CB 20 Collecting Composting Data

What are the actual contents of your compost pile? What is its temperature and moisture content? What organisms are present? How do the organisms in the compost pile interact? How does the material change in size and texture? How acidic or basic is the pile? This activity provides some techniques for analyzing data from your compost pile. You can also make other, more detailed analyses. This inquiry contains five parts, asking you to measure temperature, moisture, pH, and, finally, living organisms. Depending on how much time you have for this inquiry, you may want to select only some of these parts.

Materials

- various sized beakers
- distilled water
- small sticks or probes
- gloves
- masking tape
- Taxonomic guides
- Vernier Temperature Sensor
- Vernier pH Sensor and pH buffer tablets
- Vernier Temperature Sensor
- Vernier Gaseous O_2 and Gaseous CO_2 Sensors
- Casio Data Collector EA-100
- Casio fx2 Graphing Calculator
- Casio QV2800 Digital Camera

Procedures

Part A. Physical Appearance

Examine your column periodically, noting any changes in the contents. Note especially any apparent changes in color, volume or moisture. Take a digital image whenever there any changes. As usual, try to fill the frame with the column or even take some very close up shots of the contents. Store the images in a file for future use.

Part B. Measuring Temperature

Have you ever felt the warmth of a rotting pile of lawn cuttings? You can investigate the heat generated by decomposition in your pile by taking its temperature periodically. You should measure the temperature at different places of the pile and at different times. Set a schedule for where and when to take temperature and enter this into your *Log*. Collect enough data in your *Log* to confidently answer the following questions.

1. What is the pattern of heat distribution in the pile?
2. What is the range of heat distribution?
3. What is the range of heat change over time?
4. What is the source of the heat

Using the temperature probe, collect temperature data over a chosen period of time. Graph the Data. When graphing, place the independent variable on the horizontal X axis and the dependent variable on the vertical Y axis so you can easily see the changes (up or down) in the dependent variable. In measuring the temperature of your compost pile, you will graph time (probably in days, since the changes are fairly slow) on the X axis.

Part C. Determining pH

The pH scale is used to describe the acidity of a sample. The simplest way to think about pH is to dissect the term itself. The 'H' refers to the Hydrogen atom, because pH refers to the concentration of these atoms. The 'p' is a symbol for the mathematical term which means "negative log." Thus, pH is the negative log of the hydrogen ion concentration of a given sample.

The pH scale ranges from 0 to 14. A pH of 7 is considered neutral - neither acidic nor basic. Values above 7 indicate lower acidity; values below 7 indicate high acidity. Samples having very large concentrations of hydrogen ions have a low pH, thus are acidic. Samples with low concentrations of hydrogen ions have a high pH, thus are basic.

Use the pH probe to monitor the changes in pH over time. To measure pH of your sample take a small sample from three different levels of your pile and place each sample in a clean container. Add enough distilled to nearly fill each container. Stir the contents with a clean glass rod. Let the containers sit for at least ten minutes. Using pH sensor determine the pH of each sample and enter these data into your *Log*. Sample periodically to monitor any changes in pH of the pile. In your *Log:*

1. Describe qualitatively the relative acidity of the pile.
2. Describe pH differences in different locations of the pile.
3. Describe how pH might help decomposition.
4. Describe changes in pH that you notice over time. Graph these data if appropriate.

Part D. Gaseous CO_2 and O_2 levels

These gaseous levels can be monitored directly in the column by placing the sensor probes through the top opening and sealing the remaining opening with masking tape.

Part E. Discovering Life in the Compost Pile

Working in teams of three, put on your plastic gloves and have each person take a small sample from a different layer of the pile. Spread the contents of each sample on a separate sheet of white paper. Sort through the contents with a small probe or stick. Record in your *Log* either the general name or a description of any organisms you find. Taxonomic or other available library resources can help you identify organisms. Your teacher may also know of some valuable resources. If you have both compound microscopes and stereoscopes available, examine some of the contents under these instruments. Dispose of the contents and clean up as indicated by your teacher.

Interpretations

1. What organisms are most common in your sample? How do you explain this?
2. Did you find different organisms at different levels? How do you account for these differences?
3. What organisms do you believe are not only present but very abundant, even though you can't observe them with the instruments available?
4. Make a diagram, which includes all the organisms you observed in your pile. Try to add arrows indicating the direction of food energy flow. Look up information about the feeding habits of some of the organisms that you found in a reference such as *Compost Critters* by Bianca Lavies (1993). This procedure can be repeated periodically during the school year to monitor changes in the kinds and abundance of organisms in your compost pile.