Seeding quality from six Pinus species produced in polyethylene bag

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Introduction

Reforestation programs in Mexico are a strategy for increasing forest areas and reducing forest land degradation. In 2011, the program reforested 350,000 ha and ranked the country among the four with a higher amount of trees planted. However, low seedling survival rate is an important problem, which is associated to poor seedling quality.

Despite some works about plant quality in nurseries in Mexico, the knowledge is still limited due to the variability in conditions, species and production processes in nurseries.

The present work aimed to evaluate the plant quality of six pine species produced in a nursery in polyethylene bags.

Materials and methods

We choose 90 seedlings of the genus Pinus (15 plants by species from a Heroes Bicentennial Forest Nursery of Tecamach, state of Mexico, Mex. Plants were produced in forest soil and polyethylene bags.

We measured seedling's basal diameter (at the root neck (SCM) (Figure 1), height (Alt), slenderess index (IE = Alt/DC), aerial dry biomass and dry root biomass ratio (BSA/BSR) and Dickson's quality index (ICD) in P. pseudostrobus, P. leiophylla Schid. & Cham., P. pseudostrobus Lindl, P. ayacahuite Ehren, P. hartwegii Lindl, and P. cembroides Zucc. plants.

Results

For DC, all of the species but P. ayacahuite, had higher values than that of Mexican Norm NMX-AA-170-SCFI-2016. P. hartwegii had the higher quality than the other species in this variable (Table 1).

Table 1. Mean values of size and plant quality of six pine species produced at Heroes Bicentennial Forest Nursery.

<table>
<thead>
<tr>
<th>Species</th>
<th>DC</th>
<th>Alt</th>
<th>IE</th>
<th>BSA/BSR</th>
<th>ICD</th>
</tr>
</thead>
<tbody>
<tr>
<td>P. ayacahuite</td>
<td>3.7</td>
<td>18.2</td>
<td>4.4</td>
<td>1.9</td>
<td>0.9</td>
</tr>
<tr>
<td>P. cembroides</td>
<td>4.6</td>
<td>15.9</td>
<td>3.5</td>
<td>1.5</td>
<td>1.1</td>
</tr>
<tr>
<td>P. greggii</td>
<td>5.0</td>
<td>38.5</td>
<td>7.5</td>
<td>4.6</td>
<td>0.7</td>
</tr>
<tr>
<td>P. hartwegii</td>
<td>9.2</td>
<td>18.4</td>
<td>2.0</td>
<td>2.6</td>
<td>2.2</td>
</tr>
<tr>
<td>P. leiophylla</td>
<td>6.1</td>
<td>28.4</td>
<td>3.8</td>
<td>5.0</td>
<td>0.9</td>
</tr>
<tr>
<td>P. pseudostrobus</td>
<td>4.8</td>
<td>20.7</td>
<td>4.4</td>
<td>8.3</td>
<td>0.5</td>
</tr>
</tbody>
</table>

*DC: basal diameter at the root neck (mm), Alt: height (cm), IE: slenderess index , BSA: aerial dry biomass, BSR: dry root biomass and ICD: Dickson's quality index.

In Alt, P. greggii and P. leiophylla had higher values than that of Mexican Norm, whereas P. ayacahuite and P. pseudostrobus showed lower height than those established in the Norm (Table 1).

For IE, all the species but P. greggii, had values <6 (Table 1), which means that plants present high quality and more possibilities to survive due to resistance to frost and drying (Haase, 2008; Escobar-Alonso y Rodríguez, 2019).

Regarding BSA/BSR, P. cembroides, P. ayacahuite and P. hartwegii showed lower values (Table 1), this means high quality of seedlings due to a good balance between BSA and BSR (Haase, 2008), and greater chances of success during the plantation in sites with low precipitation (Thompson, 1985).

During the analysis of ICD, P. hartwegii showed the highest value, while P. greggii and P. pseudostrobus the lowest ones. P. cembroides, P. ayacahuite, and P. leiophylla showed medium ICDs. In general all the species but P. pseudostrobus, showed high quality with ICD values > 0.5 (Rodríguez-Ortiz et al., 2020).

Based on all of the variables evaluated, four species (P. hartwegii, P. cembroides, P. leiophylla and P. ayacahuite) had the higher quality of seedlings that suggests better possibilities to grow up in sites with harsh environmental conditions.

Conclusions

For reforestation programs to succeed in degraded areas, plants with high quality must be used. Good morphological traits help plants to survive in harsh conditions. However, nurserymen do not usually have quality references to evaluate different pine species they produce, since these values are scarce in the country (Rueda et al., 2014).

Overall, the results showed that P. cembroides and P. greggii had the higher plant quality while P. ayacahuite the lowest quality, whereas P. hartwegii, P. leiophylla and P. pseudostrobus had rather medium plant quality.

This information is keystone when analyzing seedling survival in the reforestation areas based on the characteristics of the sites. Therefore, it could help to make timely decisions during plantations management, particularly for the species evaluated.

Literature cited


Acknowledgments

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Further information

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