# Exp 11 Effect of chemicals on germination

<table>
<thead>
<tr>
<th>Jan 12 1970</th>
<th>Dry seeds soaked in 1% solution of all chemicals below. Grown in lab for 24 hours. Seeded into germ at 4:30P.</th>
<th>Jan 15 (3rd day)</th>
<th>Jan 16</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Good reactions</td>
<td>About 70% ger. Conc. too high. Trace.</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Thiourea</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Urea</td>
<td>No apparent growth</td>
<td>Trace</td>
</tr>
<tr>
<td>3</td>
<td>Na$_2$PO$_4$ (50 seeds)</td>
<td>Good reaction 19 ger 17 tips 23 mager</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Ascorbic acid</td>
<td>No growth</td>
<td>Trace</td>
</tr>
<tr>
<td>5</td>
<td>Riboflavin</td>
<td></td>
<td>Trace</td>
</tr>
<tr>
<td>6</td>
<td>Quercitrin</td>
<td>Pumping? Tips</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Nicotinic Acid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Diethiothreitol</td>
<td>No growth</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Thiourea-acetic acid</td>
<td>Pumping? Tips</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Cysteine</td>
<td>Definite reaction</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Mercaptoethanol</td>
<td>Pumping Tips</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Mercapto-1-propenol</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$\checkmark$ $\square$ $\checkmark$  $\square$ $\checkmark$

1. Seeds soaked in water for 12 hours and then in 1% Thiourea for 3 hrs @ 77°F gave about 90% ger. Best growth more healthy than in 1 above.

Plan: Repeat with 0.1% solutions. Also soak seed in H$_2$O for 12 hours, then into solutions for 4 hours, then germinate at 77°F.
Exp M. Chemicals - Results

Jan 26 1970
Thiocura 0.1%
Soaked seed
Dry seed
20% ger. solution too weak
No germination

Thiocura 0.5%
Soaked seed (5 days)
Into Thiourea Jan 24 11:00 AM
Out Jan 25 6:00 AM, 19 hrs in Thiourea

Germination in lab

Jan 26 11:00 AM
3

Jan 27
40
43

Jan 28
8
51

Jan 28
No root hair development yet.

Jan 29
Roots stunted, hypocotyls
60 to 75% of length of radical.

Grow in soil

Tried 0.3% solution

Feb 4
Seed into solutions for 3 hours after soaking in H2O 24 hrs

Feb 4 9:30
Into germ, 70F lab table

8 9:00 AM
Solution too Promising
weeks for seed

10
2 Try
Try without dry seed
Solution may be too strong
No reaction
Oxidation

**Urea**

\[
\text{C} = \text{O} \quad \text{H}_2\text{O} \text{ soluble}
\]

**Thiourea**

\[
\text{C} = \text{S} \quad \text{H}_2\text{O} \text{ soluble}
\]

**Theoretic**

\[
\text{C}_6\text{H}_5\text{e-SH}
\]

**Sulphydryl**

**Gluthathione**

\[
\text{HS-C}_6\text{H}_4\text{e-0-U}
\]

**Thio glycic acid**

\[
\text{C}_6\text{H}_5\text{e-SI} - \text{e-0-H}
\]

**Pantheine acid**

**Thiolactic acid**

\[
\text{Nicotinic acid (oxid)}\
\]

**Ribo flavin (oxid) B_2**

**Vitamine B complex**

**Thiamine (oxid) B_1**

**Vitamine C = Ascorbic acid**
Oxidation - page 191 at Batansky

Glutathione

\[
\text{CH}_2\text{S-H}
\]

Sulfhydryl group

\[
\text{CH-NH-CO-CH}_2\text{-CH}_2\text{-CH-COOH} = \text{G}
\]

G - S-H + O_2 \rightarrow \text{H} \text{S}-\text{G}

\[
\text{H}_2\text{O}_2 \rightarrow \text{Hydrogen peroxide} + \text{Catalase or peroxidase}
\]

G - S ---- S - G = 2\text{H}_2\text{O} + \text{O}_2

G - S-H \quad \text{HS-G}

G - S-H \quad \text{HS-G}
\[ \frac{\text{CO}_2}{\text{O}_2} \] Respiratory Quotient

Sugar = 1

Low O in \rightarrow \text{Fat} = 0.7 \pm 1

High O in \rightarrow \text{Malic acid} = 1 \pm 1.33

✓✓ [Di-thio-threitol]
✓ [Cysteamine (Need cystime)]
✓✓ [Na, S, O] ✓✓ [Mercaptoethanol]
✓✓ [Ascorbic acid] ✓ [Nicotinic]
✓✓ Riboflavin
✓✓ Gliathione Reduced (Fungi control)
✓✓ Thimerosal
✓✓ Thioctic
✓✓ Thioeing
✓✓ Urea
January 16/70  95°F inhibited growth of seed
          treated with 1% thiourea
          Exps with A, B
          7PF 75°F
# Chemical solutions prepared

<table>
<thead>
<tr>
<th>Percent</th>
<th>Chemical</th>
<th>Date prepared</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Jan 7, 1970</td>
</tr>
<tr>
<td>1</td>
<td>5% Thiourac</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>5% Urea</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5% Na$_2$S$_2$O$_4$</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5% Ascorbic acid</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2.5% Riboflavin</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>5% Glutathione (reduced)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>5% Nicotinic</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>5% Dithiothreitol</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>5% Thioceric acid</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>5% Cysteine</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>5% Merscaptothanol (fungicide)</td>
<td></td>
</tr>
</tbody>
</table>

Note: 3% Thiourac & 8 minutes
Thiourag check on Sus. Summit seed

Jan 10 1970
8:55 AM Started soaking 24 seeds
11:55 AM Drained seeds and put in 77°F water for germination without drying
1 PM 10 germinated

Jan 11 8:00 AM Tips beginning to show
12:00 PM 10 germinated
8 tips
6 no sign growth

Jan 13 4:30 PM 18 germinated
3 tips
3 no sign growth

Jan 14 8:30 AM 18
3
3

Jan 12/70 Sealed seeds in water first for 12 hours, then into 1/4% thiourag for 3 hours, into germination at 77°F at 3:30 PM Jan 12/70

Jan 14 11:00 AM 18 germinated (looks healthy growth)
10 tips
7 no growth (absolutely)

Try 0.1% thiourag solution
Thiourea treated seed
Neal - Newman

Collected 1969 Lassen Co
Claim "Good germination"

Wetted and germination by AH
Sept 17/1970

Approx germination
10 - 15%

Check germination in sand
Compare with strat-dried seed.