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ANGIOSPERMS IN NARSINGDI DISTRICT OF BANGLADESH: CLASS LILIOPSIDA

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Abstract

This study provides the taxonomic data on 168 plant species belonging to 96 genera and 23 families of Liliopsida (monocotyledons) extant in Narsingdi district of Bangladesh. These species are mostly comprised of herbs (90.48%), followed by trees and shrubs (4.76% each). Poaceae with 66 species under 37 genera is the best represented family, followed by Cyperaceae with 26 species of seven genera, Araceae with 16 species of 11 genera, Commelinaceae with 11 species of four genera and Arecaceae with 10 species of eight genera. *Cyperus* with 13 species appears as the largest genus, which is followed by *Panicum* with nine species, *Digitaria* with six species, and *Commelina* and *Dioscorea* with five species each. The six upazilas of this district are 39.77% similar in the species composition of their Liliopsida, but the similarity between the pairs of upazilas varies from 6.45% to 32.31%. Roadside and fallow land habitats share the highest similarity (36.84%) in species composition. Total 117 species are distinguished as economically useful. This study suggests for implementation of necessary measures in order to minimize the major threats to this plant group and to favor its sustainable development in the study area.

Introduction

Narsingdi district, situated in central Bangladesh, is a densely populated industrial area. The plant genetic-, species- and ecosystem diversities of this area might have a tremendous influence on the environment of this region. Nevertheless, the floristic elements and natural vegetation are rapidly decreasing in this district. Most of the areas of this district harboring its flora and plant diversity are being replaced by urbanization with numerous infrastructures, industrialization, habitat fragmentation, agricultural expansion and other human interventions. Considering the current trend of destruction and fragmentation of natural habitats, many plant species might disappear from this area before they are recorded and described.

After Hooker (1872-1897) and Prain (1903), some floristic studies covered the area of the present political boundary of Bangladesh including this district (Siddiqui *et al*., 2007 and Ahmed *et al*., 2008). Many other studies were conducted in different areas of this country (Rahman and Hassan, 1995; Islam *et al*., 2009; Arefin *et al*., 2011; Rahman *et al*., 2012; Rahman, 2013; Sarker *et al*., 2013; Rahman *et al*., 2015; Haque *et al*., 2018; Shetu *et al*., 2018). However, the flora or plant diversity of this district has never been studied before based on detail field inventories and examination of plant specimens, except the checklist of its 468 species of Magnoliopsida (Dicotyledons) recently published by Khanam *et al*. (2020). Thus, the Liliopsida and other plant groups of this area are left yet unexplored. Therefore, this study was conducted to fetch the basic taxonomic data on Liliopsida species extant in Narsingdi district, to know their current specific distribution and economic importance, to collect and preserve their representative specimens for future reference, and to identify the existing threats to their species diversity.

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Materials and Methods

Narsingdi district, located in between 23º46'N and 24º14′N and 90º35′E and 90º60′E (http://www.narsingdi.gov.bd), is comprised of an area of 1140.76 sq. km (BBS, 2011). The area is administered under six upazilas, namely Belabo, Monohardi, Narsingdi Sadar, Palash, Raipura, and Shibpur. It is composed of mostly plain lands including numerous agricultural fields, many industries, a huge fallow lands, many low and wet lands, some small hills, and densely populated homestead areas. This area includes a total of 89045 hectares of cultivable land and 22154 hectares of fallow land. In this area, the maximum and minimum annual average temperature are 36°C and 12.7°C, respectively, and the annual rainfall is 2376 mm (BBS, 2011). The main rivers crossing this district are Meghna, Arial Khan, Haridhoa, Kalagachhia and Paharia.

This study was based on field data accumulated by thorough taxonomic inventories comprised of 32 field trips conducted in different seasons of 2014-2019 throughout the study area and laboratory data collected through the examination of representative specimens of each plant taxon. The collection, processing, drying and preservation of plant specimens were done following standard herbarium methods and techniques (Bridson and Forman, 1989; Singh and Subramaniam, 2008). All plant specimens of Liliopsida collected from the study area were examined at Plant Systematics and Biodiversity Laboratory of Jahangirnagar University and Bangladesh National Herbarium (DACB). The specimens were identified by consulting taxonomic descriptions and keys available in the relevant literatures (Hooker, 1872-1897; Prain, 1903; Nasir and Ali, 1980-2005; Wu and Raven, 2000; Wu *et al*., 2006-2010), and by matching with the respective voucher specimens of DACB and Jahangirnagar University Herbarium (JUH). Additionally, the relevant specimen images including those of types available in the web pages of different international herbaria, especially of Royal Botanic Gardens Kew (K), and the Conservatoire et Jardin botaniques de la Ville de Genève (G), and pertinent illustration of Flora of China (Wu and Raven, 2000; Wu *et al*., 2006-2010) were matched. The voucher specimens of all taxa studied are preserved at JUH.

