Afterripening and Harvesting Effects on Tabasco Pepper Seed Germination Performance

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Abstract. Field emergence of Tabasco pepper (Capsicum frutescens L.) often requires 10 to 14 days even under optimum conditions. Methods to increase and accelerate Tabasco seed germination were investigated. Seed were extracted from orange and red fruit harvested at 150, 195, and 240 days from transplanting. The influence of fruit maturity on seed germination performance was significant over all harvest times. Seed extracted from red fruit had a significantly greater germination rate and final germination percentage than seed from orange fruit. Germination performance of seed extracted from red fruit harvested 150 days after transplanting was superior to that of 'McIlhenny Select' Tabasco were there­ signed, therefore, to investigate the influence of fruit maturity, harvest time, and afterripening on Tabasco pepper seed germination performance.

Tabasco pepper continuously produces flowers and fruit over a 3- to 4-month period in the Gulf Coast area. Orange and red fruit of ‘McIlhenny Select’ Tabasco were therefore harvested for seed extraction at 150, 195, and 240 days from transplanting in 1984 and 1985. Harvest times were in September, October, and November, and correspond to the time and length of a typical red Tabasco fruit harvest season. Time, as days from transplanting, was used as an index of crop maturity or age. Determination of fruit color at harvest was made by use of the Mun­ sell Standard Color Difference method, where minimum orange = 7.5 YR 7/12 and minimum red = 10R 5/16 (7). Fruit color was used as an index of fruit maturity at each harvest. Depending on temperature, the change in Tabasco fruit color from pure orange to pure red will require from 4 to 8 days. Immediately following harvests, pure orange and pure red fruit were macerated carefully by hand to avoid damaging seed coats and placed separately in dilute HCl (1:20) for 5 min at 25°C to facilitate separation of seed from placental tissue and to disinfect seed coats. Seeds were then rinsed of acid and debris with copious amounts of running water, followed with a final distilled water rinse. Seeds from red and orange fruit were patted dry between paper towels (sur-
Table 1. Effect of fruit maturity and harvest time of 21-day afterripened Tabasco seed on germination percentage, mean rate of germination (MRG), and germination performance index (GPI) over 2 years.

<table>
<thead>
<tr>
<th>Fruit maturity (color)</th>
<th>Harvest (days after transplanting)</th>
<th>Germination (%)</th>
<th>MRG (days)</th>
<th>GPI (germination %/MRG)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>150</td>
<td>195</td>
<td>240</td>
<td></td>
</tr>
<tr>
<td>orange</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>52 d</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>81 a</td>
<td></td>
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</tr>
<tr>
<td>red</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>11.3 bc</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.1 a</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>orange</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.6 c</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.0 a</td>
<td></td>
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</tr>
<tr>
<td>red</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.5 be</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.9 ab</td>
<td></td>
<td></td>
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<td></td>
</tr>
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</table>

Germination percentage, mean rate of germination (MRG), and germination performance index (GPI) of seed extracted from pure red Tabasco fruit 150 and 240 days after transplanting in 1985.  

*Color determination of pure orange and red fruit made with the Munsell System of Color Notation (7).  
*Mean separation within germination variable by Duncan's multiple range test.  
P = 5%.

Table 2. The effect of length of afterripening period at 25°C on germination percentage, mean rate of germination (MRG), and germination performance index (GPI) of seed extracted from pure red Tabasco fruit 150 and 240 days after transplanting in 1985.  

<table>
<thead>
<tr>
<th>Afterripening period (days)</th>
<th>Germination (%)</th>
<th>MRG (days)</th>
<th>GPI (germination %/MRG)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>150 days after transplanting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>57</td>
<td>7.0</td>
<td>8.0</td>
</tr>
<tr>
<td>7</td>
<td>64</td>
<td>7.6</td>
<td>8.2</td>
</tr>
<tr>
<td>14</td>
<td>70</td>
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</tr>
<tr>
<td>21</td>
<td>86</td>
<td>6.9</td>
<td>12.7</td>
</tr>
<tr>
<td>28</td>
<td>80</td>
<td>6.9</td>
<td>11.5</td>
</tr>
<tr>
<td>Contrasts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 vs. 7, 14, 21, 28</td>
<td>**</td>
<td>NS</td>
<td>**</td>
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<tr>
<td>7 and 14 vs. 21 and 28</td>
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<tr>
<td>21 vs. 28</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>240 days after transplanting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>32</td>
<td>7.1</td>
<td>5.1</td>
</tr>
<tr>
<td>7</td>
<td>40</td>
<td>7.8</td>
<td>5.2</td>
</tr>
<tr>
<td>14</td>
<td>46</td>
<td>7.5</td>
<td>6.1</td>
</tr>
<tr>
<td>21</td>
<td>64</td>
<td>6.9</td>
<td>9.3</td>
</tr>
<tr>
<td>28</td>
<td>59</td>
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<tr>
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<tr>
<td>7 and 14 vs. 21 and 28</td>
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</tr>
<tr>
<td>21 vs. 28</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
</tbody>
</table>

Seed moisture at start of afterripening period was 34% and stabilized at 21 days at 6.9%.  
NS. **Nonsignificant and significant at the 0.01% level, respectively.

Table 3. The effect of length of afterripening period at 25°C on germination percentage, mean rate of germination (MRG), and germination performance index (GPI) of seed extracted from pure orange Tabasco fruit 150 and 240 days after transplanting in 1985.  

