Effect of polybag size on seedling growth of three commercial multipurpose trees in Bangladesh

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Abstract: An experiment was conducted to observe the effect of polybag size on the growth of Kalokoroi (*Albizia lebbeck*), Raintree (*Albizia saman*) and Ipil-ipil (*Leucaena leucocephala*) seedlings during November, 2004 to June, 2005 at the pot yard of the Agroforestry department. Three different polybag size (23 cm x 15 cm, 20 cm x 13 cm and 17 cm x 11 cm) and three types of seedlings (Kalokoroi, Raintree and Ipil-ipil) were taken as two factors of the study with five replications. Polybag size showed significant influence on different growth parameters of the seedlings. All species grown in 23 cm × 15 cm sized polybag was observed to be superior to other treatments. The combined effect of different polybag sizes and species was also highly significant in all the parameters. The best performance was observed in S2T1 (raintree grown in 23 cm × 15 cm size polybag) followed by S3T1 (Ipil-ipil grown in 23 cm × 15 cm size polybag) and the lowest performance showed in S3T3 (Ipil-ipil grown in 17 cm × 11 cm size polybag).

Keywords: Polybag size, Seedlings, Growth parameters.

Introduction

Bangladesh is a densely populated country with 143596 km² area having 130.34 million people (BBS, 2002). The ever increasing population of Bangladesh appears as a dreadful problem. A vast majority of population who live in rural villages in Bangladesh are directly dependent on the continued productivity of soil, water and forest for their food, timber, fodder and fruit. Increasing deforestation has resulted not only severe but also has threatened the ecological balance of the country. Under this alarming situation massive afforestation program including first growing multipurpose trees can only help in increasing the first forest coverage of the country. Raintree (*Albizia saman*), Ipil-ipil (*Leucaena leucocephala*) and Kalokoroi (*Albizia lebbeck*) is an important multipurpose tree cultivated all over the country and use for production of timber, wood pulp, fuel, fodder and wind breaks, as browse for domestic grazing animals and to improve soil fertility. In recent years, the use of polybags in the nursery practices has been increased considerably due to massive afforestation and reforestation programs. It has many advantages in raising stocks, easy transportation and irrigation, unbreakable characters, easy availability of transparent and white colours, easy to make holes for aeration and drainage. Above all each polybag contains equal volume of rooting media for each seedling which is very important for growing tall, healthy and
uniform seedlings in the nursery. In the market different sizes of polybags with different thickness and colours are available, but it is difficult to standardize optimal size, thickness and colour for a particular species due to limited fund, facility and quantity of seed. Moreover, it is reported that in Eucalyptus hybrid non standard size of polybags (25 × 25 cm × 150 guage) does not respond well as the seedlings remain short, lanky and suffer causalities in transport and planting (Singh et al., 1985). Keeping this view in mind the research work was conducted to investigate the growth behavior of important timber seedlings in different size of polybags.

Materials and Methods

The polybag experiment was carried out at pot yard of the Agroforestry department, Bangladesh Agricultural University, Mymensingh, during the month of November 2004 to June 2005. The soil for filling the polybag was collected from the field of the Agroforestry farm, Bangladesh Agricultural University, Mymensingh from a depth of 0-15 cm and the soil was dried in the sun and removed the plant roots, pebbles and mixed up with the manure and fertilizer following the recommendation rate of forestry department. An amount of 2, 1.5 and 1 kg soil was taken in for polybag like 23 cm × 15 cm, 20 cm × 13 cm, 17 cm × 11 cm, respectively. There were 135 polybags comprising 9 different treatments with 5 replications. Before sowing the collected seeds were soaked in hot water for 5 minutes then it was rinsed with water for 5 minutes and kept in petridish over night for breaking the dormancy. Two seeds were sown in each polybag and proper intercultural operations were maintained during the studied period. The experiment was laid out in a two factorial Complete Randomized Design (CRD) with 5 replications.

Factor A:
S_1 = Kalokoroi
S_2 = Raintree
S_3 = Ipil-ipil

Factor B:
T_1 = Size of the polybag was 23 cm × 15 cm,
T_2 = Size of the polybag was 20 cm × 13 cm,
T_3 = Size of the polybag was 17 cm × 11 cm

Seedlings were harvested at 90, 150 and 210 day after sowing for measuring plant height (cm), base diameter (cm), leaf number plant^{-1}, shoot fresh weight (g), shoot dry weight (g), root fresh weight (g) and root dry weight (g). The collected data on growth and dry matter production were analyzed statistically by F-test to examine whether treatment effects were significant or not (Gomez and Gomez, 1984). The mean comparisons of the treatments were evaluated by least significant difference (LSD).

