



Science Unit: *Fossils and the Changing Earth*

Lesson 5: *Decomposition Lab, Part 1*

School Year: 2016/2017

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Grade level: Presented to grade 6-7; appropriate for grades 4 - 7 with age appropriate modifications

Duration of lesson: 1 hour

Notes: After setting up this experiment, students should collect data at least once a week. Ideally, let the experiment run 2-3 weeks. See lesson 7 for results analysis lesson

Objectives for students:

1. Gain insight into the process of fossilization by investigating what environmental conditions favour mold growth on bread.
2. Learn how to design a fair test to answer a question.
3. Learn the difference between independent and dependent variables, and about the concept of an experimental control.
4. Practice observing, measuring, and recording data

Materials:

- **Decay Assessment Probe**, 1 per student (printable included below)
- Bread slices, 2 per group of 2-3 students
- Clear baggies (2 per group), sharpies for labelling
- Thermometer, toaster, desk lamp, access to refrigerator
- **Lab report sheets**, for experiments 1-7, 1 per group (printables included below)
- Clear 1cm x 1cm or 2cm x 2cm grid, to measure mold growth after start of experiment.

In the Classroom

Introduction

- Have students complete the **Decay Assessment Probe**
- [What factors are different in Vancouver and Cairo?](#) Temperature, rainfall, soil type....
- What factors would affect how fast a piece of bread decays?
- How can we set up a fair test to evaluate these ideas?
- Independent vs. Dependent Variables

Activity: Bread Mold Lab

- Split students into ~14 groups. Each group gets one lab report sheet, labelled from group 1 - group 7. Each group will do a slightly different experiment. Groups 1-3 will test moisture as the independent variable, and groups 4-7 will test temperature as the independent variable. Ideally, two groups will do each experiment.



SCIENTIST IN RESIDENCE PROGRAM

- Go over **Lab Procedures** (printable below)
- Have students set up their CONTROL and TEST baggies
- All CONTROL baggies are left at room temperature. Help students put their TEST baggies in the correct location, either at room temperature, in a refrigerator, or under a desk lamp (to raise the temperature to 25°C - 32°C).
- Safety precautions
 - Have students seal their baggies. You may want them to double bag.
 - Do not exceed 32°C under the desk lamp.
 - Do not let students open the baggies once they are sealed
 - Make sure no students have bread mold allergies

Wrap up discussion:

- How will we measure bread mold growth? (print out a 1cm x 1cm or 2cm x cm grid onto a clear plastic sheet).
- How often should we measure mold growth? (at least once a week)
- Do students have any predictions about the experiment?

Vocabulary:

| | |
|----------------------|------------------------------------------------------------------------------------------------------------------|
| Control: | In an experiment, a sample used for comparison, in which the variable being studied is held constant |
| Decay: | Rot or decompose through the action of bacteria or fungi |
| Decomposition: | The process of rot and decay |
| Dependent variable | Variable that responds to changes in the independent variables; the variable that is observed and/or measured. |
| Experiment | A fair test, undertaken to make a discovery or test an idea |
| Fungus | Organisms, such as mushrooms, mold, and mildew, that live by decomposing the organic material in which they grow |
| Independent variable | A factor that is changed by the scientist in an experiment |
| Preservation: | The degree to which something is kept in its original state |
| Variable | A factor, trait, or condition, that can exist in differing amounts or types. |
| replication | Repetition of an experiment |

Extension

After learning about how to set up an experiment to answer a question, students could design and conduct their own experiments.



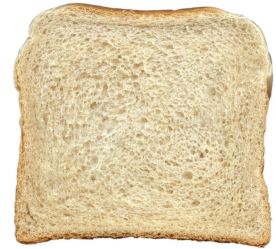
References

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2. <<http://www.ingridscience.ca/node/660>> Decomposing Foods. Ingrid Science. [Bread decomposition lab]. Accessed May, 2017.
3. <https://www.teachengineering.org/lessons/view/duk_decomposers_mary_less> Dirty Decomposers. Teach Engineering [Decomposition Lab]. Accessed February, 2017.
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Decomposing Bread

Two groups of students are on field trips: A group of students from Vancouver are visiting the forest in Pacific Spirit Park, and a group of students from Cairo are visiting the Pyramids of Giza. One student in each group accidentally drops a piece of bread from their lunch.



Assuming no birds or other animals find it, what do you think will happen to the two pieces of bread? Circle the best answer:

- A. The bread in Vancouver will decompose faster
- B. The bread in Cairo will decompose faster
- C. Both pieces of bread will decompose at about the same rate

Please explain your thinking. What reasoning did you use to select your answer?

