Short Duration Presprouting Enhances Sweet Potato Plant Production

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Additional index words. Ipomoea batatas, seed roots, emergence

The potential number of plants and time required to propagate them (3) from bedded roots vary among sweet potato [Ipomoea batatas (L.)] cultivars. High production costs from bedded roots underscore a need to maximize the number of plants produced per bed area and minimize the amount of time for them to reach transplant size. Presprouting for 3 weeks or longer at 32° ± 1°C and 85% ± 5% RH promotes early plant production and increases the number of plants produced (1, 3), but heating costs have deterred the use of presprouting. Some chemical treatments occasionally improved plant production from seed roots but such treatments have only limited commercial use. In a previous study (2), concentrations (150 to 1500 ppm) of the surface sterile calcium hypochlorite did not increase the number of transplants produced, but three of the four genotypes tested produced earlier plants following immersion. This study was conducted to determine the effects of presprouting duration and duration of immersion in two concentrations of calcium hypochlorite on plant production by bedded roots of a sparse plant-producing sweet potato genotype.

After 3 months in storage (16° ± 1°C and 85% ± 5% RH), uniformly large roots of ‘Georgia Jet’ were presprouted (32° ± 1°C and 85% ± 5% RH) for 0, 9, 18, and 27 days. Roots from each duration of presprouting were randomly assigned to lots of 10 each and immersed for 1, 5, 10, or 15 min in a 150 or 500 ppm calcium hypochlorite solution. Mean weight of each lot was 26.4 ± 26 g. Roots were air-dried, placed in 30 × 40 cm plots in an open greenhouse bed, and covered with 5 cm of fumigated Tifton sandy loam soil (fine-loamy, siliceous, thermic Plinthic Paleudults). Plots were watered immediately after bedding and thereafter as needed. After the first plant harvest, granular fertilizer [28.0N–12.3P–3.2K (g·m⁻²)] was applied to the bed surface prior to 0.5 cm of water. Minimum air temperature in the greenhouse was maintained at 24° and soil temperature was 28° ± 4°.

Plant harvests from the earliest plots began 3 weeks after bedding. Plants at least 20 cm above the bed surface were harvested weekly from individual plots for 9 consecutive weeks during a 16-week period following initiation of harvesting. Data included cumulative number of plants during the first 4 and 8 weeks of harvesting during the 16-week period and the total number of plants harvested during the nine consecutive harvests per plot, regardless of when the harvests occurred during the 16-week period. Plants were weighed and counted after each harvest.

The experimental design was a 4 × 2 × 4 split-split plot with four replications. Data for days from bedding to first plant emergence, days from emergence to first plant harvest, and number of plants were subjected to a √X + 0.5 transformation. Data for plant weight were subjected to a √X transformation. All transformed means were back-transformed for presentation. Concentration or duration of immersion in calcium hypochlorite did not affect plant production. Compared to roots not presprouted, the time from bedding until first plant emergence was reduced by 40% when roots were presprouted for 9 days and by 50% with 18 or 27 days of presprouting (Table 1). Emergence of roots from subjects to increasing periods of presprouting accelerated and was reflected in reduced time from emergence until first plant harvest. Roots presprouted for 9 or 18 days required 4 to 6 days longer between plant emergence and first plant harvest than were required by roots presprouted for 27 days. Average plant weight (21 g) was not adversely affected by any of the treatments and all plants were of satisfactory size for transplanting.

Increased presprouting time tended to increase the total number of plants and their cumulative numbers 4 and 8 weeks after harvests were initiated. After 8 weeks the cumulative number of plants harvested from roots not presprouted was only 41% of the total number of plants harvested, compared with 71–76% from roots presprouted 9, 18, or 27 days. Also, compared to roots not presprouted, the total number of plants increased by 59%, 68%, or 95% when roots were presprouted for 9, 18, or 27 days, respectively.

The concentrations or durations of immersion in calcium hypochlorite used in this experiment were not critical in affecting plant production, regardless of presprouting treatment. However, these findings confirm the benefit of short duration as well as standard 3-week or longer presprouting (1, 3) to enhance plant production from bedded ‘Georgia Jet’ sweet potato seed roots. Total number of plants produced was increased and the time required to produce plants of satisfactory size for transplanting was reduced. Further investigations could help determine specific short-term presprouting intervals for maximizing plant production from this and other cultivars while minimizing heating costs involved in presprouting.

Literature Cited


Table 1. Effects of duration of presprouting on number of days to emergence, number of days from emergence to first plant harvest, cumulative number of plants harvested 4 and 8 weeks after harvest initiation, and total number of plants harvested during nine consecutive weekly harvests from bedded ‘Georgia Jet’ sweet potato seed roots during a 16-week harvest period.

<table>
<thead>
<tr>
<th>Presprouted (days)</th>
<th>Emergence (days from bedding)</th>
<th>First plant harvest (days from emergence)</th>
<th>Cumulative no. of plants (weeks after harvests initiated)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>0</td>
<td>20 a</td>
<td>30 a</td>
<td>0 c</td>
</tr>
<tr>
<td>9</td>
<td>12 b</td>
<td>23 b</td>
<td>4 b</td>
</tr>
<tr>
<td>18</td>
<td>10 c</td>
<td>21 b</td>
<td>4 b</td>
</tr>
<tr>
<td>27</td>
<td>10 c</td>
<td>17 c</td>
<td>7 a</td>
</tr>
</tbody>
</table>

Regression a

- Linear (%) 80**
- Quadratic (%) 20**

Means within columns pooled across main effects of duration of presprouting, concentration of calcium hypochlorite, and duration of immersion in calcium hypochlorite.

Means separation within columns by Duncan’s multiple range test, 5% level.

aPercentages of sums of squares for presprouting partitioned to linear and quadratic.

**Linear or quadratic terms significant at the 5% or 1% levels, respectively.