

Study on seedling growth of important timber trees in agroecologically different area in Bangladesh

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Abstract: A study on seedling growth of four important timber trees viz. mahogany (*Swietenia mahagoni*), akashmoni (*Acacia auriculiformis*), raintree (*Albizia saman*) and rajkori (*Albizia richardiana*) at three growth stages (three, eight and twelve months aged) in three agro ecologically different area was carried out during 2003. Three agro-ecologically different areas are namely Mymensingh (Old Brahmaputra Flood Plain, AEZ 09), Bagerhat (Low Ganges River Flood Plain, AEZ 12) and Pirojpur district (Ganges Tidal Flood Plain, AEZ 13). The aim of the experiment is to investigate the growth behavior of important timber seedling in different area in Bangladesh and find out the best site (district) where specific important timber seedling grows well. Data collection was started on 20 June, 2003 and completed on 20 July, 2003. Data on height, base diameter, fresh weight and dry weight of each selected species was taken. Soil and climate of different region influenced the growth of seedlings significantly. Seedling of mahogany gained highest growth in Pirojpur region followed by Mymensingh and Bagerhat region. Akashmoni showed the highest growth performance in Mymensingh, medium growth in Pirojpur and the lowest growth in Bagerhat region. Raintree seedling growth found highest in Pirojpur region, followed by Bagerhat and Mymensingh region. The highest growth of rajkori seedling was found in Bagerhat region while medium growth in Mymensingh and the lowest in Pirojpur region.

Key word: Timber, seedlings, age, growth, region.

Introduction

Bangladesh is one of the least developed country in the world having an area of 1,47,570 sq.km with extremely limited resource based. The total forest area stands at 17.8% of the total area of the country. But actual tree cover area represent only 7.6% of the total land which are decreasing at an alarming rate due to severe deforestation of traditional forest. As a result the crisis of timber, fuel wood and other forest product are increased day by day remarkably. The present wood demand of Bangladesh is about 13.2 million cubic meters which occupies 62% for fuel wood, 34% is for log and the remaining is for poles, pulpwood and others (Haque, 1994). To tackle this critical situation we should undertake participatory forestry, agroforestry, farm forestry, small scale private plantation and other forestation program. To make success of these forestation programs, it is essential to produce abundant number of timber seedling with sustainability in different agro ecological region having knowledge on its growth performance. For trees plantation, growth is expressed as a function of age, stand density, site quality, species mixture and management regimes (Mallick, 1992). Stand density, stand age, site quality, genetic variation and management regimes are the main factors which affect the growth of trees (Leak 1970; Kozlowski 1971; Khan, 1972). Besides this water quality, moisture, rainfall, sunshine, temperature, and adaptability are also important for the growth of tree. The amounts of these elements are not same in different agroecological zone. So the growth of seedlings might be found different in various agro- ecological zone of the country. In view of this fact, the present study has been undertaken to elucidate (i) the growth behavior of important timber seedling in different area in Bangladesh, and(ii) to find out the best site (district) where specific important timber seedling grows well.

Materials and Methods

The experiment was conducted at nine nurseries comprising three from each of Trishal thana in Mymensingh district, Morrelganj thana in Bagerhat district

and Sarupkathi thana in Pirojpur district. The sites were selected on the basis of the availability of nursery. In each nursery of every district four species of different ages (three months, eight months and twelve months) timber seedlings namely mahogany (*Swietenia mahagoni*), akashmoni (*Acacia auriculiformis*), raintree (*Albizia saman*) and rajkori (*Albizia richardiana*) were selected by random sampling. Data on height, base diameter, fresh weight and dry weight was taken for each selected species. Height and base diameter was measured from standing seedlings in nursery. Then seedling species of different ages were collected from each selected nursery of the respective thana and taken fresh weight by balance. The collected samples were dried in sun light over a period of one month and dry weight was taken in the laboratory of Agroforestry Department, Bangladesh Agricultural University, Mymensingh. The time of sowing and age of seedling was recorded from respective nursery owner. Data were collected from 20 June, 2003 to 20 July, 2003. Data on various growth parameters under the study were analyzed statically by using MSTAT C. The mean differences were evaluated by least significant difference test

The physical properties of soil of three districts were different. The soil of Mymensingh district except some minor areas of hill in the northern border is formed of with recent and sub-recent alluvial sediments. The soil of Trisal thana belongs to Mymensingh was same. The soil of Bagerhat district was mainly non calcareous clay, but the working thana, Morrelganj under the same district was highly saline tidal clay. The soil of northern part of the Pirojpur district was non saline, tidal silty clay while the soil of southern part was poorly drained, tidal clay of the old Lower Meghna Tidal Flood plain. The soil of Sarupkathi, the representative thana of Pirojpur was non saline, tidal silty clay. The chemical properties of soil of the three selected sites are given below.