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List of Experimental Treatments

| Group # | Variable tested | CONTROL | TEST treatment |
|---------|-----------------|----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| 1 | Moisture level | Moisture: no water added, bread sealed in baggie Temperature: Baggie left at room temperature | Moisture: + 1 Tablespoon water, bread sealed in baggie. Temperature: Baggie left at room temperature |
| 2 | Moisture level | Moisture: no water added, bread sealed in baggie Temperature: Baggie left at room temperature | Moisture: + 2 Tablespoons water, bread sealed in baggie. Temperature: Baggie left at room temperature |
| 3 | Moisture level | Moisture: no water added, bread sealed in baggie Temperature: Baggie left at room temperature | Moisture: bread toasted on setting 3, sealed in baggie Temperature: Baggie left at room temperature |
| 4 | Temperature | Moisture: + 1 Tablespoon water, bread sealed in baggie. Temperature: Baggie left at room temperature | Moisture: + 1 Tablespoon water, bread sealed in baggie. Temperature: Baggie put under desk lamp* |
| 5 | Temperature | Moisture: + 2 Tablespoons water, bread sealed in baggie. Temperature: Baggie left at room temperature | Moisture: + 2 Tablespoons water, bread sealed in baggie. Temperature: Baggie put under desk lamp* |
| 6 | Temperature | Moisture: + 1 Tablespoon water, bread sealed in baggie. Temperature: Baggie left at room temperature | Moisture: + 1 Tablespoon water, bread sealed in baggie. Temperature: Baggie put in refrigerator |
| 7 | Temperature | Moisture: + 2 Tablespoons water, bread sealed in baggie. Temperature: Baggie left at room temperature | Moisture: + 2 Tablespoons water, bread sealed in baggie. Temperature: Baggie put in refrigerator |

*do not let temperature under desk lamp exceed 32 °C

Materials:

Sliced bread

Baggies

Sharpies, for labelling baggies

Tablespoon, for measuring water

Refrigerator

Toaster Desk lamp



Bread Mold Lab Procedure:

Step 1. Get your lab report sheet from the teacher. Each report will have a different group number at the top. Different groups will be doing different experiments.

Step 2. Get two baggies and label them with your group number and your names. Then label one bag “CONTROL” and the other bag “TEST”

Step 3. Get two pieces of bread.

Step 4. Look at your lab sheet, and read about your CONTROL treatment. Groups 1,2 and 3 will just seal the piece of bread in the CONTROL baggie, while groups 4-7 will need to either add one or two tablespoons of water to their bread, and then seal it in the CONTROL baggie.

Step 5. Now look at your lab sheet and determine your TEST treatment. Groups 1,2 and 3 are varying the moisture level of their bread, so they will need to add water or toast their piece of bread, and then seal it in the TEST baggie. Groups 4-7 will need to add the same amount of water to their TEST bread as they added to their CONTROL bread in step 4, and then seal the TEST bread in the TEST baggie.

Step 6. All CONTROL baggies are left at room temperature. Groups 4-7 are varying the temperature of their bread, so they will need to either put their TEST baggie under the desk lamp or in the refrigerator. Look at your lab sheet for specific instructions.

Step 7. Answer the questions at the bottom of the first page of your lab report.



Lab Report: Bread Mold Experiment Group 1

Class Question: What variables affect the rate of mold growth on bread?

(a variable is a factor, trait, or condition that can vary, that is, exist in differing amounts. In this experiment, the variables we will test are temperature and moisture)

My group's question: *Does moisture level affect the rate of mold growth on bread?*

Independent variable my group is testing: *Moisture*

Procedure (How you set up your experiment):

CONTROL

(A control is used for comparison; it is the standard, or baseline, that does not undergo any experimental treatment):

*1 piece of bread, sealed in baggie
Baggie left at room temperature*

TEST treatment

(For the test sample, the variable to be tested is changed compared to the control):

*1 piece of bread, moistened with 1 Tablespoon water, sealed in baggie
Baggie left at room temperature*

What is room temperature _____

How will our test treatment help answer our question?

How will we measure the rate of mold growth (dependent variable)?

Do you have any additional notes on your procedure that would help another group replicate (copy) your experiment?



Lab Report: Bread Mold Experiment Group 2

Class Question: What variables affect the rate of mold growth on bread?

(a variable is a factor, trait, or condition that can vary, that is, exist in differing amounts. In this experiment, the variables we will test are temperature and moisture)

My group's question: *Does moisture level affect the rate of mold growth on bread?*

Independent variable my group is testing: *Moisture*

Procedure (How you set up your experiment):

CONTROL

(A control is used for comparison; it is the standard, or baseline, that does not undergo any experimental treatment):

*1 piece of bread, sealed in baggie
Baggie left at room temperature*

TEST treatment

(For the test sample, the variable to be tested is changed compared to the control):

*1 piece of bread, moistened with 2 Tablespoons water, sealed in baggie
Baggie left at room temperature*

What is room temperature _____

How will our test treatment help answer our question?

How will we measure the rate of mold growth (dependent variable)?

Do you have any additional notes on your procedure that would help another group replicate (copy) your experiment?



Lab Report: Bread Mold Experiment Group 3

Class Question: What variables affect the rate of mold growth on bread?

