

Know by the Glow

By Susan Hershberger



Introduction

Algae and plants are similar but not quite the same. Their structures are very different, for example: plants have stems, roots, flowers, and fruits, while algae do not. And where plants are always made of many cells, algae may be made from one single cell, or millions.

Plants contain a molecule called chlorophyll that works with energy from the sun, water, and carbon dioxide to make plant food and release oxygen. We also know that algae make their own food. But do they do it the same way plants do, with chlorophyll?

Question to Investigate

Do algae contain chlorophyll, just like plants?



The green leaves of plants contain chlorophyll, which glows under a UV light. Do algae contain chlorophyll? What is your evidence?

Materials

- Green algal powder, either in a pack or in capsules that contains spirulina, chlorella, or both. (Your adult partner can find these materials at a nutritional supplement store or online.)
- 2 or 3 spinach, kale, or other green plant leaves (be sure to get permission from an adult before using any houseplants for this activity)
- Green food coloring or green paint (watercolor, tempera, or acrylic)
- ¼ teaspoon (about 1.2 mL) measure
- 1 tablespoon (about 15 mL) or medicine cup
- Regular bright flashlight
- UV flashlight
- 1 sheet of white paper
- Permanent marker
- Liquid hand sanitizer
- Scissors
- 3 small clear cups
- 3 spoons

Procedure

1. Use a permanent marker to label three clear plastic cups: COLOR, PLANT, and ALGAE.
2. Add 15 mL (about 1 tablespoon, or 10 squirts) of hand sanitizer to each cup.
3. Arrange all 3 cups on the white paper.
4. For the COLOR cup, add 2 drops of food coloring.
5. For the PLANT cup, use the scissors to cut up spinach, kale, or other green plant leaves into tiny pieces and then place them in the cup.
6. For the ALGAE cup, take about ¼ teaspoon (a tiny pinch) of the green algal powder, either by opening up a capsule or taking it straight from the pack. Stir each of the cups with a clean spoon to mix thoroughly.
7. Now dim the lights in the room and shine a *regular* flashlight straight down into each of the cups. Write the colors you see in the chart below.
8. Next, shine your *UV* flashlight down into each of the three cups. Record the colors and any other observations you notice in the same chart.



Safety Suggestions

- ✓ Do not eat or drink the materials used in this activity.
- ✓ Do not shine either flashlight into the eyes of any human or animal.
- ✓ Many common plants are toxic. Receive permission from a knowledgeable adult before using leaves from any plant.
- ✓ Disposable cups, capsules, and plant matter may be placed in the trash.



How does it work?

Anything that appears a certain color, like green for example, means that it absorbs all the colors of the rainbow *except* that color. Instead, that green light is reflected back at us, which allows us to see the object as being “green.” Chlorophyll is a molecule that absorbs blue and red parts of visible light. That means mainly green light gets reflected back. This is the reason plants and certain algae appear green to our eyes!

Chlorophyll uses the energy it takes in from the sun to start a set of chemical reactions called photosynthesis, the process plants use to make their own food. In both plants and algae, this important process takes place in tiny, specialized places inside the cell called chloroplasts. Chloroplasts use the absorbed energy from the sun to convert carbon dioxide and water into glucose and oxygen. Glucose is the food that plants and algae make, store, and use as they grow. Oxygen is a byproduct of the chemical reactions and is released into water or atmosphere. We and other living things use this oxygen to breathe!

When you shone the UV flashlight on the algae powder and the plant pieces, you may have observed that some of the light energy was released as a red or pink glow. This is called **fluorescence**. Fluorescence happens when an object or organism absorbs light with high energy, like UV light, and gives off excess energy as lower energy light that they do not absorb. Sometimes, they may give off extra energy as heat.

Chlorophyll fluoresces to release the extra energy as red light. If you observed a pinkish glow, that is what you were seeing! Because the algae powder and the plant leaves fluoresce the same way, we can conclude that the algae in this activity also contain chlorophyll.

Algae are an extremely diverse group of organisms, with many differences in type, size, and other aspects. But there are three features that most algae share: they contain chloroplasts and chlorophyll, and they conduct photosynthesis. This experiment shows that algae, like plants, contain chlorophyll that allows them to make their own food!

Labeled cup	Observations		
	Color	Plant	Algae
Regular flashlight			
UV flashlight			

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