Table 1. The properties of soil of three districts

District	pH	Organic matter(%)	N (%)	P (ppm)	K (ppm)	S (ppm)
Mymensingh	5.54	2.31	0.115	24.0	194	20
Bagerhat	7.98	0.95	0.048	2.0	226	18
Pirojpur	7.76	1.25	0.063	17.0	80	15

Results and Discussion

Mahogany

The effect of region and age has significant effect on the growth of mahogoni seedlings (Table 2). In case of three months aged seedling, the highest height (41.00 cm), base diameter (1.80 cm), fresh weight (21.33 g) and dry weight (9.50 g) were recorded from Pirojpur region. The second

highest height (39.50 cm), base diameter (1.60 cm), fresh weight (19.17 g) and dry weight (7.23 g) were obtained from Mymensingh and it was statistically similar with the results of Pirojpur region. The lowest height (30.67 cm), base diameter (1.40 cm), fresh weight (15.67 g) and dry weight (6.31 g) were recorded from Bagerhat region.

Table 2. Growth performance of different aged mahogany seedlings in different region

Region	Height (cm)			Base diameter (cm)			Fresh weight (g)			Dry weight (g)		
	3 MAS	8 MAS	12 MAS	3 MAS	8 MAS	12 MAS	3 MAS	8 MAS	12 MAS	3 MAS	8 MAS	12 MAS
Mymensingh	39.50	112.30	178.80	1.60	6.79	6.80	19.17	197.50	202.00	7.23	31.00	62.00
Bagerhat	30.67	95.00	143.00	1.40	3.80	4.60	15.67	79.00	90.33	6.31	18.83	30.33
Pirojpur	41.00	121.00	203.00	1.80	6.80	8.10	21.33	207.00	203.80	9.50	51.00	74.33
CV (%)	5.47	4.93	2.62	7.22	6.83	8.97	7.45	2.80	0.72	14.47	6.67	5.44
LSD (5%)	4.59	12.23	10.40	0.258	0.90	1.32	3.15	10.26	2.83	2.51	5.07	6.84

MAS=Month Aged Seedling

Similarly, the highest height, base diameter, fresh weight and dry weight of eight (121.00 cm, 6.80 cm, 207.00 g, 51.00 g) and twelve (203.00 cm, 8.10 cm, 203.80 g, 74.33g) month aged seedling were also recorded from Pirojpur region. Height, base diameter, fresh weight and dry weight of eight (112.30 cm, 6.79 cm, 197.50 g, 31.00 g) and twelve (178.80 cm, 6.80 cm, 202.00 g, 62.00 g) months aged seedlings were obtained from Mymensingh region next to Pirojpur region. The lowest height 95.00 cm, 143.00 cm; base diameter 3.80 cm, 4.60 cm; fresh weight 79.00 g, 90.33 g; and dry weight 18.83 g, 30.33 g for eight and twelve month aged seedlings were found from Bagerhat region respectively.

From the above results, it reflected that all the growth parameters showed the best performance in Pirojpur region. It was might be due to the soil and climatic

condition of Pirojpur region were favourable for growth of mahogany seedlings. But the growth of mahogany seedlings showed the poorest performance in Bagerhat region for it's high soil salinity and saline water which hampered the growth of mahogany seedlings. Kramer and Kozlowski (1981) rightly pointed out that increase of plant diameter mainly depends on favourable temperature and other environmental conditions, especially water supply.

Akashmoni

The growth of akashmoni seedling was highly influenced by age and region (Table 3). The height, base diameter, fresh weight and dry weight of akashmoni seedling of three, eight and twelve months aged were found highest from Mymensingh region and it were 67.00 cm, 1.60 cm, 19.00 g, 4.98 g; 130.00 cm, 2.83 cm, 144 g, 32.33 g and 163.00 cm; 4.98 cm; 196.00 g and, 45.33 g respectively.

