



RESEARCH PAPER

Performance of Seedling Growth of Important Timber Trees in Agroecologically Different Area in Bangladesh

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ABSTRACT

Growth of seedling is the most important for timber species which is mostly depends on existing soil and climate. A study on seedling growth of five important timber trees namely Mahogany (*Swietenia mahogoni*), Akashmoni (*Acacia auriculiformis*), Raintree (*Albizia saman*), Raj koroi (*Albizia richardiana*) and Sissoo (*Dalbergia sissoo*) at three growth stages (two, four and six months aged) in three agroecologically different area was carried out during July to December 2019. Three agroecologically different areas are namely Dhaka (Old Brahmaputra Flood Plain, AEZ 09), Khulna (Lower Ganges River Floodplain, AEZ 12) and Patuakhali district (Ganges Tidal Floodplain, AEZ 13). The aim of the study was 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 on height, base diameter, fresh weight, dry weight and leaf number of each selected species were recorded. Soil and climate of different region influenced the growth of seedlings significantly. Seedling of mahogany gained highest growth in Patuakhali region followed by Dhaka and Khulna. Akshmoni showed the highest growth performance in Dhaka, medium growth in Patuakhali and the lowest growth in Khulna region. Raintree seedling growth found best in Patuakhali region followed by Dhaka and Khulna region. The highest growth of Raj koroi seedling was found in Khulna region while medium growth in Patuakhali and the lowest in Dhaka region. Sissoo showed the highest growth performance in Dhaka followed by Patuakhali and Khulna region.

Key words: Growth, seedling, timber, region

Introduction

Bangladesh is the eighth-most populated country in the world which is almost 2.2% of the world's population with the population density of 1265 people per Km² (BBS, 2022). 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 represents 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. Homestead is the most plant diversified ecosystem in Bangladesh. Plant diversity plays an important role for maintaining ecological balance as well as environmental stabilization. So plant diversified condition is desirable for sound environment. In Bangladesh scope of agroforestry is vast. Homestead, roadside, railway side, riverside, pond side, canal side, coastal area, deforested area, fallow land etc. are the main venue of agroforestry. Homestead garden is a traditional agroforestry system and an important component in the livelihoods of rural poor. It has significant contribution in the rural economy of the country (Uddin et al., 2002). The development in productivity of homestead agroforestry could reduce fuel wood deficits and

provide currency to homestead gardeners. This provides benefits to all of the rural community because trees ensure so many facilities such as shade, shelter, recreation, agroecological balance and so on (Roy *et al.*, 1996).

To make success of these forestation programs, it is essential to produce abundant number of timber seedling with sustainability in different agroecological region having knowledge on its growth performance. For tree plantation, growth is expressed as a function of age, stand density, site quality, genetic variation and management regimes; which are the main factors that affect the growth of trees (Mallick, 1992; 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 agroecological zone of the country. Very few studies were found on seedling growth in different agroecological zones in Bangladesh (Howlader *et al.*, 2008) which can improve the yield of important timber. Thus, the present study has been taken to investigate the growth performance of important timber seedling in different area in Bangladesh and find out the best site (district) where specific important timber seedling grows well.

Materials and methods

The experiment was conducted at 12 nurseries comprising four from each of Dhaka, Khulna and Patuakhali district which stands in three different agroecological areas namely Dhaka (Old Brahmaputra Flood Plain, AEZ 09), Khulna (Lower Ganges River Floodplain, AEZ 12) and Patuakhali district (Ganges Tidal Floodplain, AEZ 13) of Bangladesh. The sites were selected on the basis of the availability of nursery additionally the selection of the study area, however, was based on some main considerations like (i) The study site had available home garden as a major production system, (ii) The site was the representative of selected region areas of Bangladesh and (iii) Co-operation from the farmers was expected to be high and,

Seedling growth of timber trees therefore, reliable data would be collected. In each nursery of every district five species of different ages (two, four and six months) tree seedlings namely Mahogany (*Swietenia mahogoni*), Akashmoni (*Acacia auriculiformis*), Raintree (*Albizia saman*), Raj kori (*Albizia richardiana*) and Sissoo (*Dalbergia sissoo*) were selected by random sampling.