Recent literatures (Wu and Raven, 2000; Wu *et al*., 2006-2010; Zuloaga *et al*., 2008; Jørgensen *et el*. 2014; Schatz *et al*., 2020) and nomenclatural databases (The Plant List, 2013; TROPICOS, 2017; IPNI, 2018; Madagascar Catalogue, 2020) were consulted for nomenclatural verification. The common names were collected from Huq (1986), Siddiqui *et al*. (2007), Ahmed *et al*. (2008) and through interviews with local people during field visits. In the checklist, the families are arranged following Cronquist (1981), and all genera and species alphabetically (Table 1). However, in case of the Liliaceae taxa, their new combination under three separate families, *viz*. Hypoxidaceae, Amarylidaceae and Asparagaceae, and the recent circumscription of Aloaceae under Asphodelaceae, accepted by APG IV System (Angiosperm Phylogeny Group, 2016), are followed. The economic uses of the species were recognized consulting the relevant literatures (Ghani, 1998; Van Valkenburg and Bunyapraphatsara, 2002; Siddiqui *et al*., 2007; and Ahmed *et al*., 2008) and through interviews with the local people during the field visits. The similarities in the upazilas of the study area and habitats in species composition were measured by Jaccard coefficient (Jaccard, 1912).

Results and Discussion

This study confirmed the current occurrence of total 168 species of monocotyledons (Liliopsida) under 96 genera and 23 families in Narsingdi district. All of these species are presented here in the checklist with habit, habitat, distribution within the study area, and representative specimen examined (Table 1). Among the monocot families documented by this study, only five were represented by more than 10 (10-66) species each and 10 by single species

Table 1. List of the species of Liliopsida (monocotyledons) extant in Narsingdi district, Bangladesh.

Scientific name	Bangla name	Habit	Habitat	Distribution	Use	RSE (JUH)
Liliopsida Batsch						
Alismataceae Vent.						
Sagittaria guayanensis Kunth	-	Herb, aq	WL	B, M	Fd	Robayda 2635
Hydrocharitaceae Juss.						
Ottelia alismoides (L.) Pers.	Ramkarala, Shamakola	Herb, aq	WL	R, NS, M	V	Robayda 2235
Najas gracillima (A. Braun ex Engelm.) Magnus	-	Herb, aq	WL	NS, M, R	FF	Robayda 2372
Potamogetonaceae Bercht. & J. Presl						
Potamogeton crispus L.	-	Herb, aq	WL	R	-	Robayda 2374
Arecaceae Bercht. & J. Presl						
Areca catechu L.	Supari	Tree	RS FL, SJ (pl)	All Upazilas	M, T	Robayda 1799
Borassus flabellifer L.	Tal	Tree	RS FL, SJ (pl)	All Upazilas	Fr, M, T, Ju	Robayda 695
Calamus gracilis Roxb.	Mapuri Bet	Shrub	SJ, ML, FL	B, M, S	DU	Robayda 2316
C. longisetus Griff.	Uddom Bet	Shrub	SJ, FL	B, NS, M, S	DU	Robayda 48
Caryota urens L.	Chau Gota	Tree	SJ, FL	B, M, S	-	Robayda 1083
Cocos nucifera L.	Narikel	Tree	RS FL, ML (pl)	All Upazilas	Fr, T, Ol	Robayda 1774
Dypsis lutescens (H. Wendl.) Beentje & J. Dransf.	-	Tree	RS, ML	P	O	Robayda 1272
Elaeis guineensis Jacq.	-	Tree	RS	P	Ol	Robayda 1458
Phoenix acaulis Roxb.	Khudi khejur	Tree	RS, SJ, ML	P, S	Fr	Robayda 1647
P. sylvestris (L.) Roxb.	Khejur	Tree	RS, FL, SJ	All Upazilas	Fr	Robayda 1338
Pandanaceae R. Br.						
Pandanus amaryllifolius Roxb.	Polao Pata	Shrub	SJ, FL,	S, M	Sp	Robayda 2213
P. foetidus Roxb.	Keya-kanta	Shrub	SJ, FL(pl)	M	-	Robayda 15
Araceae Juss.						
Alocasia acuminata Schott	-	Herb	SJ, FL, ML	B, M, S	-	Robayda 85
A. fornicata (Roxb.) Schott	Salukachu	Herb	SJ, FL, ML	S, M, NS	V	Robayda 1171
A. macrorrhizos (L.) G. Don	Mankachu, Fankachu	Herb	FL, AF, SJ	B, NS, M	V	Robayda 2580