Table 3. Growth performance of different aged akashmoni seedlings in different region

Region	Height (cm)			Base diameter (cm)			Fresh weight (g)			Dry weight (g)		
	3 MAS	8 MAS	12 MAS	3 MAS	8 MAS	12 MAS	3 MAS	8 MAS	12 MAS	3 MAS	8 MAS	12 MAS
Mymensingh	67.00	130.00	163.00	1.60	2.83	4.98	19.00	144.00	196.70	4.98	32.33	45.33
Bagerhat	50.33	112.30	145.00	1.26	2.36	4.00	15.67	54.00	137.00	5.33	26.17	39.00
Pirojpur	65.66	121.30	154.70	1.53	2.75	4.45	13.00	133.6	148.00	4.33	28.42	41.67
CV (%)	2.50	4.11	1.96	1.98	10.02	7.48	10.49	3.46	2.50	13.75	5.16	4.86
LSD (5%)	3.46	11.28	6.85	0.0716	0.59	0.7587	3.77	8.67	16.11	1.46	3.46	4.16

MAS=Month Aged Seedling

At Pirojpur region, height (65.66 cm, 121.30 cm, 154.70 cm), base diameter (1.53 cm, 2.75 cm, 4.45 cm), fresh weight (13.00 g, 133.6 g, 148.0 g) and dry weight (4.33 g, 28.42 g, 41.67 g) of three, eight and twelve months aged seedlings of akashmoni seedlings were obtained the second highest respectively next to Mymensingh region. The lowest height (50.33 cm, 112.30 cm, 145.00 cm), base

diameter (1.26 cm, 2.36 cm, 4.00 cm), fresh weight (15.67 g, 54.00 g, 137.00 g) and dry weight (5.33 g, 26.17 g, 39.00 g) of akashmoni seedlings were recorded from Bagerhat region.

The above results depicted that eight and twelve months aged seedlings performed the best in Mymensingh region considering all the growth parameter while poor

performance was found in Bagerhat region. Seedling growth of at Pirojpur region showed poor performance than Mymensingh but it was better than Bagerhat. Uriarte (1994) mentioned that average annual stump diameter, diameter of breast height and total height of *Acacia auriculiformis* varied by the effect of various site factors.

Raintree

The effect of age and region on the growth of raintree seedlings is presented in Table 4. Significant variation was found in different studied parameters. The highest height (83.33 cm), base diameter (4.08 cm), fresh weight (79.67 g) and dry weight (18.67 g) of three month aged raintree

seedlings were recorded from Pirojpur region. Similarly, the highest height (153.70 cm, 229.70 cm), base diameter (6.25 cm, 8.00 cm), fresh weight (296.70 cm, 322.33 cm) and dry weight (18.67 g, 91.00 g) of eight and twelve months aged seedling was found in Pirojpur region. The lowest height of three and eight months seedling was observed in Bagerhat region and it was 81.00 cm and 142.70 cm respectively and for twelve months aged seedling in Mymensingh region (201.30 cm). No significant difference was observed in height, fresh weight and dry weight of three months aged seedlings and in base diameter of eight months aged seedlings.

Table 4. Growth performance of different aged raintree seedlings in different region

Region	Height(cm)			Base diameter(cm)			Fresh weight (g)			Dry weight (g)		
	3 MAS	8 MAS	12 MAS	3 MAS	8 MAS	12 MAS	3 MAS	8 MAS	12 MAS	3 MAS	8 MAS	12 MAS
Mymensingh	82.33	150.70	201.30	3.42	5.90	6.58	76.67	209.30	292.70	18.00	43.33	68.50
Bagerhat	81.00	142.70	213.00	3.63	5.73	7.25	50.00	280.00	305.70	16.17	69.33	87.92
Pirojpur	83.33	153.70	229.70	4.08	6.25	8.00	79.67	296.70	322.33	18.67	91.00	108.30
CV(%)	3.87	2.60	2.89	7.46	5.92	7.79	11.73	2.08	3.95	1.61	4.53	2.53
LSD(5%)	7.20	8.77	14.08	0.62	0.79	1.28	18.29	4.53	121.52	2.87	6.96	5.06

MAS=Month Aged Seedling

The lowest base diameter for three and twelve months aged seedlings were recorded from Mymensingh region (3.42 cm, 6.58 cm) and for eight months aged seedlings in Bagerhat region (5.73 cm). The lowest fresh weight (50.00g) for three months aged seedlings was recorded from Bagerhat region. In case of eight and twelve months aged seedlings, the lowest fresh weight was recorded from Mymensingh region and it was 209.30 g and 292.70 g respectively. The lowest dry matter (16.17g) for three months aged seedling was obtained from Bagerhat region while for eight and twelve months aged seedling yielded the lowest dry weight and it was 43.33 g and 68.50 g. respectively in Mymensingh region. The above results expressed that the growth performance of Raintree

seedlings was statically highest in Pirojpur region but seedlings of Bagerhat and Mymensingh showed poorest performance than Pirojpur region