The soils of Dhaka area are predominantly silt loams to silty clay loams on the ridges and clay in the basins. Organic matter content is low on the ridges and moderate in the basins, topsoils moderately acidic but subsoils neutral in reaction. General fertility level is low. Soils of Khulna are silt loams and silty clay loams on the ridges and silty clay loam to heavy clays on lower sites. General soil types predominantly include calcareous dark grey and calcareous brown floodplain soils. Organic matter content is low in ridges and moderate in the basins. General fertility level is medium. Patuakhali region occupies an extensive area of tidal floodplain land in the southwest of the country. The greater part of this region has smooth relief having large areas of salinity. Riverbanks generally stand about a metre or less above the level of adjoining basins. Non-calcareous grey floodplain soil is the major component of general soil types. Acid sulphate soil also occupies a significant part of the area, where it is extremely acidic during the dry season. Most of the topsoils are acidic and subsoils are neutral to mildly alkaline. Soils of the Sundarban area are alkaline. General fertility level is high, with medium to high organic matter content. The physical properties of soil of three districts were different. The soil of Dhaka district except some minor areas of hill in the northern border is formed of recent and sub-recent alluvial sediments. The soil of studied area belongs to same. The soil of Khulna district was mainly non calcareous clay, but the working site under the same district was highly saline tidal clay. The soil of northern part of the Patuakhali 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 Bauphal, the representative upazila of Patuakhali was non saline, tidal silty clay. The chemical properties of soil of the three selected sites are given below in Table 1.

Table 1: The properties of soil of Dhaka, Khulna and Patuakhali district

| District | pH | OM (%) | N (%) | P (ppm) | K (ppm) | S (ppm) | CEC (c mol kg ⁻¹) |
|------------|------|--------|-------|---------|---------|---------|-------------------------------|
| Dhaka | 5.64 | 2.45 | 0.096 | 19.0 | 183 | 22 | 27.5 |
| Khulna | 7.34 | 2.12 | 0.042 | 12.0 | 203 | 17 | 16.8 |
| Patuakhali | 6.61 | 2.56 | 0.075 | 15.0 | 95 | 16 | 18.8 |

Note: OM-Organic matter, CEC-Cation exchange capacity

Source: FAO/UNDP (1988)

Data on height, base diameter, fresh weight, dry weight and leaf number was taken for each selected species. Height, base diameter and leaf number was measured from standing seedlings in nursery. Then seedling of different ages were collected from each selected nursery of respective upazila 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, Patuakhali Science and Technology University, Patuakhali. Data

were collected from July to December, 2019. Collected data were compiled, tabulated and analyzed statistically in accordance with objectives of the study. Local units of measurement were converted into standard units. Data on various growth parameters under the study were analyzed statically by using MSTAT C. The mean differences will be evaluated by least significant difference test.

Results and Discussion

The findings of the present study have been presented and discussed here following a logical sequence based on the objectives of the study.

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

| Region | Height (cm) | | | Base diameter (cm) | | | Fresh weight (g) | | | Dry weight (g) | | | Leaf number | | |
|------------|-------------|-------|--------|--------------------|------|------|------------------|-------|--------|----------------|-------|-------|-------------|-------|-------|
| | 2MAS | 4MAS | 6MAS | 2MAS | 4MAS | 6MAS | 2MAS | 4MAS | 6MAS | 2MAS | 4MAS | 6MAS | 2MAS | 4MAS | 6MAS |
| Dhaka | 28.59 | 62.50 | 105.22 | 1.30 | 1.60 | 1.84 | 14.48 | 57.92 | 84.24 | 5.83 | 20.22 | 28.25 | 6.33 | 12.25 | 20.50 |
| Khulna | 23.11 | 39.50 | 85.51 | 1.01 | 1.56 | 1.80 | 8.58 | 31.58 | 59.69 | 3.22 | 12.50 | 26.45 | 4.00 | 9.55 | 13.25 |
| Patuakhali | 35.22 | 69.11 | 115.44 | 1.60 | 1.75 | 1.85 | 19.85 | 69.55 | 105.22 | 6.85 | 24.22 | 36.25 | 7.15 | 16.25 | 26.00 |
| CV (%) | 3.50 | 4.11 | 2.96 | 4.54 | 3.52 | 5.12 | 4.12 | 5.23 | 3.23 | 5.67 | 6.42 | 5.37 | 5.43 | 3.87 | 5.24 |
| LSD (5%) | 4.15 | 10.23 | 8.40 | 0.36 | 0.68 | 0.96 | 2.63 | 3.26 | 5.25 | 1.23 | 2.33 | 1.27 | 0.43 | 1.55 | 2.04 |

