REGENERATION POTENTIALS OF NATIVE TREE SPECIES IN THREE NATURAL FORESTS OF SYLHET, BANGLADESH

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Abstract

Natural regeneration status of native tree species in three natural forests of Moulvibazar, Sylhet Forest Division, Bangladesh was assessed through stratified random sampling method. A total of 70 tree species belonging to 31 families was recorded. Moraceae has the maximum number of species (8 species). Myrtaceae has 6 species and Rubiaceae has 5 species while both Euphorbiaceae and Meliaceae have 4 species each. The families Anacardiaceae, Bignoniaceae, Combretaceae, Fagaceae, Lauraceae, Sterculiaceae, Verbenaceae have 3 species each, while Clausiaceae, Mimosaceae and Ternstroemiaceae has 2 species each, and the rest 16 families (*viz.* Apocynaceae, Aquifoliaceae, Araliaceae, Arecaceae, Bombacaceae, Burseraceae, Caesalpinaceae, Dilleniaceae, Dipterocarpaceae, Elaeocarpaceae, Lythraceae, Myrsinaceae, Polygalaceae, Rutaceae, Tiliaceae, Thymelaeaceae) comprise one species each. *Artocarpus chama* represents maximum seedlings production per hectare (2,528), followed by *Syzygium firmum* (1825), *Ficus racemosa* (1425), *Syzygium fruticosum* (1033) and *Holigarna caustica* (917). Biological diversity indices were also calculated which ensure a promising regeneration status of Moulvibazar Natural forests. The percentage distribution of seedlings was maximum (78.12%) for 0-50 cm height range for all species. The numbers of seedling reduced proportionately with height growth indicating the reduction recruitment of seedlings in Moulvibazar natural forests. *Artocarpas chama* showed maximum (1.97 %) seedling recruitment. Natural regeneration potential is useful for developing the management plans for effective functioning of Moulvibazar natural forests, Sylhet, Bangladesh.

Key words: Diversity indices, regeneration potentials, Moulvibazar natural forests, seedlings recruitment.

INTRODUCTION

Natural regeneration of the plant species of a forest is essential for conservation and maintenance of biodiversity (Hossain *et al.* 2004). It helps in the development of plant population of an area over time and space. This is a complex ecological process which involves dispersal of propagating materials, reproduction and establishment of seedlings in relation to environmental factors (Barnes *et al.* 1998). Biotic and abiotic factors along with disturbance regimes strongly influence the regeneration process, recruitment, species abundance and status of plant species in an ecosystem. Dynamics of soil seed bank, seedlings of forest vegetation and population structure are utmost important factors for the successful natural regeneration. Knowledge base of plant regeneration status helps in developing management options and setting priorities (Zegeye *et al.* 2011).

Bangladesh has a total of 1.442 m ha of forest land and natural forest cover is about 1.204 m ha (Altrell *et al.* 2007). The natural forests of the country have been under stress of severe biotic and abiotic interferences for the last few decades due to over population, land use changes, inappropriate and poor management practices (Khan *et al.* 2008). Till today the forest resources of the country are declining in an alarming rate. In the circumstances, it is necessary to enhance the natural regeneration of forest tree species by suitable artificial and natural process for protecting forest flora and maintaining sustainability of yield, goods and services (Haque and Alam 1988). A number of studies that focused on natural regeneration status in different natural forests of Bangladesh provide potential information for many native tree species (Hossain *et al.* 1999, Miah *et al.* 1999, Hossain *et al.* 2004, Motaleb and Hossain 2007, Rahman *et al.* 2011, Hossain *et al.* 2013). However, there is little information about the natural forests of Moulvibazar including the Lawachara National Park which is essential for its improvement and sustainable management. Therefore, the study was conducted to evaluate the regeneration status, composition and diversity of the dominant tree species of the Moulvibazar natural forests.

