Soil Glue

What you need

- 1 trowel to collect soil aggregate sample
- 1 bag to store soil aggregate sample
- 1 large container like a mixing bowl filled with water
- 1 strainer with large holes that fits in the large container

Note: The best container for this experiment is one that is see-through and has a wide rim.

Preparation

1. Collect a soil aggregate, also known as a clod of dirt, using a trowel, and place it in the bag. Note where you collected the sample and the level of disturbance in the area. Do people walk on the soil a lot and dig the soil, or do people leave the soil alone?
2. Place the strainer in the large container.
3. Fill the container and its strainer with water. The container needs to be filled with water above the curved bottom of the strainer. If you fill the entire container to the top, that is okay too.
4. Place your soil aggregate sample, also known as the clod of dirt, into the container on top of the strainer. Be gentle and careful as you place the soil aggregate into the container. The water should cover the soil aggregate sample. Gently add more water to the container if necessary.

What to do

Observe what happens. Ask yourself the following questions:

- Does the soil aggregate stay together, or does it break apart in the water?
- If the soil aggregate breaks apart, does the water turn cloudy, or does the water remain clear?
- Was the soil aggregate collected from an area where there is a lot of disturbance, like a pathway that a lot of people walk on, or was it collected in an area that sees little disturbance?
- Did the experiment occur the way you thought it would? Why or why not?

What is happening?

Soil is composed of many different things, and although the texture of soil type (clay, silt, or sand) plays a role in how it acts when exposed to water, other soil components influence how soil acts when exposed to water too. One of those other components is glomalin, a protein produced by arbuscular mycorrhizal fungi. Arbuscular mycorrhizal fungi is a specific type of fungi.

It is important to note that glomalin is only one type of protein that acts like a soil glue. Other types of these proteins exist too. This activity focuses on soil glomalin, though.
Glomalin acts like a type of glue in the soil. Soil glue has a very similar function to glue used when doing art projects or other crafts. Soil glue creates soil aggregates, or clusters of soil stuck together. These clusters create pores or channels, or spaces for air and water to move through the soil. These clumps make it harder for soil to wash away because of rain and wind.

These soil aggregates, or clumps, stay together, especially if the soil is not disturbed or bothered. Constantly moving soil around while digging to farm or build can destroy these aggregates. Constantly digging the soil will destroy aggregates because oxygen gets into the soil and is used by decomposers to convert organic matter into food. The organic matter, including microorganisms like fungi, is reduced by decomposers, and less soil glue is produced and available in the soil. Less disturbance of soil reduces the amount of oxygen introduced to the soil. Therefore, more microorganisms survive, and proteins like glomalin remain in the soil and create soil clumps.

In general, soil from an area that is frequently disturbed breaks apart easily in water, and the water is cloudy. The cloudy water also takes a long time to settle. Soil from an area that is not frequently disturbed does not easily break apart in water, and the water remains clear.

Exceptions to the general trend of less disturbed soil holding together much better than more disturbed soil include the type of soil. Clay soil holds together very well because it is chemically bound. Dark midwestern soils hold together very well because they contain old organic materials that resist decomposition. If a dark midwestern soil clod is collected, it will quickly break apart into small aggregates and collect at the bottom of the container, not as sediment, but as small-sized aggregates. Additionally, the water will remain clear.