

Organic Matters

Grade: 6

State Standards: Grade 6 Science; Ecology (life sciences) 5.b. Organisms in ecosystems exchange energy and nutrients among themselves and with the environment. Students know matter is transferred over time from one organism to others in the food web and between organisms and the physical environment. Math; Mathematical reasoning, 2.0 Students use strategies, skills, and concepts in finding solutions; Use estimation to verify the reasonableness of calculated results. 2.7 Make precise calculations and check the validity of the results from the context of the problem.

Groups: 5 per group

Preparation Time: 25 minutes

Activity Time: 40 minutes

Key Words: Compost, organic matter, humus, permeable

OBJECTIVE

The students will be able to:

- Recognize the presence of organic matter in soils from their compost
- Recognize which soil sample contains the highest concentration of organic matter
- By composting, a gardener reduces the amount of material in the landfill, and a gardener who uses compost does not need to use potentially damaging chemical fertilizers to feed the soil.

MATERIALS

Soil Samples (at least four different samples)

Hand magnifying glasses or microscopes (one per group)

four (per group) 20 or 24 ounce plastic soda water bottles (cleaned and dry)

Hydrogen Peroxide (one bottle per group)

Four 50 ml or larger graduated cylinders

Balloons

String

Rulers (one per group)

BACKGROUND

It is beneficial to the environment and in saving space in our local landfills to compost our organic wastes. Organic matter in soil helps prevent erosion, mulch the soil, and feed plants. Organics added to gardens improves soil structure and feeds microorganisms and beneficial insects. Microorganisms are the real giants in your garden, and your garden soil is swarming with millions of these microorganisms. This “living-soil-life” helps keep your soil healthy, decompose organic matter, replenish soil nutrients, form humus, promote root growth, and increase nutrient uptake. These microorganisms include bacteria, algae, fungi, and protozoa.

The good microorganisms will feed on harmful microbes like nematodes and certain soil born diseases. Acids in organic matter help to make plant roots more permeable, improving their uptake of water and nutrients. Acids also dissolve minerals in the soil releasing them for plant absorption.

You can change the composition of existing soils by adding compost. Heavy clay soils become lighter with the addition of compost. Sandy soils retain water better after compost is added. Poor soils gain nutrients and plants begin to thrive when compost is added to them.

Vocabulary:

Humus: used to describe mature compost, or natural compost extracted from a forest.

Permeable: is a measure of the ability of a porous material to pass or spread fluids.

PROCEDURES

1. Before the activity explain to the students what the activity is about. Have the students make their own predictions of what will happen with the balloons.

2. Make sure each soil sample is dry and crumbles easily into small amounts.

The soil samples will be labeled A-D. One sample of composted soil, two samples from school campus, one sample of sand. Remove the labels from the soda water bottles, and make sure they are clean and dry. Label the bottles with large letters using a marking pen. Carefully measure 200 ml of soil sample "A". Carefully put it in the bottle marked "A". Continue this step for samples B-D. Place a different colored balloon by each bottle. Measure 50 ml of Hydrogen Peroxide into each graduated cylinder. Pour 50 ml of Hydrogen Peroxide into each bottle and put the open end of the balloon tightly over the top of the bottle. This needs to be done as quickly as possible. Begin timing when you attach the balloons. Observe and document the changes in the balloons. Check the bottles every three minutes until there is no further change in the size. Measure and record the circumference of the balloon using string and a ruler.

Note: the soil sample with the most organic matter will produce the largest amount of gas (oxygen) accumulated in the balloon.

3. Place a small amount of each soil sample on a separate sheet of paper. Carefully examine the sample with the hand lens or microscope. Describe the color, texture, and condition of the soil, and record your observations.

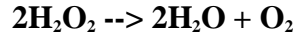
Discussion

Turn in data and observations and answer the following questions.

- Describe each soil sample using the hand lens or microscope.
- How did you determine which soil sample contained the highest amount of organic matter, based on your observations using the hand lens or microscope?
- How do you determine which soil sample contained the highest amount of organic matter, based on your observations of the bottles and balloons?
- How were you able to tell the difference in organic matter in each soil sample? Explain your answer.

- What gases do you think were causing the balloon to inflate? Why?

Catalase is an enzyme found in nearly all living things. When the catalase comes in contact with hydrogen peroxide, it turns the hydrogen peroxide (H₂O₂) into water (H₂O) and oxygen gas (O₂).



The bubbles you see in the foam are pure oxygen bubbles being created by the catalase. Healthy soil with a lot of organic matter will create more oxygen than nutrient deprived sandy soils.

ASSESSMENT

Students understand composting, food and yard waste in the garden is important because it creates healthy soils, reduces the stress on landfills, and reduces pollution in our waterways.