MATERIAL AND METHODS

The study was conducted in three locations, namely Lawachara, Adampur (Kalengi) and Sree-Gobinapur natural forests under Moulvibazar district of Sylhet Forest Division. The study area lies between 24^0 30′- 24^0 32′ N and 91^0 37′- 91^0 39′ E (Feeroz *et al.*1994). Lawachara is under the Lawachara National park (LNP) a well-known protected area in Bangladesh. The park is a part of West Banugach reserved Forest of Moulvibazar range under Sylhet Forest Division (IRG 2006). The park covers an area of 1250 hectares (1.25 km^2). Adampur (Kalengi) is a reserve forest under Adampur beat of Rajkandi range and Sree-Gobindpur was a reserve under Moulvibazar range and it was handed over to a private ownership in 1980's. Now, it is under the control of Sree-Gobindpur tea estate and gradually converted the forest into tea gardens. The remaining forest area is about 300 hectares.

The topography of the study area is undulating with gentle slopes and hillocks. These are called tilla and are scattered throughout the forest ranging from 10 to 20 meters in height and rarely 60 to 80 meters. The Manu and the Dholoi rivers exist with numerous streams flow in or around the study area. The soils are dark brown, sandy clay loam of Pliocene origin (Hossain *et al.* 1989).The climate of the study area is generally worm and humid, weather turns cool in the winter. Temperature varies in an average from minimum 5^0 C in January for a very short period maximum 37.7^0 C in March. The study area is one of the high rainfall zones of the country and varies approximately from 2400 to 5400 mm with maximum rainfall bearing in May to September due to monsoon. Humidity is high throughout the year with monthly average humidity varying from 64% in March to 86% in June (BMD 2010).

Stratified random quadrat method was applied to determine the regeneration status of Moulvibazar natural forest. A total of 72 permanent sample plots (quadrate), 24 quadrates in each location was laid out in three different locations covering all the aspects and slopes of the hill. Optimum quadrate size was found 3m×3m and was determined by applying the species area curve of Williams (1991). Within each quadrate, the name and number of seedlings with ≥ 20 cm in height and saplings of each species were counted with height and recorded for consecutive three years (2010-2012). Data were collected once a year from January to May. The seedlings were identified by local guide in the field and authenticated by the taxonomist of Bangladesh Forest Research Institute and National Herbarium.

The frequency, Relative Frequency (RF), Density, Relative Density (RD), Abundance, Relative Abundance (RA), Relative Dominance (RDo) and Importance Value Index (IVI) of each species were calculated according to Muller–Dombois and Ellenberg (1974), Balslev *et al.* (1987), and Shukla and Chandal (2007). Plant diversity indices were calculated by using the following equation:

Shannon-Winner's diversity index, $H= \sum_i^n =1\ P_i \ \ln P_i$
Simpson's diversity index, $D= \sum_i^n =1\ P^2$
Species evenness index, E= H/ Ln (S) and
Margalef's richness index, R = (S-1)/ Ln (N)
Where, S= Total number of species
N= Total number of individuals of all the species
$P_{i =}$ No. of individuals of one species + Total no. of individuals in all the samples
H= Shannon-Winner's diversity index

RESULTS AND DISCUSSION

Regenerating tree species composition

A total of 70 regenerating tree species belonging to 31 families with 48 genera was recorded from three locations of natural forest area (Table 1). Regeneration was studied for 3 years (2010, 2011 and 2012). The results revealed that at Lawachara, maximum regeneration was recorded in 2011 (39 species), followed by 31 species in 2012 and 30 species in 2010. In Adampur, highest 36 species was

recorded in 2011, followed by 31 species in 2012 and 27 species in 2010. At Gobindpur maximum 37 species was recorded in 2011, followed by 32 species in 2010 and 31 species in 2012 (Table 1).

Table 1. Regenerating tree species recorded from three locations of the natural forests of Moulvibazar district in the years 2010, 2011 and 2012.

