**Soil Characteristics and Plant Growth Lab**

**Objectives**:

1. Determine water holding capacity of different types of soils.
2. Observe differences in the growth of radish plant roots in different kinds of soil.
3. Measure biomass production of radish plants following two weeks of growth in different soils.

**Soil Characteristics:**

Soil consists of a mixture of mineral materials of different sizes and chemical composition, air, moisture, and living organisms. Particle size influences water-holding capacity and pore space. Pore space allows air to penetrate the soil. In this experiment, you will look at the effect of particle size on water-holding capacity and pore space on plant growth. Plants need three resources from the soil in order to grow. The roots need oxygen to carry on aerobic respiration and grow. Water is needed as a transport medium and a raw material for photosynthesis. Mineral nutrients, such as nitrogen, phosphorus, and potassium, as well as many minor nutrients are needed for the addition of new living material to the plant. In this experiment, you will look at the way in which soil type influences the growth of plants.

**Question**: Which soil type will be best at growing radish plants?

**Pre-lab Questions**:

1. What is the chemical formula for both photosynthesis and aerobic respiration? Explain how both of these processes interact to allow for plant growth.

1. Differentiate between the most common soil types: sand, silt, clay, and loam.

**Lab Design**:

1. Create a testable hypothesis based on the question posed with regard to radish plant growth. Remember to use “if…, then…” and include changes (increase/decrease). Needs to be specific. *(Hint: You may want to do some background research on soil types and radish growth before designing hypothesis.)*
2. Determine both the independent and dependent variables for your experiment.
3. Design a control group for your experiment.
4. Determine all external factors that must be controlled throughout the experiment. Include maintenance of growing over 2-week period.
5. Measure the water holding capacity for each soil type used in your experiment (<https://www.youtube.com/watch?v=Xfx3bhDd7YY>).
   1. Measure 100 mL of each soil type. For each soil type, place cotton ball in bottom of funnel and place in soil. Pour 100 mL of water through soil and wait one hour to determine results.
6. Develop your own set of procedures based on the lab design and materials available.
7. Set up experiment to test radish growth using one control and minimum of 3 test groups.

**Materials for Use:**

Syrofoam cups

Graduated cylinders

Ruler

Funnels

Radish plant seeds

Water

Sand

Cotton Balls

Pea gravel

Topsoil

Commercial potting soil

**Data**: Design a table to include your collected data, which should include the following,

1. Water holding capacity (per soil type).
2. Plant root growth (average and total).
3. Biomass production (average and total).

**Conclusion/Post-lab Questions**:

1. Describe how the results of the experiment supported or refuted your original hypothesis.
2. Which soil showed the greatest biomass production?
3. What soil characteristics do you believe contributed to these results and why?
4. Which soil showed the least biomass production? Why?
5. Do the sizes of the root masses differ in different soils? How?
6. Explain how sources of error may have skewed your results. How could the lab have been improved in order to provide better results?
7. Based on the results, develop a follow-up hypothesis to extend the experiment.
8. A farmer in a nearby area has mainly sandy loam soil. As an extension agent, would you recommend he plant radishes in his fields, and if not, what type of edible vegetation would he economically benefit from?