Scientific name	Bangla name	Habit	Habitat	Distribution	Use	RSE (JUH)
Amorphophallus bulbifer (Roxb.) Blume	Janglee Ool	Herb	SJ, FL, ML	B, M, S, NS	V	Robayda 2559
Colocasia affinis Schott	-	Herb	SJ, FL	M, S	-	Robayda 2225
C. esculenta (L.) Schott	Kachu	Herb	RS, FL, ML	All Upazilas	V	Robayda 327
C. gigantea (Blume) Hook. f.	Salad Kachu	Herb	RS, FL, SJ	All Upazilas	V	Robayda 2584
Dieffenbachia seguine (Jacq.) Schott	-	Herb	FL, SJ, ML	P, B	O	Robayda 1104
Lasia spinosa (L.) Thwaites	Kanta Kachu	Herb	SJ, FL	M	V	Robayda 2496
Lemna perpusilla Torr.	Khudipana	Herb, aq	WL	All Upazilas	FF	Robayda 2681
Pistia stratiotes L.	Topa pana	Herb, aq	WL	All Upazilas	M	Robayda 1226
Pothos scandens L.	Batilata	Herb	SJ, RS, FL	S, M, B	M	Robayda 49
Scindapsus officinalis (Roxb.) Schott	Gaj-pipul	Herb	FL, SJ	P, M	M	Robayda 1569
Syngonium podophyllum Schott	-	Herb	FL, SJ, ML	P, S	O	Robayda 1555
Typhonium flagelliforme (Lodd.) Blume	Ghechu	Herb	FL, AF, SJ	P, M, NS	-	Robayda 636
T. trilobatum (L.) Schott	Ghetkachu	Herb	FL, AF, SJ	All Upazilas	V	Robayda 693
Commelinaceae Mirb.						
Commelina benghalensis L.	Kanchira	Herb	RS, FL, ML, SJ	All Upazilas	V, M	Robayda 524
C. diffusa Burm. f.	-	Herb	RS, FL, SJ	P, B	-	Robayda 2014
C. erecta L.	Jata kanchira	Herb	RS, FL, SJ	All Upazilas	-	Robayda 312
C. longifolia Lam.	Pani Kanchira	Herb	AF, FL	R, S	-	Robayda 1346
C. suffruticosa Blume	-	Herb	SJ, RS, FL	NS	-	Robayda 2803
Cyanotis axillaris (L.) D. Don ex Sweet	-	Herb	AF, SJ, RS	B, R	-	Robayda 1206
C. cristata (L.) D. Don	-	Herb	AF, RS, FL	P, S	-	Robayda 2849
Floscopa scandens Lour.	-	Herb	FL, SJ,	P, S	-	Robayda 2324
Murdannia loriformis (Hassk.) R.S. Rao & Kammathy	Kanduli/Kureli	Herb	RS, FL	NS, B	-	Robayda 728
M. nudiflora (L.) Brenan	-	Herb	RS, FL	All Upazilas	-	Robayda 1954

Scientific name	Bangla name	Habit	Habitat	Distribution	Use	RSE (JUH)
M. spirata (L.) G. Brückn.	-	Herb	RS, FL	P	-	Robayda 1205
Cyperaceae Juss.						
Bulbostylis barbata (Rottb.) C.B. Clarke	-	Herb	ML, RS	P	SB	Robayda 2979
Cyperus alopecuroides Rottb.	-	Herb	WL, ML	P	-	Robayda 2858
C. compressus L.	Chanch	Herb	AF, FL,RS	All Upazilas	-	Robayda 496
C. cuspidatus Kunth	-	Herb	WL, RS, FL, AF	NS, B, M	-	Robayda 181
C. cyperoides (L.) Kuntze	-	Herb	WL, AF, FL	R, B	-	Robayda 2987
C. difformis L.	Behua	Herb	AF, WL, ML, FL	All Upazilas	-	Robayda 914
C. digitatus Roxb.	-	Herb	WL, AF, ML	S	-	Robayda 540
C. distans L. f.	Pani Malanga	Herb	AF, WL, RS	All Upazilas	-	Robayda 1637
C. exaltatus Retz.	-	Herb	RS, AF, WL	All Upazilas	-	Robayda 125
C. haspan L.	-	Herb	WL, AF, FL	S, NS, R	-	Robayda 192
C. imbricatus Retz.	Burethi	Herb	WL, AF, FL	NS	DU	Robayda 2056
C. iria L.	Barachucha	Herb	WL, AF	B, M, P	DU	Robayda 1678
C. procerus Rottb.	-	Herb	FL, WL, AF	NS	DU	Robayda 465
C. rotundus L.	Mutha	Herb	RS, FL, ML	NS, S	M	Robayda 472
Eleocharis dulcis (Burm. f.) Trin. ex Hensch.	-	Herb	WL	R	-	Robayda 3025
Fimbristylis acuminata Vahl	-	Herb	WL, RS	S, M, NS	-	Robayda 170
F. dichotoma (L.) Vahl	-	Herb	AF, WL	S, M	-	Robayda 621
F. ferruginea (L.) Vahl	-	Herb	AF, WL, ML	NS	SB	Robayda 2049
F. quinquangularis (Vahl) Kunth	Bara javani	Herb	AF, WL	NS, S, M, B	-	Robayda 172
Kyllinga brevifolia Rottb.	-	Herb	FL, AF, RS	M, P, S, R	Fd	Robayda 970
K. nemoralis (J.R. Forst. & G. Forst.) Dandy ex Hutch. & Dalziel	-	Herb	RS, FL	All Upazilas	-	Robayda 323
K.. odorata Vahl	-	Herb	RS, FL	All Upazilas	-	Robayda 2390