Family	Scientific name	Local name	Lawachara			Adampur			Gobindpur		
			10	11	12	10	11	12	10	11	12
Anacardiaceae	*Holigarna caustica*	Jawa	+	+	+	+	+	+	+	+	+
	Mangifera sylvatica	Uriam	+	+	-	-	-	-	-	-	-
	Spondias pinnata	Amra	-	-	-	-	-	+	-	-	-
Apocynaceae	*Alstonia scholaris*	Chatim	-	-	-	-	+	-	-	+	-
Aquifoliaceae	*Ilex godajam*	Ludh	-	-	-	-	+	-	-	-	-
Araliaceae	*Trevesia palmata*	Bonpapaya	+	+	+	-	-	-	+	+	+
Arecaceae	*Caryota urens*	Bonsupari	-	+	+	-	+	-	-	-	+
Bignoniaceae	*Oroxylum indicum*	Kanaidinga	-	-	-	-	-	-	+	+	+
	Stereospermum colais	Dharmara	-	-	+	-	+	+	-	+	+
Bombacaceae	*Bombax insigne*	Bonsimul	-	-	-	-	-	-	+	-	-
Burseraceae	*Protium serratum*	Gutguttya	+	+	-	-	+	-	-	-	-
Caesalpinaceae	*Cassia nodosa*	Bonsonalu	-	-	-	-	+	-	-	-	-
Clausiaceae	*Garcinia xanthochymus*	Demgola	-	-	+	-	-	+	-	-	+
	G. *cowa*	Kao	+	+	+	+	+	+	+	+	+
Combretaceae	*T. chebula*	Haritaki	-	+	-	-	+	+	-	+	+
	T. bellirica	Bahera	+	+	-	-	-	+	+	+	-
	Terminalia catappa	Katbadam	-	-	+	-	-	-	-	-	-
Dilleniaceae	*Dillenia pentagyna*	Hargaja	+	+	-	-	+	-	-	-	-
Dipterocarpaceae	*Dipterocarpus turbinatus*	Teligarjan	-	-	-	+	-	-	-	-	-
Elaeocarpaceae	*Elaeocarpus varunna*	Bonjalpai	+	+	+	+	+	+	+	+	+
Euphorbiaceae	*Aporosa dioica*	Kakra	+	+	+	+	+	+	+	+	+
	Mallotus albus	Bonmali	-	-	-	-	+	+	-	+	-
	Macaranga denticulata	Bongulli	+	+	+	+	+	+	+	+	+
	Sapium baccatum	Bolos	-	-	-	+	-	-	+	-	-
Fagaceae	*Castanopsis lancifolia*	Jatbatna	-	+	-	-	-	-	-	-	-
	C. tribuloides	Khamibatna	+	+	+	+	+	+	+	+	+
	C. indica	Silbatna	-	+	+	+	+	+	-	+	+
Lauraceae	*Cinnamomum cecidodaphne*	Tezbohal	+	+	+	+	+	+	-	+	+
	Litsea monopetala	Kukurchita	-	-	-	-	+	-	-	-	+
	L. glutinosa	Menda	+	+	-	-	+	+	+	+	+
Lythraceae	*Lagerstroemia parviflora*	Sidajarul	+	+	-	+	-	-	-	-	-
Meliaceae	*Amoora wallichii*	Lalipitraj	-	+	-	+	-	-	-	+	-
	Aphanamixis polystachya	Pitraj	+	+	+	+	+	+	-	+	+
	Dysoxylum binectariferum	Bararata	-	-	-	-	-	-	-	+	-
	Toona ciliata	Toon	+	+	-	-	+	+	+	+	+
	Azedirachta indica	Neem	-	-	-	-	-	-	+	-	-
Mimosaceae	*Albizia procera*	Sadakoroi	-	-	-	-	-	-	+	-	-
	A. chinensis	Chakuakoroi	-	-	-	+	-	-	-	-	
Moraceae	*Artocarpus heterophyllus*	Kanthal	-		-	-	-	-	+	+	+
	A. lacucha	Borta	+	+	-	-	-	-	-	-	-
	A. chama	Chapalish	+	+	+	+	+	+	+	+	+
	Ficus clavata	Panidumur	+	+	+	+	+	+	-	+	+
	F. hispida	Kakdumur	-	+	-	-	-	-	-	-	-
	F. racemosa	Jogdumur	+	+	+	+	+	+	+	+	+
	F. auriculata	Laldumur	-	-	+	-	-	+	+	-	-
	Streblus asper	Herba	-	-	-	-	+	-	-	+	-
Myrsinaceae	*Ardisia khasiana* thomsoni	Bonkola	-	-	+	-	-	-	+	+	+

