# LAB REPORT: Organic matter nitrate holding capacity

Lab Partners:

Statement of the Problem:

* Organic matter in topsoil is thought to increase the amount of nitrates that a given soil can absorb and hold. Organic matter also holds nitrates and releases it slowly over time to make them available for plants. Organic matter also serves as food for bacteria which can convert atmospheric nitrogen into plant available nitrates and different bacteria that can convert nitrates back into atmospheric nitrogen. If soil is eroded or if organic matter isn’t replaced, it could lead to a decrease in the homeostasis of nitrates available for plants. Excess nitrates can leach into waterways and cause algal blooms and other negative environmental results.
* When comparing two samples of soil – one with no organic matter and one with a high organic matter content – which will absorb and hold more nitrates?
* Hypothesis:

Materials:

* Mass scale
* Plastic container (margarine or cottage cheese containers or other Tupperware containers work well)
* Subsoil with little or no organic matter
* Potting soil with a high amount of organic matter including peat moss, bark, and other composted vegetation
* Large measuring beakers. Beaker mouth should be larger than the base of the plastic container.
* Popsicle sticks
* Drill
* Water
* Four Nitrate test strips
* All-purpose fertilizer with high nitrogen content (i.e. 24-0-0 NPK)

Procedure:

1. Fill a plastic container with a sample of 500 grams of subsoil with little to no organic matter.
2. Fill a plastic container with a sample of 250 grams of subsoil and mix in 250 grams of potting soil. Potting soil is made of things like peat moss and bark and will provide a high amount of organic matter.
3. Press both soils down into the containers to remove as much of the pore space as possible.
4. Drill or poke holes into the bottom of each container.
5. Set or hold the containers over two large beakers that can catch water. Use long popsicle sticks to create a suspension platform that will hold the container but still allow for water to drain.
6. Slowly pour 1,000 milliliters of water onto each soil sample. Let sit for 10 minutes.
7. Using nitrate test strips, measure the amount of nitrate in each of the collected water samples.
8. Record your observations.
9. Repeat steps 1-5.
10. Mix two solutions of 1,000 milliliters of water and one tablespoon of all-purpose fertilizer 24-0-0 NPK or higher nitrogen content. Slowly pour the solutions on each of the soil samples. Let sit for 10 minutes.
11. Using nitrate test strips, measure the amount of nitrate in each of the collected water samples.
12. Record your observations. Take photos throughout to document the experiment.

Data and Results:

|  |  |
| --- | --- |
|  | **Nitrate level** |
| **Control: Subsoil sample –**  **water** |  |
| **Control: Subsoil sample with organic matter –**  **water** |  |
| **Subsoil sample –**  **water and fertilizer solution** |  |
| **Subsoil sample with organic matter –**  **water and fertilizer solution** |  |
| **Notes and other observations** |  |

Conclusions:

1. Which soil sample captured more nitrate – with or without organic matter? Why?

Research Solutions: Conduct research to answer the following questions.

1. What are some procedures or methods that farmers and landowners can implement to protect soil from losing organic matter?
2. What are some procedures or methods that farmers and landowners can implement to help correct or improve soil that has lost organic matter?
3. What impacts might nitrate runoff have on the watersheds and ecosystems downstream? What data can point to those feedbacks and changes to Earth’s systems?

Report:

As a group, prepare a poster, PowerPoint, or other presentation to describe your experiment and your results to the rest of the class. Be prepared to make a 10-minute presentation and answer questions about your experiment and about organic matter’s ability to collect and hold nitrates.