Single-cell-plant production (plug production) of vegetable seedlings

**Advantages**
- Less seed is used.
- Higher survival rate of seedlings, because of reduced damage in transplanting and lower incidence of disease.
- Higher quality and uniformity of transplants.
- Earlier establishment and earlier harvest after transplanting.
- More suitable for mechanical transplanting.
- Reliable planning of production.

**Disadvantages**
- Better-quality (hence more expensive) seed must be used.
- Additional cost is needed for a protective structure, plug trays, growing medium, etc.
- Higher technical skill is needed, especially in the management of water and nutrients.

INGLE-CELL-PLANT production, called “plug production”, was developed in North America and Europe in the 1970s. It was introduced into some Asian countries in the mid 1980s. Seedlings of vegetables are grown in small cells and transplanted to fields. This technique has many advantages compared to the traditional method of growing seedlings. However, a substantial initial investment and some technical skills are needed.

Fig. 1. Trays with various numbers of plugs

Fig. 2. Transplants grown in plugs

---

Cooperating agency for this topic:
This was information summarized by FFTC from a book, Styer, R.C. and Koranski, D.S. 1997, Plug & Transplant Production. Ball Publishing.
E-mail: wnchang@dragon.nchu.edu.tw
Basic facilities needed

Seeder: Many brands of seeders for plugs have been developed and are available on the market. Growers should choose the most appropriate one, based on the kind of vegetable to be planted, and the speed and accuracy of the seeder (Fig. 1). An average speed is a rate of about 150-200 trays/hr, with 128 plugs/tray. For smallholders, or in countries where labor costs are not too high, sowing seeds by hand is also possible.

Plug tray: Different kinds of trays, containing various numbers of plugs per tray, are offered on the market. In most cases, 72-288 plugs/tray are used for crops such as cabbage, tomato, eggplant and melon.

Media: Since plugs are small, the growing medium should have good aeration, water holding capacity, drainage and a proper pH level. The most commonly used medium is a mixture of peat moss, vermiculite, and perlite.

Protective structure: To get good-quality transplants, some kind of protective structure is needed. This ensures good germination, and protects seedlings from environmental stresses.

Growing technique

☐ Growers must take good care of seedlings, and ensure good environmental conditions. These should change gradually as the growth stage advances.

☐ Growth stages can be divided into four.

Stage I: From sowing to germination.

Stage II: From germination to the development of cotyledon.

Stage III: During this stage, true leaves develop.

Stage IV: Seedlings are ready for transplanting, shipping or bedding.

Environmental conditions should be adjusted little by little to fit the growth stage, as shown in Table 1.

Recommendation

This system provides many advantages, and is very promising in view of the sharp increase in vegetable consumption in many Asian countries. The main disadvantage of the system is its cost in relation to the returns. This problem should be solved by adjusting the system, or by finding cheaper alternative resources in each country.

Table 1. The optimum environments for the growth of tomato seedlings by growth stage.

<table>
<thead>
<tr>
<th>(Growth stage)</th>
<th>Temperature (°C)</th>
<th>Light Intensity</th>
<th>Humidity (%)</th>
<th>Soil Moisture (%)</th>
<th>Nitrogen Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>25-30</td>
<td>Low</td>
<td>95</td>
<td>75-85</td>
<td>Once after germination 25-50</td>
</tr>
<tr>
<td>II</td>
<td>18-25</td>
<td>Medium</td>
<td>80</td>
<td>75-85</td>
<td>1-2 times a week 50-75</td>
</tr>
<tr>
<td>III</td>
<td>18-23</td>
<td>High</td>
<td>70</td>
<td>60-65</td>
<td>1-2 times a week 100-150</td>
</tr>
<tr>
<td>IV</td>
<td>15-24</td>
<td>High</td>
<td>65</td>
<td>60-65</td>
<td>When needed 100-150</td>
</tr>
</tbody>
</table>