Results and Discussion

Plant height: Different types of polybag significantly influenced plant height of three different species (Table 1). Plant height was increased with the increase of days after sowing. The highest plant height was observed in T_1 (23 cm × 15 cm) polybag and lowest in T_3 (17 cm × 11 cm) in case of the three harvests.

Base diameter: Data showed significant increase
Table 1: Effect of different polybag size on the growth parameter of different tree species

<table>
<thead>
<tr>
<th>Polybag size</th>
<th>Plant height (cm)</th>
<th>Base diameter (cm)</th>
<th>Leaf number/plant</th>
<th>Shoot fresh wt. (g)</th>
<th>Shoot dry weight (g)</th>
<th>Root fresh wt. (g)</th>
<th>Root dry weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>23 cm × 15 cm</td>
<td>76.933 F</td>
<td>93.067 F</td>
<td>112.333</td>
<td>24.199 F</td>
<td>37.039 F</td>
<td>46.848 F</td>
<td>19.655 F</td>
</tr>
<tr>
<td>20 cm × 13 cm</td>
<td>67.667 F</td>
<td>86.267 F</td>
<td>103.400</td>
<td>15.530 F</td>
<td>24.081 F</td>
<td>34.308 F</td>
<td>11.967 F</td>
</tr>
<tr>
<td>17 cm × 11 cm</td>
<td>58.400</td>
<td>74.267 F</td>
<td>96.467</td>
<td>9.262 F</td>
<td>14.139 F</td>
<td>23.413 F</td>
<td>7.304 F</td>
</tr>
</tbody>
</table>

**Level of sign.**

NS= Non significant
* Indicates 5% level of significance
** Indicates 1% level of significance

Table 2: Combined effect of polybag size and species on the growth parameter of different tree species at three harvest

<table>
<thead>
<tr>
<th>Species × Polybag</th>
<th>Plant height (cm)</th>
<th>Base diameter (cm)</th>
<th>Leaf number/plant</th>
<th>Shoot fresh wt. (g)</th>
<th>Shoot dry weight (g)</th>
<th>Root fresh wt. (g)</th>
<th>Root dry weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1 T1</td>
<td>72.4</td>
<td>90.2</td>
<td>110.2</td>
<td>25.39 F</td>
<td>38.076 F</td>
<td>47.762 F</td>
<td>22.543 F</td>
</tr>
<tr>
<td>S2 T2</td>
<td>63.2</td>
<td>85</td>
<td>103.2</td>
<td>17.259 F</td>
<td>27.245 F</td>
<td>37.786 F</td>
<td>13.938 F</td>
</tr>
<tr>
<td>S3 T3</td>
<td>54.2</td>
<td>73.2</td>
<td>96.2</td>
<td>9.405 F</td>
<td>17.441 F</td>
<td>26.243 F</td>
<td>7.667 F</td>
</tr>
<tr>
<td>S1 T1</td>
<td>78.8</td>
<td>97.8</td>
<td>113.8</td>
<td>31.888 F</td>
<td>48.511 F</td>
<td>51.598 F</td>
<td>18.412 F</td>
</tr>
<tr>
<td>S2 T2</td>
<td>64.2</td>
<td>85.4</td>
<td>102.2</td>
<td>18.867 F</td>
<td>28.763 F</td>
<td>41.564 F</td>
<td>14.526 F</td>
</tr>
<tr>
<td>S3 T3</td>
<td>55.8</td>
<td>73.8</td>
<td>96.2</td>
<td>11.334 F</td>
<td>14.45 F</td>
<td>26.009 F</td>
<td>8.223 F</td>
</tr>
<tr>
<td>S1 T1</td>
<td>79.6</td>
<td>91.2</td>
<td>113.8</td>
<td>31.888 F</td>
<td>48.511 F</td>
<td>51.598 F</td>
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**Level of significance**

NS= Non significant
* Indicates 5% level of significance
** Indicates 1% level of significance

Tree Species
- S1 = Kalokoroi
- S2 = Raintree
- S3 = Ipil-ipil

Polybag Size
- T1 = 23 cm X 15 cm
- T2 = 20 cm X 13 cm
- T3 = 17 cm X 11 cm