MAS=Month Aged Seedling

In case of two months aged seedling, the highest height (35.22 cm), base diameter (1.60 cm), fresh weight (19.85 g), dry weight (6.85 g) and leaf number (7.15) were recorded from Patuakhali region. The second highest height (28.59 cm), base diameter (1.30 cm), fresh weight (14.48 g), dry weight (5.83 g) and leaf number (6.33) were obtained from Dhaka and it was statistically similar with the results of Patuakhali region. The lowest height (23.11 cm), base diameter (1.01 cm), fresh weight (8.58 g), dry weight (3.22 g) and leaf number (4.00) were recorded from Khulna region. Similarly, the highest height, base diameter, fresh weight, dry weight and leaf number of four (69.11 cm, 1.75 cm, 69.55 g, 24.22 g & 16.25) and six (115.44 cm, 1.85 cm, 105.22 g, 36.25 g & 26.00) month aged seedling were also recorded from Patuakhali region. The second Height, base diameter, fresh weight, dry weight and leaf number of four (62.50 cm, 1.60 cm, 57.92 g, 20.22 g & 12.25) and six (105.22 cm, 1.84 cm, 84.24 g, 28.25 g & 20.50) months aged seedlings were obtained from Dhaka region next to Patuakhali region. The lowest height 39.50 & 85.51 cm; base diameter

Mahogany

The effect of region and age has significant effect on the growth of mahogoni seedlings (Table 2).

1.56 & 1.80 cm; fresh weight 31.58 & 59.69 g, dry weight 12.50 & 26.45 g and leaf number 9.55 & 13.25 for four and six month aged seedlings were found from khulna region, respectively.

Kramer and Kozlowski (1981) rightly pointed out that increase of plant diameter mainly depends on favourable temperature and other environmental conditions, especially water supply. This results also agreed with the findings of Howlader et al. (2008), they found highest seedling growth of Mahogani in Pirojpur followed by Mymensingh and Bagherhat district. Results reflected that all the growth parameters showed the best performance in Patuakhali region. It might be due to soil and climatic condition of Patuakhali region was favorable for growth of mahogany seedlings. But the growth of mahogany seedlings showed the poorest performance in Khulna region for its comparative high soil salinity and saline water which hampered the growth of mahogany seedlings (Table 2).

Akashmoni:

The growth of akashmoni seedling was highly influenced by age and region (Table 3).

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

| Region | Height (cm) | | | Base diameter (cm) | | | Fresh weight (g) | | | Dry weight (g) | | | Leaf number | | |
|------------|-------------|-------|--------|--------------------|------|------|------------------|-------|--------|----------------|-------|-------|-------------|-------|-------|
| | 2MAS | 4MAS | 6MAS | 2MAS | 4MAS | 6MAS | 2MAS | 4MAS | 6MAS | 2MAS | 4MAS | 6MAS | 2MAS | 4MAS | 6MAS |
| Dhaka | 35.93 | 81.25 | 105.22 | 1.68 | 2.65 | 5.25 | 21.00 | 80.92 | 104.24 | 7.25 | 27.22 | 48.25 | 8.15 | 17.25 | 35.00 |
| Khulna | 33.05 | 79.55 | 98.25 | 1.20 | 1.43 | 1.72 | 12.25 | 71.58 | 99.69 | 4.22 | 22.50 | 32.45 | 4.00 | 8.51 | 15.25 |
| Patuakhali | 34.00 | 81.00 | 100.44 | 1.52 | 1.88 | 2.23 | 18.85 | 79.59 | 101.22 | 5.85 | 24.21 | 44.25 | 7.52 | 14.46 | 31.22 |
| CV (%) | 3.09 | 2.98 | 3.08 | 1.82 | 3.27 | 4.23 | 4.39 | 3.38 | 8.18 | 5.59 | 6.62 | 8.92 | 5.27 | 6.18 | 2.29 |
| LSD (5%) | 3.27 | 7.43 | 7.51 | 0.18 | 0.32 | 1.03 | 2.27 | 3.23 | 3.39 | 2.01 | 1.92 | 3.28 | 1.09 | 1.88 | 2.29 |

