

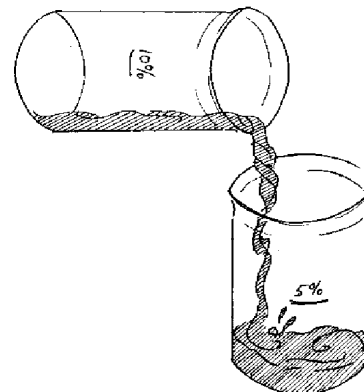
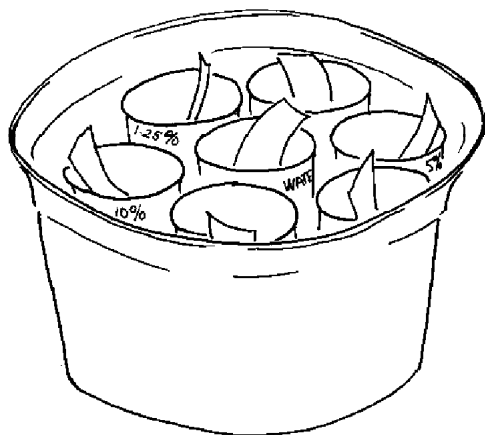


Bioassays with Fast Plants

Determining the effects of substances in the environment on living organisms is accomplished by a *bioassay*. A substance found in the environment is tested at various concentrations with a living organism to determine what concentrations are beneficial or harmful to the organism. The pharmaceutical industry evaluates new medicines by measuring the quantity of a drug that results in a defined *effective dose*, ED.

One standard measurement of toxicity of a substance is the LD_{50} , the lethal dosage that causes death of fifty percent of the organisms exposed. The most common LD_{50} is the acute oral toxicity, that is, the single internal dosage of a material necessary to kill half the test organisms. These LD_{50} values are expressed in milligrams of chemical per kilogram of body weight. Therefore, the lower the LD_{50} value for a substance, the greater the toxicity.

There may be visual or measurable symptoms of toxicity at sub-lethal levels. Organisms that are sensitive to a particular substance can be used as *indicator species* for the presence of that substance. The United States Environmental Protection Agency (EPA) has begun to test the toxic effects of materials in the environment on plants. A simple bioassay to set up with plants is to look at the effects of a substance on seed germination.



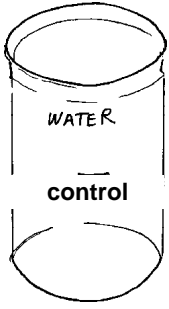
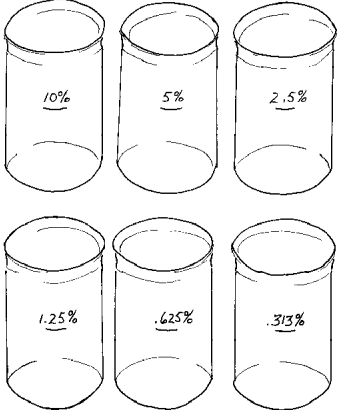
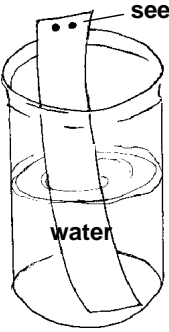
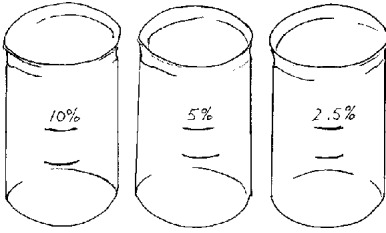
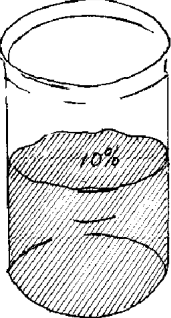
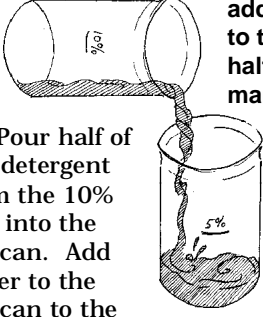
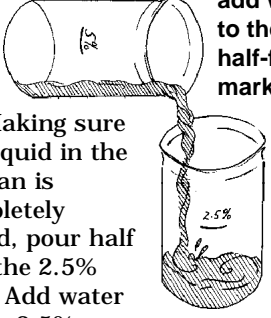
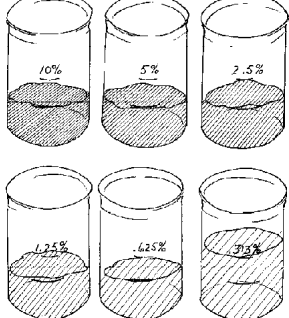
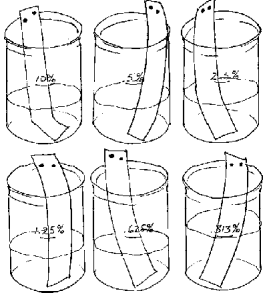
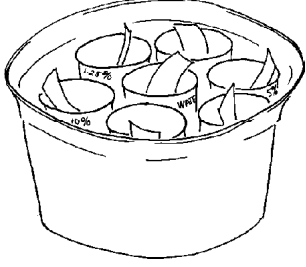
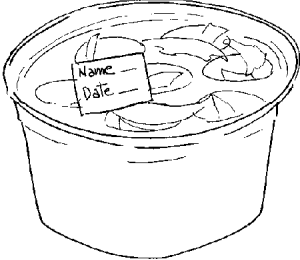
Materials

