Contributors

Stephanie Harper
Graduate Student
Georgia Southern University, GA

Yvonne Arnsdorff
Partner Teacher
Effingham, GA

Intended Audience

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<td>5-8</td>
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<td>9-12</td>
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Activity Characteristics

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<tr>
<td>Classroom Setting</td>
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<tr>
<td>Requires special equipment</td>
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<tr>
<td>Uses hands-on manipulatives</td>
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<tr>
<td>Requires mathematical skills</td>
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<tr>
<td>Can be performed individually</td>
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<tr>
<td>Requires group work</td>
<td>X</td>
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<tr>
<td>Requires more than one (45 min class) period</td>
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<tr>
<td>Appropriate for special needs student</td>
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Introduction

Description

In this lab students will observe how leaves leach compounds when submerged in water. Students will compare the difference in water color between two leaf types.

Abstract

When leaves enter streams or other bodies of water, leaf compounds are removed from the leaf and enter the stream. Streams where leaching caused the water to be a dark color are referred to as Black Water streams.

Core Themes Addressed

| Microbial Cell Biology       |  
| Microbial Genetics           |  
| Microorganisms and Humans    |  
| Microorganisms and the Environment |  
| Microbial Evolution and Diversity |  
| Other -                      | X |

Keywords
Stream ecology, decomposition, leaching, tannins

Learning Objectives

At completion of this activity, learner will

1. Define leaching.
2. Explain what is a Black Water Stream.

National Science Education Standards Addressed

Standard A: Science as Inquiry

- Abilities necessary to do scientific inquiry

Standard D: Life Science

- Matter, energy, and organization in living systems
Student Prior Knowledge

Students should have the following knowledge prior to completing this activity:

1. Be able to define an ecosystem.

Teacher Background Information

Leaves from trees contain organic color compounds called lignins and tannins. As these leaves fall into a river or lake these compounds are expelled from the leaf and enter into the stream water. In natural systems, these compounds turn the water colors resulting in “Black Water.” Depending on the concentration of lignans and tannins in a leaf, the rate of decomposition can be influenced. When leaf compounds are expelled from the leaf, it is known as leaching. This action will soften leaves and release potentially harmful chemicals allowing for consumption by aquatic organisms.

Class Time

This activity will require a minimum of two 50 minute class periods.

A. Day 1

1. Introduction PowerPoint – 15 minutes
2. Hypothesis – 5 minutes
3. Activity Set Up – 20 minutes
4. Initial observations – 5 minutes
5. Wrap up /Review – 5 minutes

A. Day 2

1. Introduction – 5 minutes
2. Final observations – 5 minutes
3. Wrap up /Review – 5 minutes

Teacher Preparation Time

This lesson will require approximately 30 minutes to collect and prep leaves.

This lesson will require approximately 15 minutes of lab bench preparation time.
Materials and Equipment (4 per group)

1. 2 leaf types (~1 gram of each)
2. 2 250 ml beakers
3. 30 ml of pond water

Methods

A. Day 1

1. Make a hypothesis about which leaf type will turn a darker color.
2. Obtain two 250 ml beakers. Label one Maple and one Oak.
3. Weigh out 1 g of Maple leaves and place it into the beaker. Record the mass below.
4. Repeat the same with Oak leaves.
5. Add 12 ml of pond water to each beaker and make an initial color observation.

B. Day 2

1. Observe the water color for each leaf type and record it below.

Tips/Suggestions

1. This activity can used as an individual lab or can be combined with the entire module.
2. You can use whole leaves or leaves cut into squares would also work.
3. Experiments should decompose for at least one month.

Answers to Student Handouts

1. Define leaching.
   Leaching occurs when the compound in the leaf, such as lignans and tannins, are initially expelled from the leaf.

2. In your own words explain what a Black Water stream is?
   A Black Water Stream is a stream where the water flowing through the stream is stained dark because of the high amount of tannins and lignans that have entered the stream. These ecosystems are commonly found in the coastal plains in the South Eastern United States.

3. Explain why you think there are different amounts of compounds in different leaf types?
   Different leaf types are composed of different amount of compounds because of possible environmental factors. Some leaf types are in an area where there is high numbers of insect herbivores. The leaves might have a higher concentration of compounds to decrease their chances of getting eaten. Other leaf types may be in hot arid conditions where they need to have an increased amount of compounds to decrease their chances of drying out.
Introduction

Leaves from trees contain organic color compounds called lignins and tannins. As these leaves fall into a river or lake these compounds are expelled from the leaf and enter into the stream water. In natural systems, these compounds darken the water resulting in “Black Water.” Depending on the concentration of lignans and tannins in a leaf, the rate of decomposition can be influenced. When leaf compounds are expelled from the leaf, it is known as leaching. This action will soften leaves and release potentially harmful chemicals allowing for consumption by aquatic organisms.

Student Background Knowledge

Students should have the following knowledge prior to completing this activity:

1. Be able to identify when a chemical change has taken place.
2. Be able to recognize a balanced chemical equation.

Vocabulary

Decomposition: The process in which materials breakdown or decay into original elements.

Leaching: The process of leaf compounds being expelled from the leaf.

Black Water Stream: Natural streams that have a dark color due to the high concentrations of leaf compounds

Materials Checklist

<table>
<thead>
<tr>
<th>Material</th>
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<tbody>
<tr>
<td>Leaf discs (2 types)</td>
</tr>
<tr>
<td>2 250 ml beakers</td>
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<tr>
<td>Pond Water</td>
</tr>
<tr>
<td>Scale</td>
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</table>
Procedure

A. Day 1

1. Make a hypothesis about which leaf type will turn a darker color.
2. Obtain two 250 ml beakers. Label one Maple and one Oak.
3. Weigh out approximately 1 g of Maple leaves and place it into the beaker. Record the mass below.
4. Add 12 ml of pond water to each beaker.
5. Make an initial water color observation.

B. Day 2

2. Make final water color observations below.

Hypothesis

1. Write your hypothesis below.

Results

Water Color Observations

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<thead>
<tr>
<th></th>
<th>Maple</th>
<th>Oak</th>
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<tbody>
<tr>
<td>Initial</td>
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<tr>
<td>Final</td>
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1. Which leaf type had the highest concentration of compounds leached from the leaf? Did this match your hypothesis?
Students Name: ___________________________ Date: ______________

1. What is leaching?

2. In your own words explain what a Black Water stream is?

3. Explain why you think there are different amounts of compounds in different leaf types?