MAS=Month Aged Seedling

In case of two months aged seedling, the highest height (35.93 cm), base diameter (1.68 cm), fresh weight (21.00 g), dry weight (7.25 g) and leaf number (8.15) were recorded from Dhaka region. The second highest height (34.00 cm), base diameter (1.52 cm), fresh weight (18.85 g), dry weight (5.85 g) and leaf number (7.52) were obtained from Patuakhali and it was statistically similar with the results of Dhaka region. The lowest height (33.05 cm), base diameter (1.20 cm), fresh weight (12.25 g), dry weight (4.22 g) and leaf number (4.00) were recorded from Khulna region. Similarly, the highest height, base diameter, fresh weight, dry weight and leaf number of four (81.25 cm, 2.65 cm, 80.92 g, 27.22 g and 17.25) and six (105.22 cm, 5.25 cm, 104.24 g, 48.25g and 35.00) month aged seedling were also recorded from Dhaka region. The second height, base diameter, fresh weight, dry weight, and leaf number of four (81.00 cm, 1.88 cm, 79.59 g, 24.21 g and 14.46) and six (100.44 cm, 2.23 cm,

101.22 g, 44.25 g and 31.22) months aged seedlings were obtained from Patuakhali region next to Dhaka. The lowest height 79.55 & 98.25 cm; base diameter 1.43 & 1.72 cm; fresh weight 71.58 & 99.69 g, dry weight 22.50 & 32.45 g and leaf number 8.51 & 15.25) for four and six month aged seedlings were found from Khulna region, respectively (Table 3).

From the above results, it is reflected that all the growth parameters showed the best performance in Dhaka region. Considering all the growth parameter poor performance was found in Khulna region. But the growth of akashmoni seedlings showed better performance at Dhaka and Patuakhali than Khulna region for might be its soil and water quality which helpful the growth of akashmoni seedlings. Howlader et al. (2008) found highest seedling growth of Akashmoni in Mymensingh district followed by Pirojpur and Bagherhat region. Kramer and Kozlowski (1981) rightly pointed out that increase of plant

diameter mainly depends on favourable temperature and other environmental conditions, especially water supply. 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.

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

| Region | Height (cm) | | | Base diameter (cm) | | | Fresh weight (g) | | | Dry weight (g) | | | Leaf number | | |
|------------|-------------|--------|--------|--------------------|------|------|------------------|--------|-------|----------------|-------|-------|-------------|-------|-------|
| | 2MAS | 4MAS | 6MAS | 2MAS | 4MAS | 6MAS | 2MAS | 4MAS | 6MAS | 2MAS | 4MAS | 6MAS | 2MAS | 4MAS | 6MAS |
| Dhaka | 72.33 | 135.25 | 198.22 | 3.01 | 4.85 | 5.87 | 68.88 | 190.10 | 302.1 | 14.20 | 55.25 | 73.40 | 17.25 | 40.25 | 62.55 |
| Khulna | 68.25 | 112.50 | 176.20 | 2.65 | 3.88 | 4.25 | 55.25 | 167.50 | 285.2 | 12.88 | 51.38 | 68.22 | 15.45 | 38.88 | 58.25 |
| Patuakhali | 76.33 | 143.45 | 205.50 | 3.88 | 5.22 | 6.17 | 76.86 | 200.25 | 318.5 | 16.05 | 63.20 | 103.2 | 20.23 | 51.55 | 75.42 |
| CV (%) | 4.26 | 3.28 | 3.36 | 4.48 | 2.27 | 4.46 | 8.72 | 4.48 | 11.10 | 1.92 | 3.37 | 5.48 | 3.35 | 2.28 | 3.37 |
| LSD (5%) | 5.48 | 8.92 | 10.14 | 1.13 | 0.36 | 1.15 | 12.28 | 6.69 | 5.72 | 2.54 | 2.83 | 11.17 | 1.16 | 3.84 | 4.37 |

MAS=Month Aged Seedling

The highest height (76.33 cm), base diameter (3.88 cm), fresh weight (76.86 g), dry weight (16.05 g) and leaf number (20.23) of two month aged raintree seedlings were recorded from Patuakhali region. Similarly, the highest height (143.45 & 205.50 cm), base diameter (5.22 & 6.17 cm), fresh weight (200.25 & 318.5 cm) and dry weight (63.20 & 103.2 g) and leaf number (51.55 & 75.42) of four and six months aged seedling was found in Patuakhali region (Table 4).