- 14 Fast Plants Seeds
- water
- permanent marker
- 7 clear plastic 35 mm film cans
- one 1-pound cottage cheese container with lid
- 7 wicks made of absorbent fabric; wicks should be approximately 1.5 centimeters wide and 6 centimeters long.
- 10% liquid detergent solution (1 part detergent, 9 parts water). Liquid detergent is the substance whose effect on Fast Plants seedgermination is being assayed. Assay any substance you like.

Tips and suggestions

- An alternative method of designating the dilutions or concentrations of the substance being assayed would be to have the students mark the full strength solution as 'x,' and successive dilutions — each reduced by 1/2 — as x/2, x/4, x/8, x/16 and x/32.
- A local film processing outlet or camera store is the source of the film cans. Ask them to save the film cans for you, since they are usually discarded.
- Pellon is available at fabric stores. Pellon must be washed and double rinsed before being used. Washing removes chemicals used in the manufacturing process which are toxic to the germinating seed.

Bioassay Experiment Diagram

<p>1. Mark the 7 cans at the half-full line with a permanent marker. Label one film can "water." The "water" can is the control. Label the other 6 cans as they are at right.</p> 		<p>2. Fill the "water" can to the mark with water. Insert a "wick" by gently pushing the strip down the side of the can with the end of a pencil. The wick will stick to the sides of the can. Place two seeds at the top of the wick.</p> 
 <p>3. Make a mark on the other six film cans half-way between the first mark and the bottom of the can.</p>	<p>4. Fill the 10% can to the top mark (half-full) with the 10% liquid detergent solution. This is approximately 20 ml.</p>  <p>10% detergent</p>	<p>5. Pour half of the detergent from the 10% can into the 5% can. Add water to the 5% can to the half-full mark. The 5% can now contains a 5% detergent solution.</p> 
<p>6. Making sure the liquid in the 5% can is completely mixed, pour half into the 2.5% can. Add water to the 2.5% can to the half-full mark, making a 2.5% solution.</p> 	 <p>7. Repeat this procedure until all 6 cans are prepared.</p>	 <p>8. Insert wicks in all 6 cans. When the wicks are moist at the top, place two seeds on each.</p>
<p>9. Place the 6 cans inside the cottage cheese container around the edge. Place the "water" can in the center.</p> 	<p>10. Secure the lid on the container and label your container with your name and the date.</p> 	<p>11. Observe each day for the next 3-4 days and record observations.</p> 