per day (M) was calculated for each day per the example for Expt. 1:

Day 1  \( M_1 = E_W^1 \)
2  \( = E_W^1 + E_W^2 \)
3  \( = E_W^1 + E_W^2 + E_W^3 \)
4  \( = E_W^1 + E_W^2 + E_W^3 + E_W^4 \)
5  \( = E_W^1 + E_W^2 + E_W^3 + E_W^4 + E_W^5 \)
6  \( = E_W^1 + E_W^2 + E_W^3 + E_W^4 + E_W^5 + E_W^6 \)
7  \( = E_W^1 + E_W^2 + E_W^3 + E_W^4 + E_W^5 + E_W^6 + E_W^7 \)
8  \( = E_W^1 + E_W^2 + E_W^3 + E_W^4 + E_W^5 + E_W^6 + E_W^7 + E_W^8 \)
9  \( = E_W^1 + E_W^2 + E_W^3 + E_W^4 + E_W^5 + E_W^6 + E_W^7 + E_W^8 + E_W^9 \)
10  \( = E_W^1 + E_W^2 + E_W^3 + E_W^4 + E_W^5 + E_W^6 + E_W^7 + E_W^8 + E_W^9 + E_W^{10} \)
11  \( = E_W^1 + E_W^2 + E_W^3 + E_W^4 + E_W^5 + E_W^6 + E_W^7 + E_W^8 + E_W^9 + E_W^{10} + E_W^{11} \)
12  \( = E_W^1 + E_W^2 + E_W^3 + E_W^4 + E_W^5 + E_W^6 + E_W^7 + E_W^8 + E_W^9 + E_W^{10} + E_W^{11} + E_W^{12} \)

The daily accumulation of silk mass from the simulated 10,000 ear production scheme for both plantings is presented in Fig. 2. The mass of newly accumulated silk reached a peak around 100 GDD in Expt. 2. The rise of this peak was more rapid and the duration more concentrated than for Expt. 1, the curve for which showed a broad peak through 110 to 140 GDD. Faster plant development during the summer months resulted in a greater mass of newly emerged silk for the CEW moth to target in a more concentrated time period.

Strategies for CEW control should take into account the difference in plant development in response to different time periods when silking occurs. Perhaps, consecutive insecticide applications through the peak silking period of the later planting would be more beneficial than applications every 2 or 3 days, which might be adequate for slower developing corn plants, as experienced in the early planting (Expt. 1). Monitoring CEW moth populations in conjunction with a more-thorough understanding of silk development patterns would be the next step toward testing different strategies for most efficient control of the CEW.

Literature Cited


Radicle Dehydration of Germinated Seed on Seedling Emergence and Vigor in Spinach

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Additional index words. Spinacia oleracea, seed treatment, dessication, plasmolysis, pregermination, rehydration

Abstract. Germinated spinach (Spinacia oleracea L.) seed (radicle length 3 to 12 mm) were subjected to dehydration under uncontrolled room conditions for 3 to 25 days before planting. Although diminishing over time, some seedlings emerged after all dehydration periods. Seedling height and dry weight responded similarly. Dehydration of germinated seed for ≥15 days was required before seedling emergence was reduced by 50% of that produced by undehydrated germinated seed. Three cultivars responded similarly to length of dehydration period in respect to seedling emergence and vigor.

Field conditions such as high soil temperature, soil-borne pathogens, and erratic soil moisture often result in poor stand establishment of many vegetable species (Bhatt and Srinivasa, 1987; Goode and Morelock, 1987; Suganuma et al., 1985). In recent years, pre-plant seed stimulation has gained considerable attention as a means of enhancing vegetable stands. Increased emergence, emergence rate, and seedling uniformity have been reported for various vegetables resulting from preplant seed stimulation (Cantliffe et al., 1981; Lipe and Skinner, 1979; Schultheis et al., 1988; Yaklich and Orzolek, 1977). Because problems are often encountered with the establishment of early fall spinach, a study was initiated in late summer 1982 to determine whether seed stimulated could alleviate the stand establishment problem. Unfavorable field conditions delayed the planned planting of spinach. As a result, the primed seed treatments prepared for the study germinated. At planting, germinated seed with plasmolyzed radicles 6 to 12 mm long from the initial lot were aerated in a water bath at room temperature (24C) for 1.5 hr, removed, placed in Laponite 508 gel (Laporte, Hackensack, N.J.), and fluid drilled into a guard row of the stand establishment study. I noted seedling emergence in seed with dehydrated radicles 3 days after drilling and, therefore, now report on a subsequent study to determine the effect of dehydration germinated spinach seed (DGS) before planting on subsequent seedling emergence and vigor.

Test 1. 'Vienna' spinach seed (100 g) was held in aerated water until ≥50% germination (radicle emergence) had occurred. Seeds were removed from the water and hand-sorted into germinated and nongerminated lots. The nongerminated lot was discarded. The germinated lot was air-dried on paper towels at ≥25C for 5, 10, 15, 20, or 25 days before

Table 1. Effect of radicle dehydration time on emergence of germinated seed of the spinach cultivar Vienna.

| Duration of DGS
| (days) | Seedling emergence
| (%) |
|---|---|
| Test 1: (14 - DAP) | 0 82 |
| 5 70 |
| 10 56 |
| 15 28 |
| 20 14 |
| 25 26 |
| d' (P = 0.95)
| 34 |
| Test 2: (10 - DAP) | 0 66 |
| 3 58 |
| 6 54 |
| 9 64 |
| 12 46 |
| 15 36 |
| d' (P = 0.95)
| 36 |

d'GDS = Dehydration of germinated seed.
DAP = Days after planting.
Significant differences obtained using Dunnett's procedures.