Myrtaceae	*Syzygium cumini*	Kalojam	-	-	-	+	+	+	+	+	+
	S. fruticosum	Putijam	+	+	+	+	+	+	+	+	+
	S. firmum	Dhakijam	+	+	+	+	+	+	+	+	+
	S. macrocarpum	Bonjam	+	+	+	+	+	+	+	+	+
	S. syzygoides	Khudijam	-	+	-	-	-	-	-	-	-
	S. formosum	Pannyajam	-	-	-	+	-	-	-	+	-
Polygalaceae	*Xanthophyllum flavescens*	Gandi	-	-	-	-	-	-	+	-	-
Rubiaceae	*Neolamarkia cadamba*	Kadam	-	-	-	+	+	-	-	-	-
	Gardenia coronaria	Kannyari	-	-	-	-	+	+	-	-	-
	Mitragyna rotundifolia	Bonchampa	-	-	-	+	-	-	-	-	-
	M. parvifolia	Dakrom	-	-	-	-	-	-	-	+	-
	Adina cordifolia	Haldu	-	-	+	-	-	-	-	-	-
Rutaceae	*Acronychia pedunculata*	Bonjamir	+	+	+	-	+	+	+	+	+
Sterculiaceae	*Pterospermum acerifolium*	Moskand	+	+	+	-	-	-	-	+	-
	Sterculia. foetida	Jorabadam	+	+	+	-	+	+	-	-	-
	S. villosa	Udal	+	+	-	-	-	-	+	-	-
Theaceae	*Eurya acuminata*	Jharu	-	+	+	-	+	-	+	+	+
	Schima wallichii	Kanak	-	-	-	-	-	-	+	-	-
Tiliaceae	*Microcos paniculata*	Assar	+	+	+	+	+	+	+	+	+
Thymelaeaceae	*Aquilaria agallocha*	Agar	+	+	+	-	-	-	-	-	-
Verbenaceae	*Callicarpa macrophylla*	Bongamar	-	-	-	+	-	+	-	-	-
	Vitex pubescens	Awal	-	+	-	-	-	-	+	-	-
	V. peduncularis	Horinagoda	+	+	+	+	+	+	+	+	+

The maximum number of species was found in the family Moraceae (8 species) followed by Myrtaceae (6 species), Rubiaceae (5 species), Euphorbiaceae and Meliaceae (4 species each), Anacardiaceae, Bignoniaceae, Combretaceae, Fagaceae, Lauraceae, Sterculiaceae, Verbenaceae (3 species each), Clausiaceae, Mimosaceae and Ternstroemiaceae (2 species each) and rest 16 families comprising one species each (Table 1). Results also reveal that diversity of regenerating tree species vary from location to location and also with the year. However, average number of regenerating tree species among the locations ranged from 31 to 33 species with highest 33 species in both Lawachara and Gobindpur. The composition and richness of understorey tree species are different and are seemingly due to their different responses to abiotic factors such as light, nutrient availability, water availability, wind and temperature (Laska 1997, Sevenning 2000, Siebert 2002). It is apparent from the present study that along with abiotic factors anthropogenic factors also influence the regenerating species composition and richness.

Natural regeneration trends

The present study recorded 70 regenerating tree species belonging to 31 families with average seedlings of 16,833 per hectare. The results reveal that number of seedlings varied from location to location, year to year and also species to species. At Lawachara, average seedlings were 21,875 per ha, minimum 12,875 seedlings in 2010 and maximum 29,725 seedlings/ha in 2012. In Adampur average seedlings were 12,950/ha, with minimum 9,075 seedlings in 2010 and maximum 16,225 seedlings in 2012. But, in Gobindpur average seedlings were 15,675/ha, minimum 11,600 seedlings in 2010 and maximum 20,375 seedlings in 2011 (Fig. 1). Result also reveals increasing trend of regeneration in each year irrespective of location except at Gobindpur in 2012. It was due to incidence of fire in the area. It indicates the regeneration potentials of the forests.

