Lour. | Helencha     | Herb  | Jan-Apr    | Common               | Nusrat 125     |
| *Mikania cordata* (Burm. f.) | Taralota   | Herb  | Oct-Feb    | Common               | Nusrat 68      |
| Robinson                  |              |       |            |                      |                |
| *Spilanthes calva* DC.    | Marhatatiga  | Herb  | Jan-Dec    | Common               | Nusrat 14      |
| *Synedrella nodiflora* (L.) Gaertn. | Shialmoti | Herb  | Jan-Dec    | Common               | Nusrat 126     |
| LILIOPSIDA                |              |       |            |                      |                |
| Hydrocharitaceae          |              |       |            |                      |                |
| *Ottelia alismoides* (L.) Pers. | Panikola | Herb  | June-Dec   | Common               | Nusrat 81      |
| Areaceae                  |              |       |            |                      |                |
| *Areca catechu* L.        | Supari       | Tree  | Jan-Dec    | Common               | Nusrat 11      |
| *Borassus flabellifer* L. | Tal          | Tree  | Jan-Oct    | Common               | Nusrat 123     |
| *Calamus gracilis* Roxb.  | Raton        | Tree  | Apr-Oct    | Rare                 | Nusrat 66      |
| *Cocos nucifera* L.       | Narikel      | Tree  | Mar-Jul    | Common               | Nusrat 169     |
| *Phoenix sylvestris* Roxb. | Khejur      | Tree  | Dec-Jul    | Common               | Nusrat 67      |
| *Alocasia macrorrhizos* (L.) G. Don | Mankachu | Herb  | Jul-Oct    | Common               | Nusrat 09      |
| *Amophollus bulbifer* Bl. | Ul kachu     | Herb  | May-Oct    | Rare                 | Nusrat 63      |
| *Colocasia esculenta* Schott | Kochu     | Herb  | May-Oct    | Common               | Nusrat 122     |
| *Pistia stratiotes* L.    | Topa-pana    | Herb  | Oct-Mar    | Common               | Nusrat 168     |
| *Typhonium trilobatum* (L.) Schott. | Ghetkachu | Herb  | Apr-Oct    | Common               | Nusrat 64      |
| *Xanthosoma violaceum* Schott. | Dastorkachu | Herb  | Apr-Oct    | Common               | Nusrat 10      |
Table 1 contd.

| Taxa             | Bengali name | Habit | Phenology | Status of occurrence | Voucher number |
|------------------|--------------|-------|-----------|----------------------|----------------|
| **Lemnaceae**    |              |       |           |                      |                |
| *Lemna purpurilla* Torrey | Khudipana    | Herb  | Sep-Dec   | Common               | Nusrat 29      |
| **Commelinaceae**|              |       |           |                      |                |
| *Commelina bengalensis* L. | Dholpata     | Herb  | Feb-Dec   | Common               | Nusrat 72      |
| **Cyperaceae**   |              |       |           |                      |                |
| *Cyperus compressus* L. | Chanch       | Herb  | Jan-Dec   | Rare                 | Nusrat 76      |
| **Poaceae**      |              |       |           |                      |                |
| *Brachiaria kurzii* (Hook. f.) A. Camus | Not known | Herb  | Jan-Dec   | Rare                 | Nusrat 43      |
| *B. mutica* Stapf | Para gash    | Herb  | Nov-Mar   | Common               | Nusrat 149     |
| *Chrysopogon aciculatus* (Retz.) Trin. | Premkanta    | Herb  | Jan-Dec   | Common               | Nusrat 98      |
| *Cynodon dactylon* (L.) Pers. | Durbaghas   | Herb  | Jul-Dec   | Common               | Nusrat 169     |
| *Imperata cylindrica* (L.) P. Beauv | Ulookash | Shrub  | Oct-Jan   | Common               | Nusrat 150     |
| *Isachne globosa* (Thunb.) Kuntze | Not known | Herb  | Jan-Dec   | Rare                 | Nusrat 194     |
| *Oryza latifolia* Desv. | Jangli dhan | Herb  | Jul-Feb   | Rare                 | Nusrat 99      |
| *O. sativa* L. | Dhan          | Herb  | Sep-Jun   | Common               | Nusrat 44      |
| *Panicum repens* L. | Dhanighas    | Herb  | Jan-Dec   | Common               | Nusrat 195     |
| *Paspalum scrobiculatum* L. | Goicha        | Herb  | Jan-Dec   | Common               | Nusrat 46      |
| *Saccharum spontanum* L. | Kash        | Herb  | Jan-Dec   | Common               | Nusrat 100     |
| *Thysanolaena maxima* (Roxb.) Kuntze | Jharu phul | Herb  | Sep-Apr   | Rare                 | Nusrat 151     |
| **Bromeliaceae** |              |       |           |                      |                |
| *Ananas comosus* (L.) Merr. | Anarosh   | Herb  | Feb-Jul   | Common               | Nusrat 17      |
