

Growing Algae

Grade Level: 6th - 12th; **Type:** Life Science, Engineering

Objective:

The project measures the growth rate of algae supplied with supplemental carbon dioxide.

The goal is to have the student conduct a controlled experiment to test a hypothesis about conditions affecting the growth of algae.

Research Questions:

- Does supplemental carbon dioxide affect the growth rate of algae?
- Is the experimental design capable of producing enough carbon dioxide to drive algal growth?

Algae are organisms commonly found in aquatic environments. There are two types; macroalgae and microalgae. The large multicellular macroalgae are often found in ponds and in the ocean. They tend to be measurable in inches, although giant kelp in the ocean can grow to more than 100 feet in length. Microalgae are tiny unicellular algae that grow as suspensions in water; they are measurable in micrometers. Common sources of microalgae are bogs, marshes, and swamps.

All algae require sunlight, water, nutrients, and carbon dioxide for growth. Through the process of photosynthesis, algae convert the carbon dioxide into glucose (a sugar). The glucose is then broken down into fatty acids, which under normal conditions, are used to produce membranes for new algal cells. If, however, the algae are starved of nutrients, the fatty acids produce fat molecules (oil). Because carbon dioxide is the only source of carbon for algae, having an adequate supply is essential if they are to be used for commercial purposes.

Materials:

- What materials are included? Three one-liter bottles of purified water; sugar; brewer's yeast; silicone sealant; drill; 6-mm aquarium airline tubing; algae
- Materials can be found at the following places: Purified water (supermarket), sugar (supermarket), brewer's yeast (supermarket), silicone sealant (Walmart-type store); aquarium; airline (pet store); algae (pond or marsh or biological/scientific supply house); 10-15-10 liquid plant food (plant nursery or Internet)

Experimental Procedure:

1. Read about the conditions required for algae to grow, and formulate a hypothesis to predict whether giving algae supplemental carbon dioxide would be a feasible way to increase algae growth.
2. Collect some algae from a pond, marsh, swamp, swimming pool, fish aquarium, bird bath or other source. If you are unable to locate a natural source, contact a biological/scientific supply house (Google).
3. Add equivalent amounts of algae to two (clear plastic) bottles of purified water. Discard the bottle caps.
4. Add two drops of 10-15-10 liquid plant food to each bottle.
5. Pour out a small amount of water from a third bottle of purified water, leaving about an inch of air space at the top of the bottle. This bottle will be the carbon dioxide reactor.
6. Make a hole in the bottle cap of the reactor bottle that is just large enough to allow an aquarium airline to pass through it, then run the airline through the hole so that it extends into the free air space when the cap is on. Seal the airline to the top of the bottle cap with a silicone sealant.
7. Dissolve 2 teaspoons of sugar and 1 teaspoon of brewers yeast in the reactor. (Yeast is a fungus that converts sugar into carbon dioxide bubbles.)
8. Extend the aquarium airline from the reactor bottle to one of the bottles containing algae. The airline should extend about half way into the algae bottle.
9. Place all three bottles outdoors where they will get indirect sun.

TIP Direct sunlight may inhibit growth. The optimum temperature for algal growth is between 20 and 24 deg C. Temperatures above 35 deg C are lethal to algae.

10. Monitor the growth of the algae in the two sample bottles for one month. If necessary, replace the sugar, yeast, and water in the reactor to keep the carbon dioxide source operating.
11. At the end of the month, compare the amounts of algae in the two sample bottles.
12. Evaluate your hypothesis in light of your findings. Revise it if necessary and propose additional experiments.

Terms: Photosynthesis; Algae; Microalgae; Macroalgae; Carbon dioxide; Yeast; Sugar

References:

- <http://www.pbs.org/wgbh/nova/tech/algae-biodiesel.html>



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