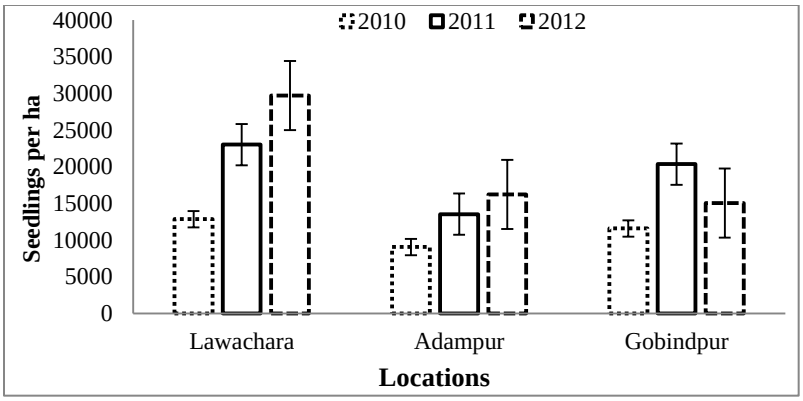

Fig. 1. Regeneration trends of seedlings (per hectare) in three locations of the natural forests of Moulvibazar district in the years 2010, 2011 and 2012.

Number of regenerating tree species with IVI

The study recorded 70 regenerating tree species in Moulvibazar natural forest. Among the regenerating tree species average highest number of seedlings was found 2558 per hectare for *Artocapus chama* followed by *Syzygium firmum* (1825), *Ficus racemosa* (1425), *Syzygium fruticosum* (1033), *Haligarna caustica* ((917), *Sygygium macrocarpum* (825) and *Garcinia cowa* (700). The lowest number of seedlings per hectare (25) was found for *Microcos paniculata*, *Sterculia foetida*, *Aphanamixis polystachya* and *Trema orientalis*. The maximum Importance Value Index (IVI) was calculated for *Artocarpus chama* (21.60), followed by *Syzygium firmum* (20.54), *Ficus racemosa*, *Syzygium. macrocarpum* (13.82), *Castonopsis tribuloides* (12.29) and *Garcinia cowa* (11.26). The minimum IVI (1.76) was found for *Albizia procera*, *Trema orientalis*, *Aquilaria malaccences*, *Ilex godajam*, *Bombex insigne* and *Cassia nodosa*. Seedlings per hectare and Importance Value Index (IVI) of 30 regenerating tree species in Moulvibazar natural forest was given in Table 2.

Table 2. Seedlings per hectare and IVI of 30 dominant regenerating tree species in Moulvibazar natural forest.

Scientific Name	Seedling per hectare				Importance Value Index (IVI)			
	L	A	G	Avg.	L	A	G	Avg.
Albizia chinensis	-	350	-	117	-	9.37	-	3.12
Aphanamixis polystachya	50	650	825	508	1.88	10.53	8.92	7.11
Aporosa dioica	375	50	650	358	6.23	1.54	8.05	5.27
Artocarpus chama	6375	175	1125	2558	46.43	5.52	12.84	21.60
Artocarpus heterophyllus	-	75	375	150	-	3.34	7.24	3.53
Castanopsis indica	850	375	775	667	10.87	9.27	10.39	10.18
Castanopsis tribuloides	1300	575	425	767	17.73	12.18	6.95	12.29
Cinnamomum cecidodaphne	125	1025	200	450	3.33	12.68	4.74	6.92
Elaeocarpus varunna	100	75	175	117	2.82	3.34	4.99	3.72
Ficus clavata	500	25	125	217	10.35	1.73	3.23	5.10
Ficus hispida	1025	-	-	342	20.23	-	-	6.74
Ficus racemosa	2575	150	1550	1425	23.05	5.13	16.85	15.01
Garcinia cowa	375	425	1300	700	8.19	10.45	15.13	11.26
Holigarna caustica	300	700	1750	917	5.72	10.74	12.71	9.72
Ilex godajam	-	500	-	167	-	9.74	-	3.25
Macaranga denticulata	1500	-	325	608	16.22	-	5.81	7.34
Mallotus albus	-	375	100	158	-	8.65	3.15	3.93