Rajkoroi

The age and region has significant effect on growth of rajkoroi. In case of three months aged seedlings, the highest height (68.00 cm), fresh weight (17.67 g) and dry weight (6.90 g) were recorded from Bagerhat region. But base diameter (2.16 cm) for same aged seedling was obtained from Pirojpur region (Table 5). The highest height 95.00 cm, 158.70 cm; base diameter 4.16 cm, 5.83 cm; fresh weight 60.00 g, 132.70 g and dry weight 17.83 g, 51.00 g were recorded for eight and twelve months aged seedling of rajkoroi in Bagerhat region respectively.

Table 5. Growth performance of different aged rajkoroi seedlings in different region

Region	Height (cm)			Base diameter (cm)			Fresh weight (g)			Dry weight (g)		
	3 MAS	8 MAS	12 MAS	3 MAS	8 MAS	12 MAS	3 MAS	8 MAS	12 MAS	3 MAS	8 MAS	12 MAS
Mymensingh	53.90	88.23	128.3	1.22	3.95	4.75	10.00	55.00	124.9	4.5	17.17	45.67
Bagerhat	68.00	95.00	158.7	1.66	4.16	5.83	17.67	60.00	132.7	6.9	17.83	51.00
Pirojpur	41.75	71.00	110.0	2.16	3.58	3.42	7.33	38.00	93.67	3.66	14.67	30.11
CV(%)	9.60	3.95	2.94	59.59	6.27	10.81	59.76	5.49	3.90	9.71	5.99	8.70
LSD(5%)	11.87	7.59	8.83	2.28	0.55	1.14	3.69	6.34	10.35	1.10	2.24	8.33

MAS=Month Aged Seedling

The lowest height 41.75 cm, 71.00 cm, 110.00 cm; fresh weight 7.33g, 38.00 g, 93.67 g and dry weight 3.66 g, 14.67 g, 30.11 g for three, eight and twelve months aged seedling of rajkoroi were recorded from Pirojpur region respectively. But the lowest base diameter (1.22 cm) was obtained from Mymensingh region. Through out of the results it was observed that all aged class seedling showed better performance in Bagerhat region and the poorest performance exhibited in Pirojpur region. Sonker *et al.*, (1998) reported that *Albizia sp.* was the most promising to increase height, collar diameter and biomass production

followed by *Dalbergia sissoo*, *Pongamia pinnata* and *Acacia nilotica* in degraded soil. The observation of the present study was also inconsistent with the above findings

From the results it may be concluded that growth performance of akshmoni was found highest in Mymensingh region and lowest in Bagerhat region while the seedlings of Pirojpur region exhibited medium growth performance. Mahogany and raintree seedling showed best performance in Pirojpur region. But mahogany seedling gained poor growth in Bagerhat region and raintree gained

poor growth performance in Mymensingh region. Seedling growth of rajkori was found highest in Bagerhat region and lowest in Pirojpur region.

References

- Haque, M.A. 1994. Agroforestry in Bangladesh. Village and Farm Forestry Project. Swiss Development Cooperation, Dhaka, Bangladesh. 32p.
- Khan A.A. 1972. Revised working plan of Daphar and pakhowal plantation of Gujrat Forest Division. Govt. of pnajab, Forest Dipt. Lahore.
- Kozlowski T.T. 1971. Growth and development of trees. Academic Press. New York. Vol.1. 445p
- Kramer P. J. and Kozlowski T. T. 1981. Physiology of tree. Mc Grow Hill Book company, New York. 642p.
- Leak W. 1970. Yield of faster white pine in new England related to age, site and stocking. USDA Forest Service Research paper NF, 176pp
- Mallick C. P.1992. Plant physiology, Kalyahi publishers. New Delhi,India. pp. 417-425
- Sonker S.D., Bhowmik A.K., Singh A.K. and Banerjee S.K. 1998. Growth performance of some nitrogen fixing tree species in degraded soil and subsequent nitrogen enrichment by them. Indian Agriculturist 42(2): 131-136.
- Uriarte, M.T. 1994. Growth performance of *Acacia mangium* and *A. auriculiformis* in the National Capital Region. Sylvatrop publ. 4(2):7-27.