Scientific name	Bangla name	Habit	Habitat	Distribution	Use	RSE (JUH)
Pycreus pumilus (L.) Nees	-	Herb	WL	S	SB	Robayda 191
P. stramineus C.B.Clarke	-	Herb	RS, FL	NS, M	-	Robayda 2723
Schoenoplectus juncoides (Roxb.) Palla	-	Herb	WL, AF, ML	P	-	Robayda 1440
S. supinus (L.) Palla	-	Herb	AF, WL, FL	S	-	Robayda 180
Poaceae Barnhart						
Apluda mutica L.	-	Herb	RS, SJ, ML	R	Fd	Robayda 3078
Arundo donax L.	Nal	Herb	FL, ML	All Upazilas	Fd, DU	Robayda 625
Axonopus compressus (Sw.) P. Beauv.	Carpet grass	Herb	RS, FL, ML	All Upazilas	SB	Robayda 214
Bambusa balcooa Roxb.	Borak Bans	Herb	SJ, FL	All Upazilas	DU	Robayda 1319
B. jaintiana Majumdar	Tengra bans/ Chhip bans	Herb	SJ, FL	S, M, B	DU	Robayda 2228
B. nutans Wall. ex Munro	Mahal Bans	Herb	SJ, RS	M, B, S	DU	Robayda 72
B. vulgaris Schrad. ex J.C. Wendl.	Jaoa Bans	Herb	SJ	S	DU	Robayda 2227
Brachiaria brizantha (Hochst. ex A. Rich.) Stapf	-	Herb	AF	R	SB, Fd	Robayda 3135
B. distachya (L.) Stapf	Cori ghas	Herb	FL, ML	P, B	SB, Fd	Robayda 892
B. kurzii (Hook. f.) A. Camus	-	Herb	RS, SJ	R	Fd	Robayda 3026
Centotheca lappacea (L.) Desv.	-	Herb	RS, WL	S	Fd	Robayda 59
Chloris barbata Sw.	-	Herb	RS, FL, AF	P	Fd	Robayda 598
C. virgata Sw.	-	Herb	RS	NS	Fd	Robayda 559
Chrysopogon aciculatus (Retz.) Trin.	Premkanta	Herb	RS, FL	S, R	SB, DU	Robayda 1822
C. zizanioides (L.) Roberty	Bena, Bena-mul	Herb	ML, FL	NS, R	Ol, DU	Robayda 2381
C. fulvus (Spreng.) Chiov.	-	Herb	RS, FL	P	Fd	Robayda 288
Coix lacryma-jobi L.	Kaich Gota	Herb	FL, SJ	B, M	Fd	Robayda 2596
Cynodon dactylon (L.) Pers.	Durbaghas	Herb	RS, FL	All Upazilas	Fd	Robayda 290
Cyrtococcum oxyphyllum (Hochst. ex Steud.) Stapf	-	Herb	SJ, FL	M	Fd	Robayda 1058

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Dactyloctenium aegyptium (L.) Willd.	Makra	Herb	AF, FL	NS, R	Fd	Robayda 2724
Digitaria bicornis (Lam.) Roem. & Schult.	-	Herb	RS, SJ	NS, P, R	Fd	Robayda 280
D. ciliaris (Retz.) Koeler	-	Herb	RS, FL, AF	NS	Fd	Robayda 2053
D. ischaemum (Schreb.) Muhl.		Herb	FL, AF	P	-	Robayda 2985
D. sanguinalis (L.) Scop.	Makunjali	Herb	FL, RS, AF	P, S, M	Fd	Robayda 161
D. setigera Roth	-	Herb	RS, FL, ML	P, NS	Fd	Robayda 291
D. ternata (A. Rich.) Stapf	-	Herb	RS, FL	NS, B	Fd	Robayda 543
Echinochloa colona (L.) Link	Shama Ghas	Herb	RS, AF, FL, ML	All Upazilas	-	Robayda 538
Eleusine indica (L.) Gaertn.	Ghora Dubboher	Herb	RS, FL, AF	All Upazilas	SB	Robayda 182
Eragrostis cilianensis (All.) Vignolo ex Janch.	-	Herb	RS, SJ	S	Fd	Robayda 3095
E. ciliaris (L.) R. Br.	-	Herb	RS, FL	S	Fd	Robayda 410
E. tenella (L.) P. Beauv. ex Roem. & Schult.	Koni Ghas	Herb	FL, RS, AF	All Upazilas	Fd	Robayda 1938
E. unioloides (Retz.) Nees	-	Herb	RS, FL	All Upazilas	Fd, GM	Robayda 2929
Eriochloa procera (Retz.) C.E. Hubb.	-	Herb	AF, ML	R	Fd	Robayda 3068
Hygroryza aristata (Retz.) Nees ex Wight & Arn.	-	Herb	WL, AF	R, M, NS	Fd	Robayda 3065
Ichnanthus pallens (Sw.) Munro ex Benth.	-	Herb	RS, FL	All Upazilas	Fd	Robayda 2665
Imperata cylindrica (L.) Raeusch.	Chhan	Herb	FL, AF	All Upazilas	SB	Robayda 683
Isachne globosa (Thunb.) Kuntze	-	Herb	AF, FL	M	Fd	Robayda 1137
Leersia hexandra Sw.	Arali ghas	Herb	RS, FL, ML	P, S	Fd	Robayda 702
Leptochloa chinensis (L.) Nees	-	Herb	WL, AF	B	Fd	Robayda 3052
Oplismenus burmanni (Retz.) P. Beauv.	-	Herb	RS, FL	M, R, P	Fd	Robayda 1900
O. compositus (L.) P. Beauv.	Gohur	Herb	FL, SJ	M, P	-	Robayda 1565
Oryza sativa L.	Dhan	Herb	AF (cu)	All Upazilas	FG, Ol	Robayda 681
Panicum brevifolium L.	-	Herb	FL, ML	P, B	-	Robayda 2183
P. humile Steud.	-	Herb	RS, FL	P, R	Fd	Robayda 3136