Microcos paniculata	75	250	375	233	2.35	8.97	6.79	6.04
Mitragyna rotundifolia.	-	2000	-	667	-	26.33	-	8.78
Pterospermum acerifolium	250	-	150	133	5.65	-	4.25	3.30
Stereospermum colais	-	75	325	133	-	2.34	6.83	3.06
Sygygium macrocarpum	650	700	1125	825	8.79	14.69	17.97	13.82
Syzygium cumini	-	225	250	158	-	8.17	6.84	5.00
Syzygium firmum	575	1475	3425	1825	8.54	22.59	30.49	20.54
Syzygium formosum	-	-	750	250	-	-	10.68	3.56
Syzygium fruticosum	125	1100	1875	1033	3.33	18.21	18.99	13.51
Terminalia chebula	25	750	200	325	1.41	12.69	5.61	6.57
Toona ciliata	300	125	600	342	5.58	4.95	8.67	6.40
Trevesia palmata	1400	-	500	633	16.16	-	7.81	7.99
Vitex peduncularis	475	325	950	583	8.15	7.86	12.99	9.67

Here, L = Lawachara, A = Adampur, G = Gobindpur

Biological diversity indices

Different biological indices, such as Shannon-Winner diversity index (H), Simpson's diversity index (D), Species evenness index (E) and Margalef's richness index (R) were evaluated for Moulvibazar natural forest to reveal the natural regeneration status of recorded plant species (Table 3). Margalef's index (5.645) for regenerating plant species indicates higher species richness in Moulvibazar natural forests. On the other hand, Shannon-Winner diversity index (3.22) and Simpson's diversity index (0.065) depict higher diversity in regenerating plant species. A small variation in the plant community was also depicting by higher value of species evenness (0.859 out of 1). The different diversity indices of the regenerating plants are represented in Table 3.

Table 3. Different diversity indices for regenerating plant species in Moulvibazar natural forests.

Locations	Shannon-Winner diversity index (H)	Simpson's diversity index (D)	Species evenness index (E)	Margalef's richness index (R)
Lawachara	3.049	0.065	0.852	5.560
Adampur	3.121	0.065	0.846	5.815
Gobindpur	3.049	0.065	0.851	5.560
Mean	3.073	0.065	0.849	5.645

Distributions of seedlings in different height classes

Regenerates below 251 cm in height were considered as seedlings. The percentage distribution of all seedlings of all species into different height (cm) classes is provided in Figure 2. It was evident that maximum (78.12 %) seedlings were within the range of 0-50 cm height classes, whereas, only 1.44% seedlings were found 201-250 cm height classes. It indicates the poor survival of seedlings probably resulting from both biotic and abiotic interferences.

Recruitment of the seedlings

The recruitment of seedlings is important in a natural forest to determine the structure and sustainability of the forest. Data on regeneration were collected for consecutive three years (2010, 2011 and 2012). However, seedling recruitment percentage of the species was evaluated for the year 2011 only, keeping the similarities as species diversity and density were evaluated for the same year. Comparative recruitment percentages of major dominating seedlings with the corresponding tree stem/ha are shown in Table 3. *Artocapus chama* had maximum 1.79% seedling recruitment percentage followed by *Syzygium firmum* (1.86%), and *Ficus racemosa* (1.54%).

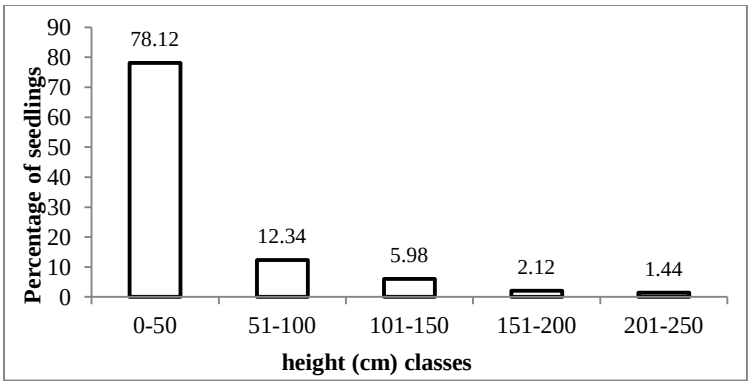

Fig. 2. Percentage distribution of all seedlings in different height (cm) classes.

