

## Activity 22

# Analysis of Run-off – Leachate or Tea

**Rationale:** The run-off water at the bottom of the bin is an important aspect of the vermiculture. One of the scientific names best ascribed to this liquid is leachate. The traditional name is tea, because of its tea-like appearance.

### Objectives

- 1) Determine the pH of the leachate.
- 2) Determine the specific ion concentrations of the leachate.

### 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	50-mL beakers (20)
TI 83/84	Distilled water
pH sensor	
Vernier: specific ion sensors - chloride, nitrate, calcium, ammonia (aq) OR	
Aquarium test kits: nitrate, nitrite, ammonia (aq), carbonate hardness, phosphate, and copper	

### Introduction

The chemical characteristics of the leachate are important. *E. fetida* and *E. andreei* are being considered for possible rehabilitation of contaminated soils. Aquarium test kits can be used in place of the CBL2, TI 83/84, and Vernier sensors. The Vernier sensors measure in continuous mg/L, whereas the aquarium kits will have limited ranges and read in various units. Either one will work for this activity. The chemical

characteristics of the leachate are a view of the various ions that are available from certain foodstuffs and how well the worms tolerate these chemicals. One of the more popular vermiculture research areas focuses on the tolerance of salty soils by the worms. These are soils that have been contaminated with surface ocean water or the invasion of underground fresh water aquifers by salt water.

### **Strategies**

As with all of the chemical activities, the students may need a little more coaching than usual. However, if they have approached the previous activities carefully and in a scholarly manner, this activity will be evidence of their laboratory skills. It is reasonable to write the chemical formula in English, but the introduction of chemical symbols is good pedagogy. Unbalanced chemical equations will suffice. Samples of the leachate should be tested on a regular basis and measurements recorded in the journal and in Data Table 1. Because the aquarium test kits and the Vernier sensors each test for different ions (nitrate and ammonia (*aq*) in common), the best method is to use both. The Vernier sensors report the measurement digitally and the aquarium test kits use a color reference chart.

### **Procedure**

- 1) Collect the leachate.
- 2) If no leachate is present, make enough leachate for the class. Pour distilled water on top of the vermicompost. The water will run through and leach out the soluble particles. The leachate can be collected at the bottom of the bin.
- 3) Place 10 mL samples (aliquots) in as many 50-mL beakers as needed for duplicate tests.
- 4) Test each sample for a specific ion (use one beaker for each measurement).
- 5) Use either the Vernier sensors or the aquarium test kits or both if available.
- 6) Use the DataMate application.
- 7) Set up the CBL2 for each of the sensors by following the on-screen directions.
- 8) Set up the aquarium test kits and follow the specific directions for each test, using the appropriate color reference guide.
- 9) Record the measurements in the journal and Data Table 1.
- 10) Draw conclusions from the results.