Scientific name	Bangla name	Habit	Habitat	Distribution	Use	RSE (JUH)
P. incomtum Trin.	-	Herb	FL, ML	R, NS	-	Robayda 2388
P. luzonense J. Presl	-	Herb	FL	B	-	Robayda 2819
P. maximum Jacq.	Gini ghas	Herb	AF, FL	S	Fd	Robayda 184
P. notatum Retz.	-	Herb	RS, SJ, AF	NS, P, R	-	Robayda 701
P. paludosum Roxb.	Borali	Herb	WL, ML	P	-	Robayda 682
P. repens L.	-	Herb	RS, SJ	P	-	Robayda 2988
P. miliaceum L.	-	Herb	RS, AF	S	Fd	Robayda 216
Paspalidium flavidum (Retz.) A. Camus	Karin Ghas	Herb	RS, FL	P, NS	Fd	Robayda 740
Paspalum distichum L.	-	Herb	ML, WL	P, NS	SB	Robayda 2984
P. scrobiculatum L.	Goicha	Herb	FL, WL	NS, S, P	M	Robayda 217
Phragmites karka (Retz.) Trin. ex Steud.	Nalkhagra	Herb	ML, WL	NS	Fd	Robayda 483
Rottboellia cochinchinensis (Lour.) Clayton	Bara Swati	Herb	AF, RS	NS, R	-	Robayda 2052
Saccharum officinarum L.	Aakh	Herb	ML	P, NS	Ju, Sg	Robayda 751
Sacciolepis indica (L.) Chase	-	Herb	RS, FL	S	Fd	Robayda 219
S. interrupta (Willd.) Stapf	-	Herb	FL, AF	P	Fd	Robayda 2996
S. myosuroides (R. Br.) Chase ex E.G. Camus	-	Herb	ML, AF	P	-	Robayda 725
Setaria barbata (Lam.) Kunth	-	Herb	RS, ML	S	-	Robayda 218
Sorghum bicolor (L.) Moench	Dedhan, Jowar	Herb	AF (cu)	NS	FG	Robayda 2061
Sporobolus diandrus (Retz.) P. Beauv.	Bina Joni	Herb	RS, AF	B, NS	Fd	Robayda 2387
S. indicus (L.) R. Br.	-	Herb	AF, WL	S	-	Robayda 1495
Urochloa setigera (Retz.) Stapf	-	Herb	RS, AF	R, S	-	Robayda 2897
Zea mays L.	Bhutta	Herb	AF (cu)	NS	FG	Robayda 2433
Bromeliaceae Juss.						
Ananas comosus (L.) Merr.	Anarash	Herb	RS (cu)	NS	Fr, M	Robayda 1502
Musaceae Juss.						
Musa paradisiaca L.	Kola	Herb	RS, AF	All Upazilas	Fr	Robayda 1782

Scientific name	Bangla name	Habit	Habitat	Distribution	Use	RSE (JUH)
Zingiberaceae Martinov						
Alpinia zerumbet (Pers.) B.L. Burtt & R.M. Sm.	Bara Elachi	Herb	SJ, FL	B	O	Robayda 2418
Curcuma longa L.	Halud	Herb	AF, FL (cu)	P, S	Sp	Robayda 791
C. zedoaria (Christm.) Roscoe	Shoti	Herb	RS, FL, SJ	B, M	BF, M	Robayda 2302
Hedychium coronarium J. Koenig	Dolon Chapa	Herb	ML, FL	M	O, M	Robayda 2510
Zingiber officinale Roscoe	Ada	Herb	FL, ML (cu)	All Upazilas	Sp, M	Robayda 1036
Z. zerumbet (L.) Roscoe ex Sm.	Bon Ada	Herb	SJ, RS	B, M	M	Robayda 2649
Costaceae Nakai						
Cheilocostus speciosus (J. Koenig) C.D. Specht	Keomul	Herb	RS, SJ	M, B, R	M	Robayda 1874
Cannaceae Juss.						
Canna indica L.	Kalabati	Herb	RS, FL	All Upazilas	O, M	Robayda 655
Marantaceae R. Br.						
Maranta arundinacea L.	Shitalpati	Herb	ML, RS	B, M	BF, DU	Robayda 2617
Schumannianthus dichotomus (Roxb.) Gagnep.	Tikhur Ararut	Herb	ML, FL	M	DU	Robayda 2530
Pontederiaceae Kunth						
Eichhornia crassipes (Mart.) Solms	Kachuripana	Herb, aq	WL	All Upazilas	GM, Fd	Robayda 1012
Monochoria hastata (L.) Solms	Baranukha	Herb	WL, AF	P, M, S, R	-	Robayda 197
M. vaginalis (Burm. f.) C. Presl	Chhotonukha	Herb	WL, AF	R	M	Robayda 3118
Hypoxidaceae R. Br.						
Curculigo orchioides Gaertn.	Talmuli	Herb	SJ	B, M, P	M	Robayda 57
Asphodelaceae Juss.						
Aloe vera (L.) Burm. f.	Gritakumari	Herb	FL (pl)	NS, M	O, M	Robayda 2504