The lowest height of four and six months seedling was observed in Khulna region and it was 112.50 & 176.20 cm, base diameter 3.88 & 4.25 cm, fresh weight 167.50

& 285.2 g, dry weight 51.38 & 68.22g and leaf number 38.88 & 58.25 that is smaller than Patuakhali region and the region of Dhaka is smaller than Patuakhali and greater than Khulna region (Table 4). Howlader et al. (2008) found highest seedling growth of Raintree in Pirojpur region followed by Bagherhat and Mymensingh region. This variation might be due to soil, climate and site factor.

Raj Koroi

The growth of raj koroi seedling was highly influenced by age and region has presented in Table 5.

Table 5. Growth performance of different aged raj kori seedlings in different region

| Region | Height (cm) | | | Base diameter (cm) | | | Fresh weight (g) | | | Dry weight (g) | | | Leaf number | | |
|------------|-------------|-------|--------|--------------------|------|------|------------------|-------|--------|----------------|-------|-------|-------------|-------|-------|
| | 2MAS | 4MAS | 6MAS | 2MAS | 4MAS | 6MAS | 2MAS | 4MAS | 6MAS | 2MAS | 4MAS | 6MAS | 2MAS | 4MAS | 6MAS |
| Dhaka | 33.05 | 79.55 | 98.25 | 1.20 | 1.43 | 1.72 | 12.25 | 71.58 | 99.69 | 4.22 | 25.50 | 37.45 | 4.00 | 11.55 | 19.25 |
| Khulna | 35.93 | 81.25 | 105.22 | 1.68 | 2.65 | 5.25 | 21.00 | 80.92 | 104.24 | 6.25 | 27.22 | 44.25 | 8.15 | 25.25 | 42.00 |
| Patuakhali | 34.00 | 81.00 | 100.44 | 1.58 | 1.88 | 2.25 | 18.85 | 79.47 | 101.22 | 4.85 | 25.22 | 38.25 | 7.52 | 23.46 | 38.25 |
| CV (%) | 5.35 | 4.23 | 3.39 | 6.64 | 4.38 | 3.72 | 11.72 | 8.38 | 3.39 | 4.48 | 5.27 | 7.39 | 5.58 | 6.28 | 7.28 |
| LSD (5%) | 7.72 | 6.25 | 9.28 | 0.48 | 0.63 | 0.86 | 2.73 | 5.29 | 10.25 | 2.32 | 4.47 | 10.26 | 1.82 | 4.37 | 10.26 |

MAS=Month Aged Seedling

In case of two months aged seedling, the highest height (35.93 cm), base diameter (1.68 cm), fresh weight (21.00 g), dry weight (6.25 g) and leaf number (8.15) were recorded from Khulna region. The second highest height (34.00 cm), base diameter (1.58 cm), fresh weight (18.85 g), dry weight (4.85 g) and leaf number (7.52) were obtained from Patuakhali. The lowest height (33.05 cm), base diameter (1.20 cm), fresh weight (12.25 g), dry weight (4.22 g) and leaf number (4.00) were recorded from Dhaka region. Similarly, the highest height, base diameter, fresh weight, dry weight and leaf number of four (81.25 cm, 2.65 cm, 80.92 g, 27.22 g and 25.25) and six (105.22 cm, 5.25 cm, 104.24 g, 44.25g and 42.00) month aged seedling were also recorded from Khulna region. The second height, base diameter, fresh weight, dry weight and leaf number of four (81.00 cm, 1.88 cm, 79.47 g, 25.22 g and 23.46) and six (100.44 cm, 2.25 cm, 101.22 g, 68.25 g and 38.25) months aged seedlings were obtained from Patuakhali region. The lowest height 79.55 & 98.25 cm, base diameter 1.43 & 1.72 cm, fresh weight 71.58 & 99.69 g, dry weight 25.50 & 37.45 g and leaf number 11.55

& 19.25 for four and six month aged seedlings were found from Dhaka region, respectively (Table 5).

