Edible Soil Compaction Demo

By Cathy Myers

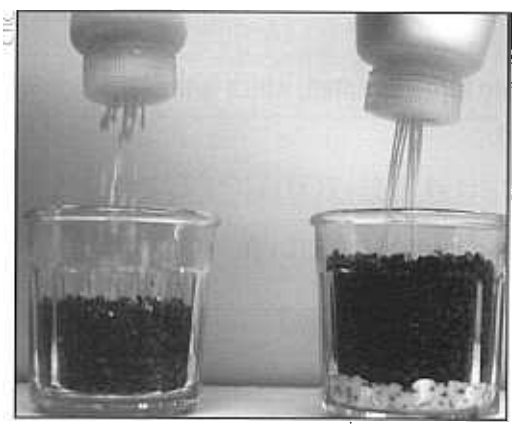
Soils that have been exposed to heavy equipment or a lot of human or animal foot traffic are usually more compacted. Compacted soils contain less air and/or water pore space than soils not subjected to a lot of weight.

If a soil does not have sufficient pore space, it is limited in its ability to function. Adequate pore space is essential for the movement of water, air and soil organisms through compacted soil. In addition, plant growth can be hindered because tender seedlings cannot grow through the soil very well. Roots cannot grow very well either; they become stunted and aren't able to absorb as much water and nutrients as a plant in soil with lots of pore spaces. Lack of sufficient pore space and the accompanying compaction also restricts water infiltration, resulting in excessive runoff, erosion, nutrient loss and potential water-quality problems.

Using cereal to illustrate particles/aggregates of soil and milk to imitate rainwater, the following edible experiment shows how compaction affects the infiltration, storage and rate of water movement through soils.

Required Materials

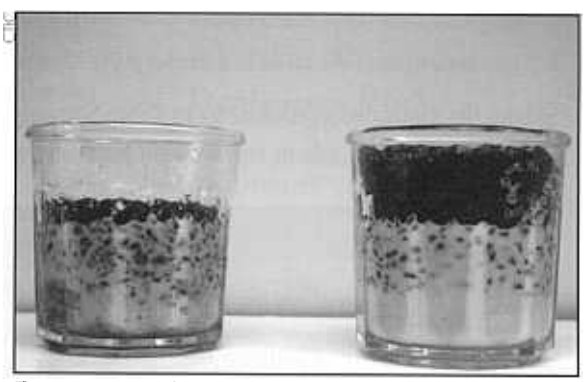
- 2 cups of chocolate sweetened rice cereal (e.g. Cocoa Rice Krispies)
- 2 clear containers (e.g. drinking glass or empty jam jar)
- rolling pin
- 1 cup milk (preferably whole milk, half and half or cream)
- 2 squirt bottles or measuring cups with pour spout



When soils are compacted, such as the cereal in the glass on the left, rain water cannot infiltrate, which increases the chance for excessive erosion, slowed root growth, nutrient loss and possible water quality problems.

Directions:

1. Pour one cup of chocolate rice cereal into one of the clear containers. Place the other cup of cereal in a closeable plastic bag and roll with a rolling pin until approximately half of the rice cereal is crushed. Pour the crushed/compacted cereal into the second clear container.
2. Pour ½ cup of milk into each of two squirt bottles or measuring cups. Whole milk or cream is more desirable than skim or two percent milk because it is thicker and whiter, making it easier to see.
3. At exactly the same time and at the same rate, have one person pour a cup of milk over the compacted cereal and another person pour a cup of milk over the non-compacted cereal. Be sure to pour the milk into the center of the cereal so that the milk doesn't run down the sides of the container.
4. Compare the rate of milk flow through the two containers of cereal. How long does it take for the milk to reach the bottom of each container? Does the milk immediately infiltrate (enter) the cereal or does it "perch" on top or part way down?
5. Repeat the experiment with new cereal and milk. This time crush/compact the cereal until few rice grains remain whole. How does this affect the infiltration of the milk? If this was water and soil instead of milk and cereal, how would this affect plant roots? Would the roots be able to grow very deep? Would there be much water available in the soil for the roots to absorb during the dry, hot summer?



From a crop production standpoint, the effects soil compaction has on water flow and storage may be more serious than the direct effect on root growth.

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