Scientific name	Bangla name	Habit	Habitat	Distribution	Use	RSE (JUH)
Amaryllidaceae J. St.-Hil.						
Allium cepa L.	Peaj	Herb	AF, ML	P, R, S	V, Sp	Robayda 1479
A. sativum L.	Rasun	Herb	AF, ML	P	Sp, M	Robayda 1603
Crinum asiaticum L.	Sukhdarshan	Herb	FL, SJ	P, M	O, M	Robayda 754
Zephyranthes carinata Herb.	Golapi Ghasphul	Herb	RS, FL	B, P, NS	O	Robayda 2503
Asparagaceae Juss.						
Asparagus racemosus Willd.	Shatamuli	Herb	RS, ML	NS	M	Robayda 475
Cordyline fruticosa (L.) A. Chev.	Patabahar	Shrub	FL (pl)	M, B	O	Robayda 1733
Dracaena reflexa Lam.	-	Shrub	RS, SJ	NS, M	O	Robayda 2457
D. spicata Roxb.	-	Shrub	SJ, RS, FL	B, S	-	Robayda 2190
Sansevieria trifasciata Prain	Sutahara	Herb	RS, FL	B, NS	M	Robayda 1499
Smilacaceae Vent.						
Smilax ovalifolia Roxb. ex D. Don	Kumarilata	Shrub, cl	SJ, FL	M, B	M	Robayda 2189
Dioscoreaceae R. Br.						
Dioscorea alata L.	Chupri alu	Herb, tw	RS, SJ	M, NS	V	Robayda 1037
D. bulbifera L.	Mou Alu	Herb, tw	RS, SJ, FL	All Upazilas	V	Robayda 2322
D. hamiltonii Hook. f.	Thakan budo	Herb, tw	SJ, FL	S, M	V	Robayda 128
D. kamoonensis Kunth	Erabera Lata	Herb, tw	SJ, RS	All Upazilas	-	Robayda 2630
D. pentaphylla L.	Jhum Alu/Kanta Alu	Herb, tw	SJ, RS, FL	R, B, P	V	Robayda 2401
Orchidaceae Juss.						
Geodorum densiflorum (Lam.) Schltr.	-	Herb	SJ, FL	M, P, S	O	Robayda 563

LEGEND: Habit. aq = aquatic, cl = climbing, tw = twiner. Habitat. AF = Agricultural Field, FL = Fallow Land, ML = Marginal Land, RS = Roadsides, SJ = Scrub Jungle, WL = Wet Land, cu = Cultivated, Pl = Planted, Distrib. = Distribution. B = Belabo, M = Monohordi, NS = Narsingdi Sadar, P = Palash, R = Raipura, S = Shibpur. Use. BF = Baby Food, DU = Domestic Use, Fd = Fodder, FF = Fish Feed, FG = Food Grain, Fr = Fruit, GM = Green Mannure, Ju = Juice Yielding, M = Medicine, O = Ornamental, Ol = Oil, SB = Soil Binder, Sg = Sugar, Sp = Spice, T = Timber and V = Vegetable, RSE = Representative Specimens Examined.

each. Poaceae with 66 species of 37 genera was appeared as the largest family in the study area, followed by Cyperaceae with 26 species of seven genera, Araceae with 16 species of 11 genera, Commelinaceae with 11 species of four genera and Arecaceae with 10 species of eight genera. *Cyperus* L. comprising 13 species was the best-represented monocot genus in this area, which was followed by *Panicum* L. with nine species, *Digitaria* Haller with six species, *Commelina* L. and *Dioscorea* L. with five species each. Rest of the families of the study area were consisted of two or three species each. Most of the species (152 species; 90.48%) were herbs, and trees and shrubs comprised only eight species (4.76%) each. The fallow lands harboring the highest number of species (102 species) comprised the most common type of habitat for the monocots in the study area that were followed by roadsides (80 species), scrub jungles (56 species), agricultural fields (55 species), marginal lands (42 species) and wetlands (36 species). Thus, these data indicate that Narsingdi district is still rich in monocotyledonous species and most of which are herbs and grow in fallow lands and roadsides.

