



Chapter 15: Quick Activities

Optimizing Food Production

Cleaning Your Plants

Perhaps the most environmentally friendly insecticides are solutions of soap or detergent. Insects are perforated with tiny holes, called *spiracles*, through which atmospheric oxygen migrates directly into cells. These holes are easily penetrated by liquid soap or detergent, which then blocks the exchange of atmospheric gases and suffocates the insect. In general, the larger the insect, the more concentrated a soap solution needs to be in order to kill the insect efficiently. A dilute soap solution, for example, will quickly annihilate aphids, but only a relatively concentrated one will kill cockroaches.

PROCEDURE

Use a measuring spoon to create soap solutions of various concentrations. Use non-bacteriocidal soap to minimize harm to beneficial bacteria in the soil. Stir your solutions gently to avoid excessive foaming. Pour each solution into a pump spray bottle and write the concentration (in teaspoons per cup, say) on each bottle. Test the effectiveness of each solution on an infested plant. Follow with a spray of fresh water to remove any residual soap from the plant.

ANALYZE AND CONCLUDE

1. What are some of the advantages and disadvantages of using soap rather than a commercial insecticide to kill insects?
2. During the time of the dinosaurs, the percentage of oxygen in the Earth's atmosphere was much greater than it is today. What effect might this have had on the potential size of insects?



Soil pH

You can measure the pH of soil samples using the red cabbage pH indicator described in Chapter 10. Saturate a soil sample with water, making a thin mud slurry. Stir the slurry and allow it to settle until about 1 centimeter of water appears above the soil. If this top layer of water does not appear, add more water, stir, and allow for further settling.

You will need to filter this soil-treated water. To do so, remove the bulb from a cooking baster and stuff several cotton balls into the top end of the baster. Use a chopstick or skewer to compact the cotton toward the narrow end of the baster.

Pour the water from the settled soil into the top of the baster. Attach the bulb and squeeze the liquid through the cotton and into one of the glasses. If the filtered water is still muddy, repeat the filtering using clean cotton balls each time.

Add to a second glass as much fresh water as there is filtered water in the first glass. Add equal amounts of the pH indicator to the two glasses. Compare colors, recalling from Chapter 10 that a deeper red color means greater acidity and that green indicates alkaline. You might test soil samples from several different sites and compare your results.





Author Responses to Quick Activities

Cleaning Your insects

1. The advantages of using soap or detergent to kill insects are that these materials are inexpensive, easily washed away, and environmentally friendly. The disadvantages are that they are not selective for harmful insect pests over beneficial ones. Also, they work only by direct contact, and the plant must be wiped clean once the pests are destroyed; getting rid of all the soap can be difficult if you are using a concentrated solution. Lastly, they have no lasting insecticidal effect.

2. Interestingly, the fine network of spiracles is what limits the size of insects. If an insect were any heavier, its weight would collapse all the tiny channels. In prehistoric times, higher atmospheric concentrations of oxygen permitted the evolution of much larger insects, such as the 1-meter-long dragonflies often depicted in dinosaur books.

Soil pH

No questions asked.