ANOVA showed that recruitment percentage with seedlings/ha is significant at F= 5.21, P<0.01 level. Moreover, recruitment percentage with stem/ha is also significant at F=3.47, P<0.01 level, that are similar to the findings of Rahman (2002), Arif (2003), Rahman *et al.* (2011) and Reddy *et al.* (2011). There is a wide gap between number of natural regeneration and their successful recruitment to only a few poles and trees. This might be partly due to lacking of silvicultural requirement of the individual species and mostly biotic interferences particularly in Adampur and Gobindpur areas of Moulvibazar natural forests.

Table 4. Percentage recruitment of 10 major regenerating tree species in relation to trees/ha and seedlings/ha at Moulvibazar natural forests.

Scientific name	Tree stem/ha	Seedlings/ha	Recruitment (%)
Artocarpus chama	51	2585	1.97
Syzygium firmum	34	1825	1.86
Ficus racemosa	22	1425	1.54
Syzygium fruticosum	9	1033	0.87
Haligarna caustica	4	917	0.44
Syzygium macrocarpum	2	825	0.24
Garcinia cowa	16	767	2.09
Castanopsis tribulodes	9	700	1.29
C. indica	5	667	0.75
Mitragyna rotundifolia	3	667	0.45

The conservation measures of biological diversity should be based on regeneration potentials of plant species (Verma *et al.* 1999). It is an important indicator for evaluating the overall situation of a forest ecosystem (Rahman *et al.* 2011). In the present study 70 regenerating tree species belonging to 31 families with 48 genera were recorded from three locations of Moulvibazar natural forest and the number of species is comparatively higher than earlier reports on similar natural forests of Bangladesh. Hossain *et al.* (2004) reported 64 regenerating tree species in the natural forest of Chittagong South Forest Division. Motaleb and Hossain (2007) reported 29 regenerating tree species from the semi-evergreen forest of Chittagong South Forest Division. Rahman *et al.* (2011) stated 55 regenerating plant species in Khadimnagar National Park and Tilagarh Eco-Park. The higher regenerating status in Moulvibazar natural forests might be due to one of the protected areas was kept under the study which is Lawachara National Park and have minimum human interference. This might be the main cause of higher number of seedlings in the initial stage of seedling development. The families Moraceae, Myrtaceae, Rubiaceae, Euphorbiaceae and Meliaceae showed the higher regeneration potentials due to

maximum seed dispersal capability and favorable climatic conditions for natural regeneration. *Artocapus chama*, *Syzygium firmum*, *Ficus racemosa*, *Syzygium fruticosum*, *Holigarna caustica*, *Syzygium macrocarpum* and *Garcinia cowa* showed the dominant regeneration. This is because of their profuse seed production and suitable climatic condition for successful regeneration.

The diversity indices of the study show promising regeneration potential in Moulvibazar natural forest in comparison to the diversity indices reported by Rahman *et al.* (2011) from the biodiversity conservation areas of Northeastern Bangladesh. They reported 0.03 for Simpson's diversity index, species richness index 4.92, Shannon-Winner diversity index 3.62, and Species evenness index 2.26. There is a tremendous pressure on Moulvibazar natural forests as forest dependent local communities are residing around the natural forests and conversion of natural forests into tea garden is common. However, recent co-management initiatives and conservation program with the participation of local people at Lawachara National Park, a protected area in the study area seem to be promising initiatives for biodiversity conservation.

Present study reveals that Moulvibazar natural forests possess higher regeneration potentials for many economically and ecologically important tree species. However, still there are many causes which may be critical for the occurrence and establishment of natural regeneration in Moulvibazar natural forests. Thus the concern authority must be careful for the implementation of the conservation measures and enhance effective co-management and protection program involving the local people to ensure fruitful conservation of Moulvibazar natural forests. The species that have low IVI should be given priority in conservation program. Protection and aided natural regeneration (ANR) may be another alternative option for effective natural regeneration and conservation of Moulvibazar natural forests instead of converting these species rich natural forests to artificial plantations.

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