The similarities between the habitats of the study area in species composition, measured by Jaccard coefficient (Fig. 1), shows that roadside and fallow land habitats share the highest similarity (36.84%), whereas the roadsides and wetland the lowest (4.5%). The similarity in species composition in between other pairs of habitats fluctuates from 4.5% (Roadside and Wetland) to 36.84% (Fallow land and Scrub jungle).

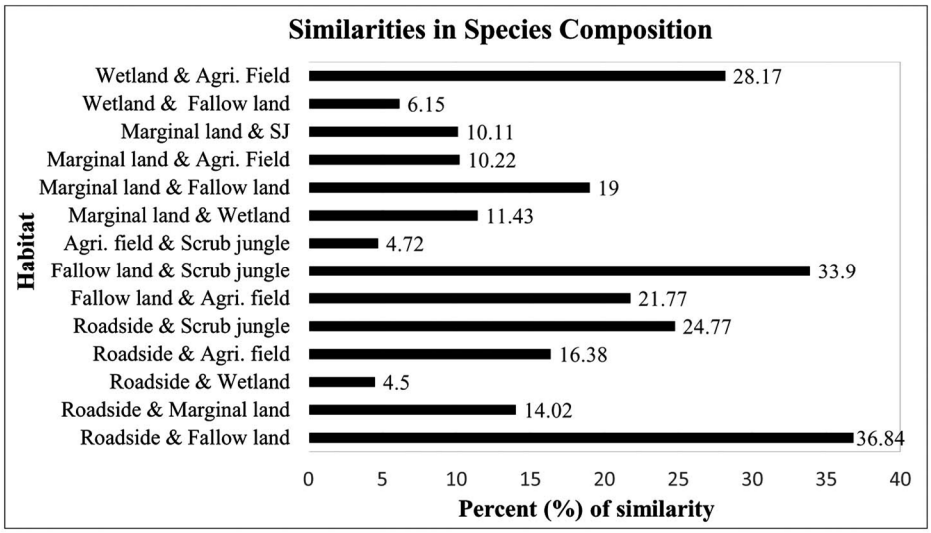

Fig. 1. Similarity in species composition in different habitats of Narsingdi district based on Jaccard coefficient (Jaccard, 1912).

In Narsingdi district, total 35 species, were commonly distributed in its all upazilas, 48 species in two upazilas, 27 species in three upazilas and only five species in four upazilas. 14 species were exclusively present in Palash, 12 in Shibpur, 11 in Narsingdi Sadar, seven in Raipura, six in Monohordi and only three in Belabo upazila. Monohordi upazila accommodated total 84 species, which was followed by Palash, Shibpur, Narsingdi Sadar, Belabo and Raipura upazilas harboring 81, 80, 79, 72 and 64 species, respectively. These data conclude that the monocot flora is richer in Palash, Belabo, Monohordi, and Shibpur upazilas, in comparison to that of Narsingdi Sadar and Raipura upazilas. However, if these species enumerations are considered in term of total

land areas of these upazilas, then their sequence turns in to Palash, followed by Belabo, Monohordi, Shibpur, Narsingdi Sadar, and Raipura upazilas. According to the data from Jaccard coefficient (Fig. 2), all of the six upazilas of Narsingdi district shares 39.77% similarity in their species composition, which indicates that the species composition in these upazilas are more different rather than similar. However, if the similarity is compared in between any pair of the upazilas only, it fluctuates remarkably, from 6.45% (in Belabo and Raipura upazilas) to 32.31% (in Monohordi and Belabo upazilas).

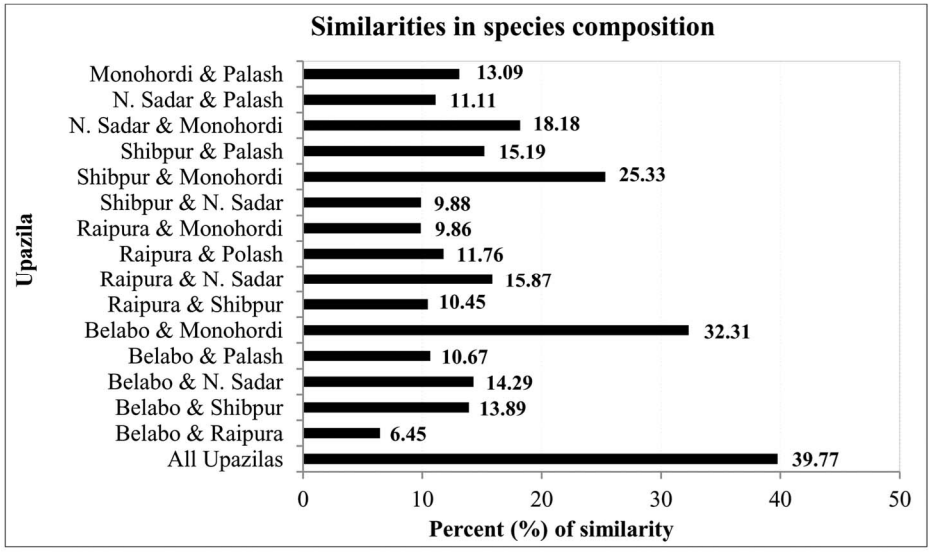

Fig. 2. Similarity in species composition in the upazilas of Narsingdi district based on Jaccard coefficient (Jaccard, 1912).

