General Considerations for Growing Vegetable Transplants

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Vegetable Transplants

Definitions

A plant (seedling) started in a protected environment such as a greenhouse, hotbed or cold frame and later transplanted in the field for further growth.

- Transplanting is often used as an alternative to direct seeding for various reasons.
- Transplant production is a specialized segment of the industry that requires strict standards to ensure that quality seedlings are delivered to the grower.
Vegetable Transplants

why to start vegetable plants indoors

- Extending the growing season by starting plants indoors, before outdoor conditions are favorable; This is important for early yields, since plants can be ready to set out immediately after reasonable risk of frost is past
- Protecting young plants from diseases, pests, and other stresses until they are sufficiently established;
- Avoiding germination and establishment problems by using seedlings instead of direct seeding.
- For expensive hybrid seed, transplants can help conserve seeds.
- Starting seedlings indoors can increase germination rates and uniformity, esp. small-seeded vegetable crops which are slow or difficult to germinate.
Vegetable Transplants

Transplants Types:

• **Bare-root transplants:**
  - *e.g.* onions

• **Containerized transplants:**
  - *e.g.* tomatoes, melons, watermelons....
Vegetable Transplants

Transplants Types:

• **Bare-root transplants:** e.g. onions

Relative ease of transplanting BARE-ROOT seedlings of various vegetables

(Knott’s handbook, 2007)

<table>
<thead>
<tr>
<th>Easy to transplant</th>
<th>Medium difficulty</th>
<th>Difficult to transplant</th>
</tr>
</thead>
<tbody>
<tr>
<td>broccoli</td>
<td>caulifower</td>
<td>cucumber</td>
</tr>
<tr>
<td>brussels sprouts</td>
<td>celery</td>
<td>muskmelon</td>
</tr>
<tr>
<td>cabbage</td>
<td>eggplant</td>
<td>squash</td>
</tr>
<tr>
<td>lettuce</td>
<td>onion</td>
<td>watermelon</td>
</tr>
<tr>
<td>tomato</td>
<td>pepper</td>
<td></td>
</tr>
</tbody>
</table>
Vegetable Transplants

**Transplants Types:**
- **Bare-root transplants:**
- **Containerized transplants:** *mini plugs*
  - e.g. tomatoes, melons, watermelons....
Seed Considerations

%Germination versus Seed Vigor

- Germination = the percent germination of a lot of seeds under good conditions,
- Seed vigor = the speed and uniformity of emergence, especially under less-than-ideal conditions.
- Enhanced seed: treatments to maximize germination, vigor and uniformity
Seed Considerations

• **Hybrids have several important advantages:**
  - greater vigor
  - better uniformity
  - higher yield
  - improved disease resistance
  - Germination versus Seed Vigor
SEEDING TRAYS

Cell packs, flats, cone-tainers, peat pots, peat pellets; must be well-drained; cell size depends on the crop;

Cell packs: 48, 72, 128, 200 cells
21” X 10 ¾”

peat pots

Flats

peat pellets

Cone-tainers
**SEEDING TRAYS**

*Cell packs, flats, cone-tainers, peat pots, peat pellets; must be well-drained; cell size depends on the crop;*

<table>
<thead>
<tr>
<th>ray (# Of Cells)</th>
<th>Plant Density (Cells/Ft²)</th>
<th>Cell¹ Volume (Cc.)</th>
<th>Recommended Crops</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>14</td>
<td>171</td>
<td>early tomatoes, vine crops</td>
</tr>
<tr>
<td>38</td>
<td>23</td>
<td>106</td>
<td>early tomatoes, vine crops</td>
</tr>
<tr>
<td>50</td>
<td>31</td>
<td>66</td>
<td>early tomatoes, vine crops</td>
</tr>
<tr>
<td>72</td>
<td>47</td>
<td>43</td>
<td>early peppers, early cole crops, early vine crops</td>
</tr>
<tr>
<td>128</td>
<td>78</td>
<td>23</td>
<td>main-season tomatoes, peppers, Cole crops</td>
</tr>
<tr>
<td>200</td>
<td>122</td>
<td>11</td>
<td>late-season peppers, Cole crops</td>
</tr>
<tr>
<td>288</td>
<td>175</td>
<td>7</td>
<td>processing tomato, Spanish onion</td>
</tr>
</tbody>
</table>

¹ Volume in cubic centimeters (Cc.)
Growing Media

- Soil – rarely
- Commercial media: usually proportions of peat moss, vermiculite, and perlite. With limestone, and nutrient charge.
- Homemade media: 1 gallon peat moss, 1 gallon vermiculite, 1 tablespoon superphosphate, and 2 tablespoons ground limestone.