| **Musaceae**     |              |       |           |                      |                |
| *Musa paradisiaca* L. | Kola       | Herb  | Jan-Dec   | Common               | Nusrat 146     |
| **Zingiberaceae**|              |       |           |                      |                |
| *Curcuma longa* L. | Holud       | Herb  | Aug-Oct   | Common               | Nusrat 200     |
| *Zingiber officinale* Rosc. | Ada      | Herb  | Sep-Nov   | Common               | Nusrat 161     |
| **Marantaceae**  |              |       |           |                      |                |
| *Schumannianthus dichotomus* (Roxb.) Gagnep. | Patibet | Shrub  | Dec-Mar   | Rare                 | Nusrat 32      |
| **Pontederiaceae**|              |       |           |                      |                |
| *Eichhornia crassipes* (Mart.) Solms | Kachuripana | Herb  | Jan-Dec   | Common               | Nusrat 45      |
| *Monochoria hastata* (L.) Solms | Jolpana | Herb  | Jan-Dec   | Common               | Nusrat 103     |
| **Liliaceae**    |              |       |           |                      |                |
| *Allium cepa* L. | Piyaj        | Herb  | Feb-Jun   | Common               | Nusrat 183     |
| *A. sativum* L. | Rosun        | Herb  | Feb-Apr   | Common               | Nusrat 139     |
| *Zephyranthes tubispatha* 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.
| Species                  | Part(s) used | Diseases                                      |
|-------------------------|-------------|----------------------------------------------|
| Abroma augusta          | Root        | Urinary problem & menstrual problems         |
| Achyranthus aspera      | Root        | Jaundice                                     |
| Adhatoda zeylanica      | Leaf        | Cold and cough                               |
| Aegle marmelos          | Fruit, root | Dysentery and diarrhoea                      |
| Ageratum conyzoides     | Leaf, stem, root | Fever, chronic ulcers and pneumonia       |
| Albizia procera         | Leaf, bark  | Insecticide and fish poisoning               |
| Alstonia scholaris      | Bark        | Asthma and fever                             |
| Amaranthus spinosus     | Leaf, root, stem | Rheumatism, blood purifier and irregular menstruation |
| A. viridis              | Whole plant | Snake-bite                                   |
| Annona reticulata       | Bark        | Diarrhoea                                    |
| Aphanamixis polystachya| Bark        | Liver diseases and spleen                    |
| Artocarpus heterophyllus| Root        | Asthma and diarrhoea                         |
| Averrhoa carambola       | Fruit       | Piles                                        |
| Blumea lacera           | Root        | Mouth diseases                               |
| Cajanus cajan           | Leaf        | Diabetes and jaundice                        |
| Centella asiatica       | Whole plant | Ulcer and dysentery                         |
| Clerodendrum viscosum   | Leaf, roots | Skin diseases, tumors and snake-bite         |
| Coccinia grandis        | Leaf        | Skin diseases and diabetes                   |
| Colocasia esculenta     | Leaf, corm  | Astringent, scorpion bites and stimulant     |
| Commelina bengalensis   | Whole plant | Urinary burning, sores and itching           |
| Cuscuta reflexa         | Stem        | Jaundice                                     |
| Cynodon dactylon        | Whole plant | Stop bleeding and toothache.                 |
| Dillenia indica         | Fruit       | Diarrhoea and dysentery                      |
| Ficus hitipada          | Fruit       | Diabetes                                     |
| F. religiosa            | Bark        | Toothache and skin diseases                  |
| Glycosmis pentaphylla   | Leaf, stem  | Jaundice and toothache                       |
| Heliotropium indicum    | Leaf        | Fever                                        |
| Holarrhena antidysenterica| Bark       | Dysentery and elephantiasis                  |
| Hypis suaveolens        | Leaf, seed  | Stomachache                                  |
| Litsia glutinosa        | Bark        | Dysentery and diarrhoea                      |
| Melia azedarach         | Leaf        | Small pox, fever and antiseptic              |
| Mikania cordata         | Leaf        | Wounds, itches and dyspepsia                 |
| Mimosa pudica           | Root        | Jaundice, blood pressure and ulcer           |