The enumeration of monocotyledonous species from the upazilas of Narsingdi district seems higher than that from some upazilas of few other districts reported by the previous studies (Islam *et al*., 2009; Rahman *et al*., 2012; Rahman *et al*., 2013; Sarker *et al*., 2013; Sajib *et al*., 2014; Mahmudah *et al*., 2017; Rahman *et al*., 2019). Considering the size of the study area, the monocotyledonous flora of whole Narsingdi district appears richer in comparison to those of Patuakhali district, Swandip Island and Rajshahi district, as reported by Sultana (2012), Sajib *et al.* (2015) and Rahman (2013), respectively, or even to that of mangrove forests (Rahman *et al*., 2015). Whereas, the monocotyledons of this district documented by this study is relatively poorer than those of few forest areas, *viz.* Sitapahar Reserve Forest (Uddin *et al*., 1998; Rashid and Chowdhury, 2013), Satchari National Park (Arefin *et al*., 2011), and Rajkandi Reserve Forest (Haque *et al*., 2018). The total number of monocot species (168) recorded from Narsingdi district is 17% of the total 988 species and that of monocot families (23) is 56.10% of the total 41 families reported for Bangladesh by Siddiqui *et al.* (2007) and Ahmed *et al*. (2008). It indicates that this floristic element of the study area is not negligible, though these proportions will be lower if the flora of Bangladesh is explored completely.

Most of the monocot species (117 species) recorded from the study area are economically useful. Majority of these species are useful as fodder (39 species) and medicinal (22 species), followed by domestic purpose (14 species), vegetable (13 species), ornamental (12 species), soil binding (nine species), spice (five species), oil yielding (four species), timber, fruit and food grain

(three species each), and juice yielding, green manure, baby food and fish feed (two species each). Among these species, 24 can be useful in two to three categories. These data show that the monocot species of the study area can notably contribute in socio-economic purposes and favor sustainable development in the region.

The study area harbored many aquatic habitats of different categories (ponds, beels, jheels, low lands, rivers), which appeared suitable for some common monocot species (*Eichhornia crassipes*, *Sagittaria guayanensis*, *Ottelia alismoides*, *Pistia stratiotes*, *Lemna perpusilla*, *Hygroryza aristata*, *Phragmites karka*) and most of them flourished there vigorously. Some species (*Axonopus compressus*, *Cynodon dactylon*, *Commelina benghalensis*, *Colocasia esculenta*, *Murdania nudiflora*, *Eleusine indica*, *Bambusa balcooa*, *Bambusa nutans*, *Imperata cylindrica*, *Curcuma zedoaria*, *Eragrostis unioloides*, *Echinochloa colona*) were commonly distributed among the upazilas of the study area with normal natural regeneration. In contrast, *Geodorum densiflorum*, *Curculigo orchioides*, *Phoenix acaulis*, *Bulbostylis barbata*, *Apluda mutica*, and *Lasia spinosa* were occasionally found in this area and assumed to be declining because of their poor regeneration.

The major functional threats to the flora of the study area identified during this study are (1) vegetation clearing, industrialization, unnecessary firing, unplanned agricultural extension, over exploitation of natural resources through multifarious human interferences; (2) habitat fragmentation and depletion as the consequence of various anthropogenic activities and few natural events; (3) soil erosion due to clearing of vegetation cover, heavy rainfall and flood; (4) invasion of some exotic species, *viz*. *Acacia auriculiformis* A. Cunn. ex Benth., *Chromolaena odorata* (L.) R.M. King & H. Rob., *Eichhornia crassipes*, *Eucalyptus camaldulensis* Dehnh., *Mikania cordata* (Burm. f.) B.L. Rob. and *Parthenium hysterophorus* L; (5)
poor regeneration in some species (*Geodorum densiflorum*, *Curculigo orchioides*, *Phoenix aculis*); (6) lack of awareness in the local people about the importance and conservation of plant diversity; and (7) lack of proper management programs in favor of natural regeneration and conservation of plant diversity. Considering these facts, this study suggests to conduct adequate inventories, monitoring and research programs on the flora and plant diversity of this district for knowing and improving their status and to implement appropriate conservation measures and management programs in favor of the depleting plant genetic resources of this area in order to contribute for sustainable development there.

This study provides important taxonomic data on the monocotyledonous species growing in Narsingdi district naturally. These information might be useful as the guiding database to track the trend of changes in species composition, diversity and vegetation of this plant group in course of time due to natural and anthropogenic stresses, contribute in studying animal diversity dependent on monocotyledonous species directly or indirectly, in undertaking appropriate biodiversity conservation initiatives and plant resource-based socioeconomic development and help in monitoring and estimating the impacts of climate change in this area.

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