

# Laboratory Investigation 14B

Station # \_\_\_\_\_

Chapter 14A: Sexual Reproduction of Plants

## Plants: Factors that Affect Germination

You may refer to pages 193-199 in your textbook for a general discussion of sexual reproduction of plants.  
Time required: 25 minutes

### Background Material

basic parts of a seed:

1. **testa** - the seed coat
2. **hilum** - a scar on the seed coat  
marks the place where the seed was attached to the wall of the plant ovary during its development
3. **micropyle** - a small opening between the integuments in the hilum region
4. **cotyledons** - serves for food storage  
may be monocot or dicot
5. **embryonic plant**

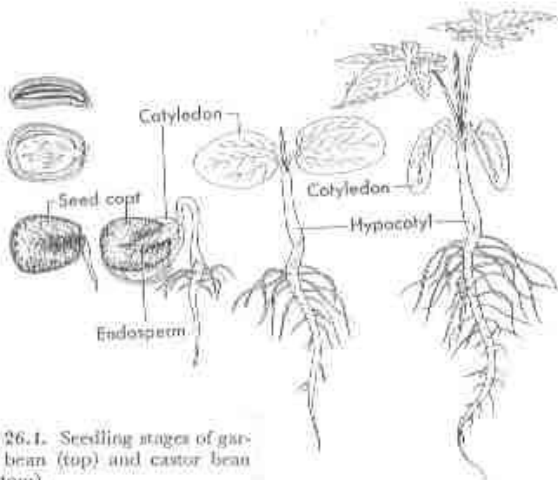
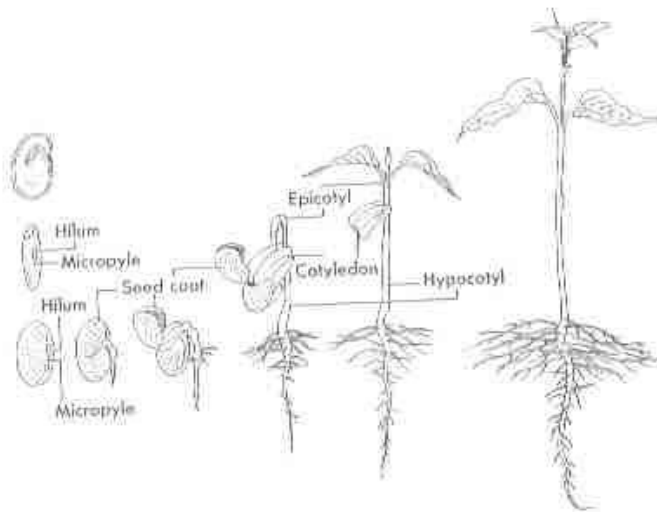


Fig. 26.1. Seedling stages of garden bean (top) and castor bean (bottom).

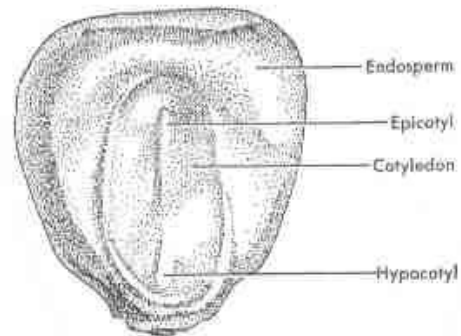


Fig. 26.2. A corn grain.

basic parts of the embryonic plant:

1. **hypocotyl** - the embryonic stem  
the part below the point where the cotyledons attach
2. **radicle** - the end of the hypocotyl which develops into the primary root
3. **epicotyle** - (plumule) become the stem and leaves  
the portion of the plant embryo above the point of attachment to the cotyledons

**germination** - the sprouting of a seed

**viable** - capable of growing and developing (the ability to germinate)

three necessary conditions for germination:

1. proper moisture
2. proper temperature
3. proper oxygen

### Goals

- Determine whether seeds are alive.
- Identify the effects of various factors on the ability of seeds to sprout and grow.
- Gain experience in recording observations accurately.

### Materials

bean seeds, potting soil, potting tray(s), masking tape, factors to be used in the experiment (See box below.)

### Procedure before lab

Take seeds home and expose them to the factor for the assigned time. Bring them back to school the day we plant the lab.

### Procedure in lab

1. Label your seed tray with your homeroom and factor. Use masking tape and sharpie.
2. Cover the holes in the bottom of your seed tray with pieces of paper towel.
3. Plant seeds in potting tray. (½ dirt, then seed, then ½ dirt)
4. Water the seeds thoroughly using the sink in the back of the room.
5. Transport your seed tray to my room (using the clear plastic tray to prevent water dripping on floor) and place it in the plant stand
6. Water the seeds daily unless there is water in the bottom of the tray.
7. During our next lab you will record your observations on the data sheet and clean your seed tray.

### Factors

*Below is a list of factors that you can use in this experiment. Perhaps you can think of additional factors. Each group in your class should choose one factor to test.*

**Hydrogen peroxide** Soak the seeds in hydrogen peroxide for twenty-four hours.

**Microwaves** Expose the seeds to microwaves in a microwave oven at low setting for five seconds.

**High temperature** Expose the seeds to temperatures of 300<sup>0</sup> F in a conventional oven for five minutes.

**Refrigeration** Place the seeds in a refrigerator for twenty-four hours.

**Freezing** Place the seeds in a freezer for twenty-four hours.

**Water** Soak the seeds in water for twenty-four hours.

**Alcohol** Soak the seeds in rubbing alcohol for twenty-four hours.

**Petroleum jelly** Coat the outside of the seeds with petroleum jelly.

**Liquid fertilizer** Soak the seeds in water containing liquid fertilizer (at the strength recommended for lawn use) for twenty-four hours.

**Weed killer** Soak the seeds in water containing weed killer for twenty-four hours.

**Bleach** Soak the seeds in water containing bleach for twenty-four hours.

**Sunlight** Expose the seeds to direct sunlight for one day.

<b>Factors that Affect Germination Observations</b>				
<b>Factor</b>	<b>Total # of Sprouts</b>	<b>Total # of Leaves</b>	<b>Avg. Height of Stems</b>	<b>Other Observations</b>
<b>alcohol</b>				
<b>bleach</b>				
<b>control</b>				
<b>freezing</b>				
<b>high temperature</b>				
<b>hydrogen peroxide</b>				
<b>liquid fertilizer</b>				
<b>microwaves</b>				
<b>petroleum jelly</b>				
<b>refrigeration</b>				
<b>sun light</b>				
<b>water</b>				
<b>weed killer</b>				

### Summing Up

- Which factor(s) in this experiment caused the seeds to sprout *more quickly* than the seeds in the control group?  
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- Which factor(s) in this experiment caused the seeds to sprout *more slowly* than the seeds in the control group?  
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- Which factor(s) in this experiment caused the seeds not to sprout?  
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4. Based on your observations, do you think that the bean seeds were alive when the factors were applied to them? Explain your answer.

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5. What did you notice about the seeds before they were planted that indicated they were alive?

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6. Why do you think the seeds in some groups did not sprout or sprouted more slowly than those in the control group?

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7. What other significant or unusual conclusions can you make based on observations of the bean seeds planted?

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8. Do you think that your conclusions about bean seeds are true of seeds in general? Why or why not?

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