Received for publication 22 Aug. 1988. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked advertisement solely to indicate this fact.
planting. Seedling emergence from germinated seed exposed to each dehydration period (treatment) was compared to that obtained from an untreated raw seed check. The experiment was planted in a randomized complete-block design with 10 replicates. Each treatment consisted of five seeds sown into one 7.6-cm (0.5 liter) plastic pot containing moistened potting mix (Fisons Complete Sunshine Mix Blend #1, Vancouver, B.C., Canada). Seed with dehydrated radicles 6 to 12 mm long were rehydrated for 1 hr in tap water and planted. The seeded pots were maintained in the laboratory at 18C for 14 days and indexed for emergence.

Statistical differences of treatment effects measured in this study were determined using Dunnett’s procedures (Steel and Torrie, 1960). Significant emergence differences occurred between the control seed and the DGS treatments dehydrated for 15 days or longer. Seedling emergence ranged from 82% for the check to 14% for the 20-day DGS treatment (Table 1). Emergence was <30% when the dehydration period exceeded 10 days. Necrotic tissue was apparent on a few radicles in each treatment, except the check, after 14 days exposure to severe dehydration, with no emergence difference being detected between the check and control seed.

Emergence was <30% with increasing dehydration duration (Table 1). Emergence was <30% when the dehydration period exceeded 10 days. Necrotic tissue was apparent on a few radicles in each treatment, except the check, after 14 days exposure to severe dehydration, with no emergence difference being detected between the check and control seed.

Table 2. Response of spinach 30 days after planting to radicle dehydration of germinated seed. (Means for three cultivars.)

<table>
<thead>
<tr>
<th>Duration of DGS treatment</th>
<th>Days</th>
<th>%*</th>
<th>Height (cm)</th>
<th>Dry wt (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (untreated seed)</td>
<td>2.2</td>
<td>96</td>
<td>6.2</td>
<td>11.6</td>
</tr>
<tr>
<td>7</td>
<td>2.7</td>
<td>80</td>
<td>4.3</td>
<td>9.6</td>
</tr>
<tr>
<td>14</td>
<td>3.0</td>
<td>77</td>
<td>4.1</td>
<td>9.5</td>
</tr>
<tr>
<td><em>P = 0.95</em>*</td>
<td>0.7</td>
<td>13.6</td>
<td>0.5</td>
<td>1.4</td>
</tr>
</tbody>
</table>

DGS = Dehydration of germinated seed.
*Days to emergence of first plant per treatment.
**Based on a random sample of 10 seedlings obtained 1 month after planting.

Significant differences obtained using Dunnett’s procedures.

Significant differences obtained using Dunnett’s procedures.

Additional research is required to detect which vegetable species can withstand the effect of DGS, the potential of DGS as a storage technique for germinated seed, and the influence of the moisture content of the rooting media on resulting emergence.

Literature Cited


Evaporative Demand and Plant Growth Characteristics

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Abstract. An easy method to estimate water requirements for poinsettia (Euphorbia pulcherrima Willd. ex Kl.) production with practical applications to commercial operations was developed to promote water conservation. A waterrequirementprediction equation (\( P \geq 0.01, R^2 = 0.78 \)) that used pan evaporation along with plant-canopy height and width as input variables was generated. Equation verification was carried out by comparing plant quality of crops irrigated according to the generated waterrequirement prediction equation to crops irrigated “on-demand” or with capillary-mat irrigation. Plants irrigated with the prediction equation were smaller than plants grown with capillary mat, but plant quality ratings for ‘Annette Hegg Diva’ and ‘Dark Red Annette Hegg’ were not significantly different. ‘Guthier V-10 Amy’ plants grown with irrigation on-demand were of higher quality than plants grown using either the capillary mat or the prediction equation. Applied water was significantly lower for plants irrigated with the prediction equation than would normally be applied in a commercial operation using a conservative fixed daily irrigation rate.

Table 1. Final plant canopy characteristics for each irrigation treatment used for each poinsettia cultivar.

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Irrigation treatment</th>
<th>Final width (cm)</th>
<th>Final height (cm)</th>
<th>Plant quality (Rating)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guthier V-10 Amy</td>
<td>II</td>
<td>38 b</td>
<td>19 b</td>
<td>3.7 b</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>45 a</td>
<td>19 b</td>
<td>4.7 a</td>
</tr>
<tr>
<td></td>
<td>IV</td>
<td>47 a</td>
<td>24 a</td>
<td>2.8 c</td>
</tr>
<tr>
<td>Annette Hegg Diva</td>
<td>II</td>
<td>52 b</td>
<td>32</td>
<td>3.3</td>
</tr>
<tr>
<td></td>
<td>IV</td>
<td>67 a</td>
<td>35 ns</td>
<td>2.3 ns</td>
</tr>
<tr>
<td>Dark Red Annette Hegg</td>
<td>I</td>
<td>54 a</td>
<td>36</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td>IV</td>
<td>64 b</td>
<td>36 ns</td>
<td>2.1 ns</td>
</tr>
</tbody>
</table>

*Values for each plant growth and quality characteristic listed represent the means of seven replications within each irrigation treatment. Mean differences followed by a different letter within each column within cultivar are significantly different from each other by Dunn’s multiple range test (\( P < 0.05 \)).

Received for publication 13 June 1988. Florida Agr. Ext. Sta. Journal Series no. 9087. This project was supported in part by a grant from the Southwest Florida Water Management District. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked advertisement solely to indicate this fact.