From the above results, it reflected that all the growth parameters showed the best performance in Khulna region. Considering all the growth parameter poor performance was found in Dhaka region. Through out of the results it was observed that all aged class seedling showed better performance in Khulna region and the poorest performance exhibited in Dhaka 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. Howlader *et al.* (2008) found highest seedling growth of Rajkoroi in Bagherhat region followed by Mymensingh and Pirojpur region. It might be due to soil and climate of the study area.

Sissoo (*Dalbergia sissoo*):

The growth of different aged sissoo (*Dalbergia sissoo*) seedlings was significantly influenced by the region shown in Table 6.

Table 6. Growth performance of different aged Sissoo seedlings in different region

| Region | Height (cm) | | | Base diameter (cm) | | | Fresh weight (g) | | | Dry weight (g) | | | Leaf number | | |
|------------|-------------|-------|--------|--------------------|------|------|------------------|-------|--------|----------------|-------|-------|-------------|-------|-------|
| | 2MAS | 4MAS | 6MAS | 2MAS | 4MAS | 6MAS | 2MAS | 4MAS | 6MAS | 2MAS | 4MAS | 6MAS | 2MAS | 4MAS | 6MAS |
| Dhaka | 37.93 | 85.25 | 108.22 | 1.80 | 2.80 | 4.25 | 21.00 | 80.92 | 104.24 | 6.25 | 27.22 | 60.25 | 8.15 | 25.25 | 32.00 |
| Khulna | 32.05 | 79.55 | 98.25 | 1.20 | 2.10 | 3.72 | 12.25 | 71.58 | 99.69 | 4.22 | 22.50 | 37.45 | 4.00 | 11.55 | 19.25 |
| Patuakhali | 35.00 | 82.00 | 103.44 | 1.58 | 2.88 | 4.22 | 18.85 | 79.55 | 101.22 | 4.85 | 24.22 | 58.25 | 7.52 | 20.46 | 28.25 |
| CV (%) | 6.05 | 5.23 | 4.28 | 4.64 | 4.28 | 3.25 | 9.62 | 5.25 | 2.73 | 5.38 | 5.47 | 8.35 | 6.28 | 7.26 | 6.26 |
| LSD (5%) | 5.27 | 8.28 | 10.84 | 0.59 | 0.37 | 0.66 | 1.28 | 7.29 | 11.18 | 1.22 | 5.27 | 8.26 | 1.22 | 3.47 | 8.24 |

MAS=Month Aged Seedling

Two, four and six months aged seedling the highest height, base diameter, fresh weight, dry weight and leaf number found best in Dhaka region followed by Patuakhali and Khulna. In case of six months aged seedling the highest height, base diameter, fresh weight, dry weight and leaf number were 108.22 cm, 4.25 cm, 104.24 g, 60.25 g and 32.00, respectively followed by Patuakhali region which were 103.44 cm, 4.22 cm, 101.22 g, 58.25 g and 28.25. Six month aged sissoo seedling gave lowest height in Khulna region which were 98.25 cm, 3.72 cm, 99.69 g, 37.45 g and 19.25, respectively (Table 6).

From the above results, it reflected that all the growth parameters showed the best performance in Dhaka region. It might be due to the favourable soil and climatic condition of Dhaka region for growth of Sissoo seedlings. But the growth of sissoo seedlings showed the poorest performance in Khulna region for its high soil salinity and saline water which hampered the growth of sissoo seedlings. Nath *et al.* (1991) mentioned that *Dalbergia sissoo* showed slow growth performance in the coastal area of West Bengal of India. Vimla and Vimal and Tyagi (1993) reported that *Dalbergia sissoo* can grow fast on well drained and alluvial soil of pH range 5.5 to 7.5. The results are in the consistent with the findings obtained by the experiment.

Increment of different tree seedlings in different region: Increment means differences of each growth parameters of its first survey value and last survey value. Results regarding increment of different seedlings from different regions are presented here separately as height increment and base diameter increment.

Height Increment: Increment of seedling height of different timber species in different location of Bangladesh was significantly different (Fig. 1). Among the different studied timber species highest height increment was observed in raintree seedling and the values in Dhaka, Khulna and Patuakhali regions were 125.9, 108.0 and 129.2 cm, respectively (Fig. 1). Height increment of others studied tree seedlings were almost similar and it ranges as 62.4 - 80.2 cm. Height increment variation in different location was not significantly varied but numerically increased values was found in Dhaka and Patuakhali region compare to Khulna region (Fig. 1).

