



Ideas for Student Research

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Ideas for Student Research Projects

Compost Ingredients

1. Garden supply stores and catalogs often sell compost "starters," which supposedly speed up the composting process. Develop a recipe for a compost starter and design a research project to test its effect on the compost temperature profile.
2. How well do human nutrition concepts apply to compost microorganisms? For example, will the microbes get a "sugar high," demonstrated by a quick, high temperature peak when fed sugary foods, compared with a longer but lower peak for more complex carbohydrates?
3. Measure the pH of a number of different compost mixes. How does the pH of initial ingredients affect the pH of finished compost?
4. Some instructions call for adding lime to increase the pH when compost ingredients are mixed. Other instructions caution to avoid this because it causes a loss of nitrogen. How does adding various amounts of lime to the initial ingredients affect the pH of finished compost?

Microorganisms

1. Composting recipes sometimes call for inoculating the pile by mixing in a few handfuls of finished compost. Is there any observable difference in appearance of microbes between systems that have and have not been inoculated?
2. Does the pH of the initial compost ingredients affect the populations of microorganisms during composting?

Compost Physics

1. What type of insulation works best for soda bottle bioreactors? Does it help to have a reflective layer? Do different insulative materials or different thicknesses affect the temperature profile?
2. When constructing compost bins or piles, some people incorporate perforated pipe, wire mesh, or other systems to increase passive air flow. What is the effect of different methods of aeration on the temperature profile of any one compost system?
3. How do various means and schedules for turning a pile affect the temperature profile and the time needed for production of finished compost?
4. What is the effect of forced aeration (with an aquarium pump or similar apparatus) on the temperature profile in a soda bottle or a two-can bioreactor?
5. Try mixing the same ingredients in a large outdoor pile, a two-can bioreactor, and a soda bottle bioreactor. Which system reaches the hottest temperatures? Which remains hot the longest? How does this affect the compost produced?
6. What is the effect of layering versus mixing organic ingredients on the compost pile temperature profile?

Worm Composting

1. Do organic wastes in compost break down more readily in the presence of worms than through composting that depends solely on microbial decomposition?
2. In some experiments, plants have not show increased growth when planted in fresh worm castings. Does aging or "curing" worm castings increase their ability to enhance plant growth? Are there chemical differences between fresh and older worm castings? Should worm compost be mixed with soil before being used to grow plants?
3. How do different food sources affect reproductive and growth rates of red worms (*Eisenia fetida*)?

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4. Red worms grow best in wastes with pH between 5.0 and 8.0. How sensitive are their cocoons to pH? Will they hatch after being exposed to extreme pH? How sensitive are they to extreme drought or temperatures?
 5. Effects of Compost on Plant Growth
 6. Some leaves, such as those of black walnut or eucalyptus trees, contain chemicals that inhibit growth of other plants. Are these compounds broken down by composting?
 7. Finished compost is near neutral pH. Can you design an experiment to answer one or more of the following questions: Is compost detrimental to use on acid-loving plants such as blueberries or azaleas? Does compost buffer the soil pH, making it harder to provide acidic conditions? How does it compare to peat moss in this regard?
 8. Water in which compost has been soaked (often called compost tea) is said to be beneficial to plants. Can you design experiments to test whether different types, concentrations, and amounts of compost tea enhance plant growth?
 9. In China, farmers dig parallel trenches and fill them with organic wastes mixed with cocoons of *Eisenia fetida*. Soybeans planted in rows between the trenches are highly productive. Can you design and test a planting system using vermicompost?

These are a few ideas about possibilities for student research projects on composting. For more ideas, plus detailed information about techniques for carrying out composting experiments, refer to our book, [Composting in the Classroom: Scientific Inquiry for High School Students](#), by N.M. Trautmann and M.E. Krasny. ISBN 0-7872-4433-3. Available online from e-Commons (**OUT OF PRINT**)