<table>
<thead>
<tr>
<th>Afterripening period (days)</th>
<th>Germination (%)</th>
<th>MRG (days)</th>
<th>GPI (germination %/MRG)</th>
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<tr>
<td></td>
<td>150 days after transplanting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>42</td>
<td>10.6</td>
<td>4.0</td>
</tr>
<tr>
<td>7</td>
<td>31</td>
<td>11.1</td>
<td>2.8</td>
</tr>
<tr>
<td>14</td>
<td>38</td>
<td>10.4</td>
<td>3.6</td>
</tr>
<tr>
<td>21</td>
<td>34</td>
<td>10.8</td>
<td>3.2</td>
</tr>
<tr>
<td>28</td>
<td>36</td>
<td>10.2</td>
<td>3.1</td>
</tr>
<tr>
<td>Contrasts</td>
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<td></td>
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</tr>
<tr>
<td>0 vs. 7, 14, 21, 28</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>7 and 14 vs. 21 and 28</td>
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<td>21 vs. 28</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>240 days after transplanting</td>
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<td></td>
</tr>
<tr>
<td>0</td>
<td>28</td>
<td>9.2</td>
<td>3.0</td>
</tr>
<tr>
<td>7</td>
<td>28</td>
<td>9.6</td>
<td>2.9</td>
</tr>
<tr>
<td>14</td>
<td>34</td>
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<tr>
<td>0 vs. 7, 14, 21, 28</td>
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<tr>
<td>21 vs. 28</td>
<td>**</td>
<td>NS</td>
<td>**</td>
</tr>
</tbody>
</table>

Seed moisture at start of afterripening period was 37% and stabilized at 21 days at 6.9%.  
NS. **Nonsignificant and significant at the 0.05% and 0.01% levels, respectively.
quent seed performance (5, 9). Performance of seeds extracted from orange, immature fruit, however, was not significantly influenced by harvest date. Germination percentage, rate, and performance index were not affected by harvest, and at all times were significantly poorer than performance of seeds from red fruit. Mean dry weights of 100 seeds extracted from orange and red fruit were 0.40 and 0.43 g, respectively, and suggest that differences in cotyledonary and endospermic food reserves do not account for seed performance differences.

The effect of the length of an afterripening period at 25°C on performance of Tabasco seeds extracted from red fruit at 150 and 240 days after transplanting is presented in Table 2. Afterripening response of seeds harvested from orange and red fruit at 195 and 240 days after transplanting was similar; consequently, only data of the 150- and 240-day harvests are presented for comparison in Tables 2 and 3. At time of extraction from red fruit, seed moisture was 34%. During the afterripening period, seed moisture decreased to 9.5%, 8.9%, and 6.9% at 7, 14, and 21 days following extraction, respectively. Moisture of seed extracted from orange fruit was initially 37%, and decreased to 6.9% 21 days following extraction in a manner similar to seed from red fruit. Randle and Honma (11) evaluated two cultivars of *C. frutescens* and observed that germination rate of both cultivars was stimulated by either a 2- or 4-week period of afterripening at 24°C. The origins of the seeds tested in their work was Brazil and Columbia. The origin of ‘McIlhenny Select’ Tabasco pepper seed tested in this study is believed to be Mexico. Data in Table 2 indicate that a 21-day period of afterripening at 25°C is optimum for stimulation of germination performance of seeds from red fruit, regardless of harvest. Germination percentages of seeds extracted from red fruit harvested 240 days after transplanting were about 20% lower than seeds harvested at 150 days. There was no apparent difference in seed germination rate between different harvests.

Afterripening effects on seeds extracted from orange fruit differed little, with the exception of a 21-day treatment effect on the seed germination percentage of seeds harvested 240 days after transplanting (Table 3). Although germination percentage appeared to be stimulated, there was not a significant afterripening treatment difference in the germination performance index. The data therefore indicate that seeds extracted from immature Tabasco fruit not only possess low germination performance characteristics (2, 11), but also do not respond significantly to afterripening treatment.

Tabasco pepper producers will generally select red-ripe fruit for seed extraction late (±240 days after transplanting) in the harvest season, immediately prior to first expected frost. The response of commercially produced Tabasco seed to a 21-day afterripening period on paper towels in the dark in incubators at 25°C is presented in Table 4. This seed lot was extracted from pure red fruit and was allowed to dry in a pepper sauce processing plant for 2 to 3 days, at ~60–70% RH and 20°C to 25°C day and 10°C to 15°C night temperatures. The exact harvest date of the seed is unknown. As a result of afterripening treatment, germination percentage, rate, and performance were all significantly improved. Data from this study indicate that, regardless of time of seed harvest, Tabasco pepper seeds extracted from red fruit respond favorably to a 21-day afterripening period at 25°C.

**Table 4. Effect of afterripening for 21 days at 25°C on commercially produced* Tabasco seed germination percentage, mean rate of germination (MRG), and germination performance index (GPI).**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Germination (%)</th>
<th>MRG (days)</th>
<th>GPI (germination %/MRG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No afterripening</td>
<td>58</td>
<td>8.9</td>
<td>6.4</td>
</tr>
<tr>
<td>Afterripening</td>
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</tr>
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<td>LSD0.05</td>
<td>8.0</td>
<td>0.5</td>
<td>1.1</td>
</tr>
</tbody>
</table>

*Exact harvest time of this 1985 seed lot unknown.

**Literature Cited**