Always use clean mixing containers; use bleach 1:9 ratio to disinfect all containers and surfaces.
A good medium should be:

- Clean & free of diseases and weed seed
- Well drained
- Fine-textured
- .....retain nutrients

- Larger-seeded plants, such as squash, cucumber, and watermelon, use 72-cell packs
- Seed directly into cell packs or peat pots.
- Sow two seeds per cell and thin to one
A good medium should be:

- **Clean & free of diseases and weed seed**
- **Well drained**
- **Fine-textured**
- .....retain nutrients

### Chemical analyses of samples of selected plug media

<table>
<thead>
<tr>
<th>Growing Media</th>
<th>pH</th>
<th>Nitrate (ppm)</th>
<th>P (PPM)</th>
<th>K (PPM)</th>
<th>Ca (PPM)</th>
<th>Mg (PPM)</th>
<th>Conductivity (EC) mmho/cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pro Mix BX</td>
<td>5.6</td>
<td>115</td>
<td>35</td>
<td>117</td>
<td>145</td>
<td>44</td>
<td>147</td>
</tr>
<tr>
<td>ASB</td>
<td>5.5</td>
<td>67</td>
<td>30</td>
<td>91</td>
<td>32</td>
<td>42</td>
<td>1.17</td>
</tr>
<tr>
<td>Metro Mix 200</td>
<td>6.5</td>
<td>50</td>
<td>5</td>
<td>99</td>
<td>144</td>
<td>84</td>
<td>1.63</td>
</tr>
<tr>
<td>Metro Mix 240</td>
<td>6.2</td>
<td>39</td>
<td>6</td>
<td>68</td>
<td>99</td>
<td>77</td>
<td>1.27</td>
</tr>
<tr>
<td>Speedel</td>
<td>6.3</td>
<td>89</td>
<td>4</td>
<td>62</td>
<td>145</td>
<td>62</td>
<td>1.43</td>
</tr>
</tbody>
</table>
Watering and Fertilizing

- Irrigate as needed (1-2x per week)
- If using a watering wand, use the soft shower setting to water flats gently.
- A strong force of water can wash the seeds out of the growing medium
- If sub-irrigating; float the flat on a clean water bath
- After emergence, fertilize with a high phosphorus Plant Starter fertilizer such as Peter’s 8-45-15 or 10-52-10.
Structures for Transplant Production

- Cold frames and hot beds - may also be used to protect tender plants during winter.
- Row Covers
- Hot caps & transparent domes
- Greenhouses
Microclimate Settings

**Temperature:**
- **Warm season crops: peppers, tomatoes:** 60-75 °F
- **Cool season crops: Cabbage, Broccoli, and Cauliflower:** 55 - 60 °F

**Light:** needed only after emergence; very low light will cause plants to be spindly.

**Humidity:** high humidity 75-90% will slow down desiccation and hasten germination.
Hardening off - gradual acclimatization of transplants to the outdoor environment.

- Harden transplants for ~ 2 weeks before planting in the field.
- *First, move transplants to a cool, shady location outdoors; avoid a windy day.*
- Gradually move transplants into full sunlight for a few hours each day.
- Gradually reduce watering but do not let the plants wilt.
High Quality Transplant

Characteristics:

- Be healthy with a green appearance,
- Mid-sized (3-5” tall) & not be spindly or leggy.
- Should not yet be flowering
- Not harbor insects or diseases on them
High Quality Transplant

Time to grow transplants

- Cool-season crops (broccoli, cabbage, cauliflower) 8 - 10 weeks
- Warm-season crops (tomato, pepper, eggplant) 5 - 7 weeks
- Vine crops (muskmelon, watermelon, squash, cucumber) 3 - 4 weeks
Transplanting

- Water seedlings before transplanting. Their root systems will take a while to develop sufficiently to "forage" for water on their own.
- Transplant early in the morning preferably in cloudy and cool weather, to reduce transplant shock.
- Minimize root disturbance; root disturbance destroys fine roots and slows down water/nutrient uptake.
Vegetable Transplants

- **good field establishment**
- **Sporadic establishment**
THANK YOU &
Happy Gardening!