Flax Seedling Emergence as Affected by Harvester Injury, Fungicidal Treatments and Age of Seeds

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In Southern California, flax (Linum usitatissimum L.) seeds held over from the previous year occasionally germinate poorly. Although the cause of poor germination has been attributed to certain fungicidal seed treatments, no experimental tests that confirm this hypothesis have been made. Cobb and Jones,1 Kommedahl and Christensen,2 and Kommedahl et al.3 showed that cracking reduced germination of flax seeds and induced seedling abnormalities. The results reported herein relate to the effects of mechanical cracking of seeds, fungicidal seed treatments, age, and storage temperatures on germination of flax seeds from greenhouse and field trials.

Materials and Methods

Seeds of the flax variety 'Imperial', C.I. 1114, were used throughout the series of experiments unless stated otherwise. Moisture content of seeds was 4% or less. Ceresan M was applied as a slurry whereas Panogen, Ceresan 200, and DuPont 244 were applied directly to the inside surfaces of glass jars (Table 1) after which seeds were added and agitated. Nontreated and fungicidally-treated seeds were stored in capped unsealed glass jars in the laboratory at Riverside, California, at 1° (± 0.5°), 20° (± 1°), 30° (± 1°), and 40° (± 1°) C. Natural storage conditions were simulated by storing seeds in a warehouse in the Imperial Valley in 1-pound cloth bags placed in the center of 50-pound bags of similarly treated seeds. During the course of this experiment warehouse temperatures were not recorded, but at El Centro, California, the average daily air temperatures ranged from 10° to 34° C. and the average maximum in July and August was 43°.

Emergence of flax in the greenhouse (18-27° C.) was evaluated by planting seeds 1/4 inch deep in flats of steamed pathogen-free sandy loam. Emerged plants were counted daily to note effects of treatments on emergence. A randomized block design with 4 to 6 replications (100 seeds per replication) was used in most experiments.

Field experiments were conducted at the U.S. Department of Agriculture Southwestern Irrigation Field Station, Brawley, California.

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Results

Effects of Mechanical Cracking of Flax Seeds on Rate and Percentage of Emergence

The effect of mechanical cracking on seedling emergence, was determined using different lots of mechanically cracked (30%) and noncracked Imperial as well as noncracked seeds of 'Punjab 47' (C.I. 1115) stored in the Imperial Valley and at 1° C. in Riverside. Seeds were not treated with fungicides.

At the beginning of the experiment average emergence in steamed soil of noncracked seeds of Punjab 47 and Imperial varieties was 98%. Emergence from cracked seeds of Imperial was 90%. Six months later, emergence in steamed soil from the noncracked seed of both varieties stored in Riverside at 1° C. and in the Imperial Valley remained high (96-99%), but emergence from cracked Imperial seeds had dropped from 90% to 83% (significant at the 1% level). No differences in emergence between seed lots stored at low or high temperatures were observed.

Table 1. Fungicidal treatments applied to flax seed.

<table>
<thead>
<tr>
<th>Fungicide</th>
<th>Dosage rate oz./100 lb. seed</th>
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<tbody>
<tr>
<td>None (Control)</td>
<td>-</td>
</tr>
<tr>
<td>Panogen (Metaldehyde quinolyde)</td>
<td>5.0</td>
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<tr>
<td>Ceresan M (ethyl mercury p-vinyl sulfonamide)</td>
<td>2.5</td>
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<tr>
<td>DuPont 244 (phenyl mercury acetate 2.37% and ethyl mercuric acetate 1.87%)</td>
<td>2.4t</td>
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<tr>
<td>Ceresan 200 (ethyl mercury 3, 3-Dihydroxypropyl mercaptide)</td>
<td>1.3</td>
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* Except in one of the early experiments in which 1.5 oz. was applied. 
† DuPont 244 was discontinued as a commercial fungicide during the course of investigation and Ceresan 200 replaced it in subsequent experiments.