| Moringa oleifera        | Leaf, fruit, bark | Dysentery, vomiting, cold and cough and abscesses. |
| Ocimum tenuiflorum      | Leaf        | Gastric disorder, cold, cough and ring worm  |
| Oxalis corniculata      | Leaf        | Antiscorbutic and antidote                   |
| Peperomia pellucida     | Leaf        | Asthma                                       |
| Phoenix sylvestris      | Fruit       | Fever, Heart disease and abdominal complaints|
| Piper nigrum            | Fruit       | Fever and bronchitis                         |
| Rauwolfia serpentina    | Root        | Nervous agitation, high blood pressure and sound sleeping |
| Scoparia dulcis         | Whole plant | Kidney problems and diabetes                 |
| Sida cordata            | Fruit, flower | Burning complaints                            |
| Solanum torvum          | Root        | Cough and toothache                          |
| Spilanthis calva        | Root        | Toothache                                    |
| Syzygium cumini         | 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                                                                                                                                 |
|--------------------------|------------|----------------------------------------------------------------------------------------------------------|
| *Aegle marmelos*         | Fruit, leaf| Fruits are edible. Leaves are used by Hindu community in religious festival                               |
| *Alstonia scholaris*     | Wood       | Used as furniture                                                                                       |
| *Annona squamosa*        | Fruit      | Fruits are edible                                                                                       |
| *Artocarpus heterophyllus* | Wood    | Used as furniture                                                                                       |
| *Borassus flabellifer*   | Fruit, leaf| Fruits are edible. Fibre is used in making mats, hats, brushes and brooms                               |
| *Cocos nucifera*         | Fruit, leaf| As drinks. Fibre is used in making brushes and brooms. Also in religious festival fruits are used by the Hindu community |
| *Colocasia esculenta*    | Whole plant| Used as vegetables                                                                                     |
| *Carciuma longa*         | Rhizome    | The Hindu community uses the rhizome in their religious festival                                        |
| *Dillenia indica*        | Fruit      | Fruits are used as vegetable, also used in making pickles                                               |
| *Ficus banghalelsis*     | Leaf       | Leaves are employed by the Hindu people in their religious festival                                     |
| *F. hispida*             | Leaf       | Leaves are used as vegetable                                                                          |
| *F. religiosa*           | Leaf       | Leaves are employed by the Hindu people in their religious festival                                     |
| *Glycosmis pentaphylla*  | Twig       | Young twigs are used as tooth-brush.                                                                     |
| *Lawsonia inermis*       | Leaf       | Leaves are employed by the Hindu people in their religious festival                                     |
| *Mangifera indica*       | Leaf       | Fruits edible. Leaves are used by the Hindu people in their religious festival                          |
| *Musa paradisiaca*       | Fruit, leaf| Fruits edible. Leaves are employed by the Hindu people in their religious festival                      |
| *Ocimum tenuiflorum*     | Whole plant| In religious festival the Hindu community used this whole plant                                        |
| *Oxalis corniculata*     | Whole plant| Used as leafy vegetables                                                                                |
| *Phoenix sylvestris*     | Fruit, leaf| Fruits are edible. Fibre is used in making mats, hats, brushes and brooms                               |
| *Solanum torvum*         |            | Used as vegetables                                                                                     |
| *Syzygium cumini*        | 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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