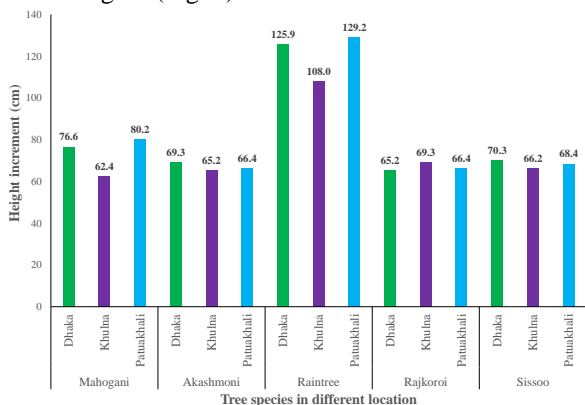


Figure 1. Height increment of different tree seedlings in different region

Base diameter increment: Like height increment, increment of base diameter of different timber species in different location of Bangladesh was also significantly different (Fig. 2). The trend of variation considering location and tree species was almost similar. Among the different studied timber species highest base diameter increment was found in Raintree seedling and the values in Dhaka, Khulna and Patuakhali regions were 2.56, 2.12 and 2.29 cm, respectively followed by Sissoo tree seedling (2.15, 2.02 and 2.24 cm), Rajkoroi tree seedling (1.52, 1.48 and 1.67 cm), Mahogani tree seedling (1.54, 1.39 and 1.45 cm) and lowest was in Akashmoni seedling (1.27, 0.92 and 1.15 cm), respectively (Fig. 2). Base diameter increment variation in different location was not significantly varied but numerically increased values was found in Dhaka and Patuakhali region compare to Khulna region.

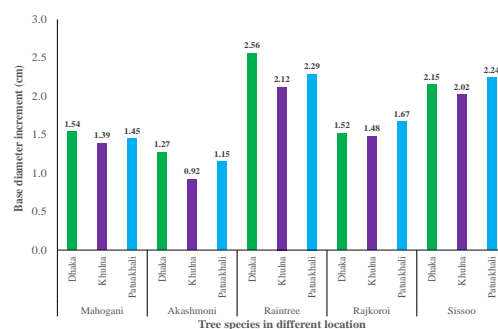


Figure 2. Base diameter increment of different tree seedlings in different region

Based on the increment analysis it is more or less clear that growth performance of Mahogani, Akashmoni, Raintree, Rajkoroi and Sissoo seedlings were different in different location as well as among the species. Both height and base diameter increment were higher in raintree species which reflect that it is a fast growing tree species compare to others. Dwivedi, 1992 and Raintree, 1992 also observed prominent root and crown expansion in Raintree species. Soil fertility status in all study region was more or less similar (Table 1) but due to high soil salinity and saline water might be the reason of lower performance in Khulna region over Dhaka and Patuakhali region. Similar phenomenon also observed by Nath *et al.* (1991) where they opined slow growth performance of *Dalbergia sissoo* in the coastal area of West Bengal of India.

Conclusion

This study explored the growth performance of five important tree species seedlings in Bangladesh perspective considering height, base diameter, fresh weight, dry weight and leaf number of two, four and six month aged seedlings. Based on the findings of this study it may be concluded that Soil and climate of different region influenced the growth of seedlings significantly. Growth performance of akashmoni and sissoo was found highest in Dhaka region and lowest in Khulna region while the seedlings of Patuakhali region exhibited medium growth performance. Mahogony and raintree seedling showed best performance in Patuakhali region and gained poor growth in khulna

Roman et al. region while the seedlings of Dhaka region showed medium growth performance. Seedling growth of Raj Koroi was found highest in Khulna region and lowest in Dhaka region while the seedling of Patuakhali region showed medium growth performance. Seasonal variations, in respect of environmental/climatic factors showed good relation with the growth and development of all the seedlings of studied five tree species. Increase of leaf surface might promote more carbohydrate production but did not show more height and diameter growth in all the species. Moreover, increased leaf surface showed less diameter growth to rajkoroi and rain tree. Therefore, the author emphasizes in these findings that growth in these types of timber species is not only controlled by environmental factors but also by genetic factors.

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