

Effect of compost on plant growth

Compost has an amazing effect on plant growth by acting as a natural source of nutrients and **organic matter** to the soil. Healthy soil produces healthy plants, which in turn can produce better tasting, nutrient-rich food. Several studies done by universities have shown that an 80:20 ratio of soil to compost is best for plant growth. Let's test this ourselves!

Hypothesis:

Experiments are a way to formulate a **hypothesis** or scientific prediction. In this experiment, we are trying to estimate the amount of compost that is optimal for plant growth. In this experiment, the pot with only soil in it is called the control. It will demonstrate the rate of growth in our specific soil with no compost added at all. Controls help us rule out effects that may have nothing to do with the experiment; for example, if there was something unique about the type of soil we are using in our experiment, we would notice it in all the pots, including the one without any compost at all.

At the other end of the spectrum, we will also fill a pot with only compost, as a control, to rule out effects that may be due to the compost itself. The experiment – what we are testing – is in the compost/soil mixtures that you will be conducting. At what ratio of compost to soil will the plants truly grow best in? It is up to you to decide how much soil and compost you want to mix together for the remaining 2 containers.

What prediction would you like to make about the growth of the plants in each container? Will the plant with a larger compost to soil ratio grow slower, bigger or faster? Or will the plant with a smaller compost to soil ratio grow slower, bigger or faster? Write down your own prediction for each container on a piece of paper. Ex. *Is a ratio of 80% soil to 20% compost optimal for plant growth?*

Experiment Materials

1. Seeds of your choice (make sure you choose the same seeds for all your containers)
2. 4 equal sized yogurt containers, over 500ml (or any containers of the same size)
3. Compost (any kind, but use the same kind for all containers)
4. Potting/garden soil (again, use the same kind for all containers)

Other Materials

1. Rulers
2. A way to water plants
3. A way to label your pots (Permanent markers or masking tape and a pen)
4. A large bowl or bucket for mixing soil and compost.

Methodology

Part 1: Preparing the seeds (1-2 weeks before the experiment)

1. Choose seeds for a plant that you like to eat. Make sure you choose enough of the same kind of seeds for all of your containers.
2. Place seeds (2-3 per container) in a moist paper towel inside of a plastic bag and place in a dark place to sprout
3. Grow seedlings until they are an inch or two in height

Part 2: Setting up the experiment (once seedlings have sprouted)

1. Mark or label each of your containers (1, 2, 3, 4). Measure the height of each container, and then mark a point 3 cm from the top of each container with a permanent marker.
2. Fill container 1 to the 3 cm point with soil. In container 2, fill to the same mark with compost.
3. Decide on how you will measure the amounts of soil and compost to go in each container. Your measurements need to be consistent, so think about what works best, and what you have access to. Do you have measuring cups?
4. Decide on the 2 different ratios of soil to compost that you want to add to the containers (ex. 1:2 = 1 cup soil to 2 cups compost and 2:1 - 2 cups soil to 1 cup compost, etc.). Seeing as 20% compost has been shown to be the most effective, this ratio could be part of your experiment. Write the chosen ratios on the numbered containers.
5. Measure out the amounts of soil and compost amount for the first ratio determined in step 4 into a bucket or bowl, and thoroughly mix the soil/compost together. Fill the corresponding container to the 3 cm mark with this mix. Repeat this process for the second ratio determined in step 4.
6. Make a hole in the soil as deep as the plant roots. Insert a seedling into the soil in each container, making sure to cover any root mass with soil.

Part 3: Running the Experiment

1. Create a plant care sheet to keep track of your seedlings. Start with creating a table for how much sunlight the plants get each day, how much watering is given, and note where the plants have been placed.
2. Within the table on your plant care sheet, add more columns based on what variable characteristics (leaf count, height, etc.) you want to measure and at what time intervals (daily, weekly?). Make sure you document these **variables** for Day 0 (starting point).
3. Find an effective way to water the plants consistently and equally. For example, this could be accomplished by having a schedule on which you water each plant with half a cup of water every Tuesday and Friday. Track your watering schedule and any changes you make on your plant care sheet.
4. What else does a plant need to grow? Nutrients for the plants are provided by the compost, water and sunlight. But how much of each is needed? Each of these nutrients are variables in your experiment that will affect how your plant grows. Do some research online to find advice on watering seedlings and how much sunlight they will need. Once you have decided

what is best for your seedlings, make sure that you keep the variables of sunlight and water as constant as you can everyday.

5. Let's go deeper into the types of variables present in scientific experiments. What are you controlling? What is being manipulated in our experiment? What is independent, or shouldn't respond to the changes, and what is dependent on the changes in the experiment? What variables do you think are independent of the experiment?
6. Let's tackle the responding variable. Based on the type of plants we are growing, brainstorm ways that you can measure which one is growing more. These are characteristics like leaf count, plant height, number of blossoms, or other factors depending on what you are growing.
7. Part way through the experiment, review the hypotheses and predictions you made at the start. Are you seeing what you would expect? If not, what may be the reason?
8. Decide when your plants are large enough to end the experiment. This time frame will depend on if they are flowering or fruiting plants and how fast they produce each.

Part 4: Results and Discussion

Analyze the results based on your tracking of various characteristics of the plants. Was your hypothesis correct? What can you infer/conclude from the findings? What soil to compost ratio is the best for growing plants?

What were the other variables that may have influenced the growth of the plants? Did they all get the same amount of light? Were you able to mix the compost and soil **homogenously**, or were there clumps or pockets throughout the soil? What are the applications for your research? What other studies were done in the class, and how did their results differ from yours? What further experiments could you do to test your theory? Could you have measured other variables? Discuss your conclusions with the class!

Glossary:

Homogenous(ly): Consistent throughout. A homogenous mixture looks the same in every sample. It is the opposite of heterogeneous, in which each sample of a mixture may look quite different.

Hypothesis: the question you are trying to answer with your experiment

Organic matter: carbon-based materials, such as wood, leaves, manure, that, through the decomposition process, are releasing nutrients back into the environment.

Variables: The factors of an experiment that can change during the process. In this experiment, controlled variables = sunlight, water, type of soil, type of plant; manipulated = nutrients/compost level; responding = plant growth.