Overview

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   Seed Longevity

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Seed Priming

Methods:
- Hydropriming
- Osmopriming
- Solid Matrix Priming
- etc.

Factors affect priming:
- Temperature
- Water potential
- Priming duration

“Hydrothermal priming time” Model

Effects of priming:
- Increase germination rate and uniformity
- Develop seedling root systems rapidly
- Break dormancy, overcome some adverse conditions, e.g., high temperature
- Reduce seed longevity, especially at high moisture content
Seed Longevity after priming

Lettuce Seeds
Controlled Deterioration @ 10% MC + 40°C

Water Incubation

Osmopriming @ -1.5 MPa

Viability (%)

Ageing period (h)

Water treatments and priming treatments affect seed longevity.

Reduction of seed longevity in storage compared to non-primed seed

Tarquis, A.M. and Bradford, K.J. (1992) Prehydration and priming treatments that advance germination also increase the rate of deterioration of lettuce seeds. Journal of Experimental Botany

Project Design – Activities performed

Objective:
Develop and evaluate priming treatments on seed longevity
**Materials and Methods**

**Seeds**

Seeds were obtained from HM.Clause company, including:
- Two seed lots of tomato (cv. Pony Express E89224 (T1) and E57272 (T2))
- One seed lot of pepper (cv. Sequoia Pepper E65965)
- One seed lot of onion (cv. Mission Star E46851).

**Materials and Methods**

**Solid Matrix Priming**

+ fixed amount of seeds and increasing amount of water to obtain threshold seed water content for priming.

**Clay mixture material**


Keith Kubick – HM-Clause
Materials and Methods

Q2 Oxygen Sensing Technology

The Q2 equipment provides a quick and precise measurement of the oxygen consumption of each individual seed, so that it can give us respiration (oxygen depletion) time courses.

http://www.astec-global.com/q2-technology

Materials and Methods

Q2 Analysis

Agar 0.4% + Fungicide

oxygen consumption measurements at 30-minute intervals
Materials and Methods

Population Oxygen Depletion (POD) Curves

- POD curves are visually similar to germination time courses.
- Seed oxygen consumption rates on an individual seed and population basis are highly correlated with germination timing.
- Potential maximum longevity (Pmax) of seeds can be estimated aging-time model based on POD data.

Results

Final Germination:
- Onion 85%
- Tomato-T1 94%
- Tomato-T2 94%
- Pepper 85%

Initial seed germination at 25C.
Results - Prescreening of Priming

<table>
<thead>
<tr>
<th>Water added (ml)</th>
<th>Pepper</th>
<th>Onion</th>
<th>Tomato-T1</th>
<th>Tomato-T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>2.75</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>3</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>3.25</td>
<td>Day 7</td>
<td>Day 6</td>
<td>Day 10 (few)</td>
<td>Day 6 (few)</td>
</tr>
<tr>
<td>3.5</td>
<td>Day 5</td>
<td>Day 6</td>
<td>Day 5</td>
<td>Day 5</td>
</tr>
<tr>
<td>3.75</td>
<td>Day 5</td>
<td>Day 3</td>
<td>Day 4</td>
<td>Day 4</td>
</tr>
<tr>
<td>4</td>
<td>Day 5</td>
<td>Day 2</td>
<td>Day 3</td>
<td>Day 2</td>
</tr>
<tr>
<td>4.25</td>
<td>Day 4</td>
<td>Day 2</td>
<td>Day 2</td>
<td>Day 2</td>
</tr>
<tr>
<td>4.5</td>
<td>Day 4</td>
<td>Day 2</td>
<td>Day 2</td>
<td>Day 2</td>
</tr>
<tr>
<td>4.75</td>
<td>Day 4</td>
<td>Day 2</td>
<td>Day 2</td>
<td>Day 2</td>
</tr>
</tbody>
</table>

Amount of days required to start germination adding increasing amount of water on bags (2.5-4.75ml). 3ml chosen for priming on all species.

2.5g of seed + 5g of clay media + different amount of water.

Project Design – Activities performed

- **Germination Tests**
- **Prescreening Priming**
  - **Priming Tests**
    - **MC Tests**
      - Drying with Drying Beads to 30% RH
      - Incubation at 47% RH
    - Controlled Deterioration Tests
  - **Q2 Tests**

**Controlled Deterioration Test:**
50°C with different aging durations, ranging from 10-40 Days

**Q2 Test:**
Population Oxygen Depletion (POD) Curves
**Results – Priming Duration**

Pepper – little change in rates for first 4 days of priming, increasing speed after that.

Onion – more gradual reduction in time with increasing priming duration.

Tomato-T1 – Similar gradual response except with longest duration.

Tomato-T2 – 1 and 2 days duration response strong as longer priming duration.

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**Results – Controlled Deterioration**

**Tomato - T1**

Longevity declined sharply between 0 and 2 days of priming, then recovered somewhat at longer priming times.
Results – Controlled Deterioration
Tomato-T2

Similar pattern to T1, with the least potential longevity occurring after 2 days of priming

Take-home Messages

Performance enhanced by priming:

- Increase germination rate and uniformity
- Develop seedling root systems rapidly
- Break dormancy, overcome some adverse conditions

Disadvantage:

- Reduce seed longevity