Name: _____

CASE
Curriculum for Agricultural Science Education

Activity 3.3.2 Extracting Air

Purpose

Just like with any living organism, plant roots need oxygen to survive. How is this possible when plant roots are grown underground? It all depends upon pores, which are pockets filled with air or water in the soil structure. Soils that have more porosity are better suited for sustaining plant life.

You will assess the quality of a soil based on porosity in this activity. Since soil is filled with pores ranging in all sizes, it is hard to see with the naked eye. You will test the porosity of the soil, which will allow you to see the air trapped in the soil as it is being replaced by water. In addition, you will also compare two soils that have different levels of organic matter content to determine if pore space is affected by organic matter.

Materials

Per pair of students:

- Clod of soil containing high amounts of visible organic matter
- Clod of soil containing low amounts of visible organic matter
- Polyurethane spray can
- 2 500 ml beakers
- Stopwatch
- Water
- Paper towels

Per student:

- *Agriscience Notebook*
- Pencil

Procedure

You and a partner will prepare two clods of soil by spraying them with a polyurethane sealant. The sealant will hold the clod together when submersed underwater. After you have made some predictions about which soil sample has the most pore space, or in other words air volume, you will submerge both and record the amount of time it takes for the air to be released from the soil samples.

Part One – Apply Sealant

Take two clods of soil, one representing a high amount of organic matter and the other sample representing a low amount. Make sure both samples are approximately the same size. Be sure the clods fit easily in the beaker. If either one does not, carefully break a small portion away to allow it to fit in the beaker.

Coat both samples with an even coat of polyurethane and set aside to dry. Drying time will require 5-10 minutes. While the clods are drying, complete Part Two.

Part Two – Make your Prediction

You and your partner will need to agree upon a prediction for the porosity of the two samples. Formulate and write down a prediction as to which soil sample will have the most pore space. In the box provided, record your prediction written as a complete sentence.

.Prediction:

I think the high organic matter will have the best ability to hold air and water because it is in bigger clumps so it most likely has more space.

Part Three – Conduct the Experiment

1. Pour 375 ml of water into each of the 500 ml breakers.
2. Once the polyurethane is dry, you and your partner will gently place each clod into the beakers at the same time. **NOTE:** Start the stopwatch at the moment the soil is placed into water.
3. Observe the bubbles that emerge from each clod. Record your observations in Table 1 for the time intervals listed. Important observations should be made including how fast and how many bubbles each clod is producing, and when a sample stops bubbling. Each partner will need to be responsible for one of the clods. But, each partner should observe the other clod when possible.

Table 1 ***Data Observations***

Observations	**High Organic Matter Sample**	**Low Organic Matter Sample**
:30 check	59	39
1:00 check	38	30
1:30 check	30	27
2:00 check	27	18
2:30 check	23	19
3:00 check	19	16

3:30 check	17	14
4:00 check	16	14
4:30 check	12	13
5:00 check	10	12

Part Four – Clean up

After your observations are recorded, dispose of the water and soil, clean and return the equipment, and clean up your workstation according to your teacher's directions.

Conclusion

1. What do you believe the bubbles represent in the soil?

Oxygen.

2. Explain why you believe your prediction was or was not correct about pore space between the two soil samples.

I was incorrect because the low organic matter held water and air the best.

3. Why do you think organic matter affects the amount of pore space in soil?

Because high organic matter seems to have more pore space to let things out while low organic matter is the opposite.

4. What are some recommendations you would make for increasing porosity in soils?

Use low organic matters instead of high organic matters.