(a variable is a factor, trait, or condition that can vary, that is, exist in differing amounts. In this experiment, the variables we will test are temperature and moisture)

My group's question: *Does moisture level affect the rate of mold growth on bread?*

Independent variable my group is testing: *Moisture*

Procedure (How you set up your experiment):

CONTROL

(A control is used for comparison; it is the standard, or baseline, that does not undergo any experimental treatment):

*1 piece of bread, sealed in baggie
Baggie left at room temperature*

TEST treatment

(For the test sample, the variable to be tested is changed compared to the control):

*1 piece of bread, toasted at setting 3, sealed in baggie
Baggie left at room temperature*

What is room temperature _____

How will our test treatment help answer our question?

How will we measure the rate of mold growth (dependent variable)?

Do you have any additional notes on your procedure that would help another group replicate (copy) your experiment?



Lab Report: Bread Mold Experiment Group 4

Class Question: What variables affect the rate of mold growth on bread?

(a variable is a factor, trait, or condition that can vary, that is, exist in differing amounts. In this experiment, the variables we will test are temperature and moisture)

My group's question: *Does temperature affect the rate of mold growth on bread?*

Independent variable my group is testing: *Temperature*

Procedure (How you set up your experiment):

CONTROL

(A control is used for comparison; it is the standard, or baseline, that does not undergo any experimental treatment):

1 piece of bread, moistened with 1 Tablespoon of water, sealed in baggie

Baggie left at room temperature

What is room temperature _____

TEST treatment

(For the test sample, the variable to be tested is changed compared to the control):

1 piece of bread, moistened with 1 Tablespoon water, sealed in baggie

Baggie put under desk lamp

What is the temperature under the desk lamp? _____

(tell your teacher if the temperature under the desk lamp is more than 32°C)

How will our test treatment help answer our question?

How will we measure the rate of mold growth (dependent variable)?

Do you have any additional notes on your procedure that would help another group replicate (copy) your experiment?



Lab Report: Bread Mold Experiment Group 5

Class Question: What variables affect the rate of mold growth on bread?

(a variable is a factor, trait, or condition that can vary, that is, exist in differing amounts. In this experiment, the variables we will test are temperature and moisture)

My group's question: *Does temperature affect the rate of mold growth on bread?*

Independent variable my group is testing: *Temperature*

Procedure (How you set up your experiment):

CONTROL

(A control is used for comparison; it is the standard, or baseline, that does not undergo any experimental treatment):

1 piece of bread, moistened with 2 Tablespoons of water, sealed in baggie

Baggie left at room temperature

What is room temperature _____

TEST treatment

(For the test sample, the variable to be tested is changed compared to the control):

1 piece of bread, moistened with 2 Tablespoons water, sealed in baggie

Baggie put under desk lamp

What is the temperature under the desk lamp? _____

(tell your teacher if the temperature under the desk lamp is more than 32°C)

How will our test treatment help answer our question?

How will we measure the rate of mold growth (dependent variable)?

Do you have any additional notes on your procedure that would help another group replicate (copy) your experiment?



Lab Report: Bread Mold Experiment Group 6

Class Question: What variables affect the rate of mold growth on bread?

(a variable is a factor, trait, or condition that can vary, that is, exist in differing amounts. In this experiment, the variables we will test are temperature and moisture)

My group's question: *Does temperature affect the rate of mold growth on bread?*

Independent variable my group is testing: *Temperature*

Procedure (How you set up your experiment):

CONTROL

(A control is used for comparison; it is the standard, or baseline, that does not undergo any experimental treatment):

1 piece of bread, moistened with 1 Tablespoon of water, sealed in baggie

Baggie left at room temperature

What is room temperature _____

TEST treatment

(For the test sample, the variable to be tested is changed compared to the control):

1 piece of bread, moistened with 1 Tablespoon of water, sealed in baggie

Baggie put in refrigerator

What is the temperature in the refrigerator? _____

How will our test treatment help answer our question?

How will we measure the rate of mold growth (dependent variable)?

Do you have any additional notes on your procedure that would help another group replicate (copy) your experiment?



Lab Report: Bread Mold Experiment Group 7

Class Question: What variables affect the rate of mold growth on bread?

(a variable is a factor, trait, or condition that can vary, that is, exist in differing amounts. In this experiment, the variables we will test are temperature and moisture)

My group's question: *Does temperature affect the rate of mold growth on bread?*

Independent variable my group is testing: *Temperature*

Procedure (How you set up your experiment):

CONTROL

(A control is used for comparison; it is the standard, or baseline, that does not undergo any experimental treatment):

1 piece of bread, moistened with 2 Tablespoons of water, sealed in baggie

Baggie left at room temperature

What is room temperature _____

TEST treatment

(For the test sample, the variable to be tested is changed compared to the control):

1 piece of bread, moistened with 2 Tablespoons of water, sealed in baggie

Baggie put in refrigerator

What is the temperature in the refrigerator? _____

How will our test treatment help answer our question?

How will we measure the rate of mold growth (dependent variable)?

Do you have any additional notes on your procedure that would help another group replicate (copy) your experiment?