Activity 10

Atmospheric O_2 Content of Vermicompost

Rationale: The consumption of atmospheric O_2 is an indication of the health and rate of metabolism in the vermiculture. This is one more metabolic indicator of the overall efficiency of the Habitat.

Objectives

1) Determine the rate of O_2.
2) Compare the O_2 rate to other metabolic indicators.
3) Determine the agreement of the relationship with the actual data points.

PDE Standards

Science and Technology
3.1.7. A,B,C
3.2.7. A,B,C,D,E,F
3.6.7. A,B
3.7.7. A,B,C,D
Environment and Ecology
4.1.7. A,B,C
4.2.7. A,C
4.6.7. A,B,C
Math
2.1.8. A,B,D,G
2.2.8. A,B,F
2.3.8. A,B,D
2.4.8. A,B,D,F
2.5.8. A,B,C,D
2.6.8. A,B,C,E,F
2.7.8. B,C,D
2.8.8. F,G,H,I,J
2.11.8. A,B

Materials

CBL2
TI 83/84
Computer
Oxygen sensor
Graphical Analysis (software)

Introduction

The worms consume O_2 24 hours a day and produce CO_2 24 hours a day. The consumption of CO_2 has already been documented in Activity 8 and now the relationship between CO_2 production and O_2 consumption will be documented. The O_2 sensor measures the amount of O_2 in the sample compared to the normal amount of O_2 present in the atmosphere, that is, the sensor will reproduce the normal amount of O_2 as about 19% in the classroom and in an active vermicompost, a reading below the room reading.

Strategies

The students will need very little coaching for this experiment if most of the other inquiry activities have been completed. Students should read about the O_2 sensor and discuss, in groups, how to best design the experiment. A review of metabolism and the composition of the atmosphere may be necessary. The students should be able to determine what other variables, from previous experiments, can be studied to observe any relationships.

Procedure

1) Press the APPS button and select DataMate.
2) Set up the O_2 sensor for the appropriate sampling length and interval.
3) Carefully excavate an indentation in the vermicompost around a 250-mL beaker.
4) Mount the O_2 sensor under the bib lid so the detector end of the sensor is in the indentation, BUT not touching any vermicompost. (This is best accomplished with a wire frame resting on the vermicompost.)
5) Download the data to the computer and attach a set of the data to this activity.

Optional

6) Press the 2^{nd} function key and then the "0" key (catalog).
7) Press the 'x^{-1}' key (letter D).
8) Scroll down to DiagnosticOn and press enter.
9) Perform a linear regression on the two variables in question.
10) When the slope is displayed, numerical values for "r" and "r^2" will be, also.
11) The "r" value will be a number between 0 and 1. The closer the value is to 1, the closer the data points (coordinate pairs) are to the best fit line.
12) Draw conclusions from the results.

Expectations

The students should be able to:

1) design the experiment.
2) design a Data Table.
3) set up the experiment.
4) program the DataMate application.
5) collect the data and analyze the data.
6) determine if other variables have a relationship.
7) draw conclusions from the results obtained.

Data Table 1 *(Typical student data table)*

Date	O_2	CO_2	?	?	?	?

Data Table 2 *(optional)*

Variable 1	Variable 2	Slope	r
O_2	CO_2		
O_2	?		
O_2	?		
O_2	?		
O_2	?		