

Soil Testing

Measuring soil nutrient content

Background

Plants use the air to get CO₂ for photosynthesis, but the mineral nutrients they need come from the soil. Three of the most common mineral nutrients plants need are nitrogen, phosphorus, and potassium. Nitrogen (N) is used in many plant parts, including building proteins, DNA, RNA, and many pigments that capture light like chlorophyll. Phosphorous (P) is used to transport energy around the plant (as ATP) and turn enzymes on and off. Potassium (K) helps plants regulate water content osmotically (keeps cells full of water), and helps stomata (the openings on plant leaves) open and close to regulate transpiration. Another aspect of soil that affects nutrient availability is the soil pH (or acidity). If a soil is too acidic or too basic, some nutrients may become unavailable and plants may not be able to grow as well.

When plants are growing in the soil, they need to be able to take up these nutrients from the soil to grow and produce seeds. Different symptoms appear to indicate an unhealthy plant (yellow leaves, stunted growth) for different nutrients. It is very important to make sure there are enough nutrients in the soil to have a healthy crop, but too much of a nutrient can be bad as well. When there are excess nutrients in the soil, the plant may not be able to take it all up and it may be lost to the environment. Preventing off-target movement of nutrients is important to persevering the environment.

Producers use soil testing as a way to measure how much of a nutrient is in the soil, and can use these numbers to calculate how much they need to add to make sure the crop is healthy for next year. A standard soil test will provide information about the soil's pH, P and K levels, as well as other information like the organic matter content and the amount of calcium and magnesium in the soil. Because N is a biologically-dependent nutrient, tests for N content usually are requested separately. Soil tests can be collected in many different ways (one sample per field, collected at multiple locations using a grid, collected in different zones, etc.) to help growers manage their fertilizer applications. Grid or zone samples can even be used to build a variable-rate fertilizer map where the nutrients are then applied only to areas that need it in the soil. Today we will practice collecting and running a soil test, and compare our results to those from a commercial lab.

I. Collecting your soil sample.

1. Take your soil corer, and push it into the soil down to 8" soil depth. Twist the corer, and pull it back out of the soil. Empty the core into a 5-gallon bucket. Give the corer to another person.
2. Repeat step 1 until you have collected 8-9 total cores.
3. Using your hands, break up the cores and mix the sample thoroughly together.
4. Bring your mixed sample back to the classroom.

II. Conducting your soil test.

1. For this experiment, we are using the Lamotte soil testing kit (Model EL Garden Kit, 5679-01). Choose one of the four tests to run on your soil sample (soil pH, N, P, or K).
2. Follow the first three instructions, label your tube, and set it aside (except for pH). Groups measuring pH can collect a final measurement after 10 minutes (proceed to step 5).
3. Once the soil has settled, proceed to finish the final steps if you are measuring N, P, or K. This may not be until the following day.
4. Compare the color of your tube to the charts provided, and record a value of your sample in the table below, as well as on the board. Try to avoid using the words "Low, Medium, or High"; instead use the range for your test to estimate a value (ex: a pink color darker than low but lighter than medium for N may be 40 lb/acre). Be sure to record the values from the other groups into your table, and record the average soil reading from the field we sampled.

	Soil pH	N	P	K
Bucket 1				
Bucket 2				
Bucket 3				
Average				

- Take one of the soil tests from the commercial laboratory and find the values for soil pH, N, P and K. For values on the report with the units “ppm”, multiply by 2 to get the value in lbs/acre. Record the values from the test report below, and record your average values in the second row for comparison.

	Soil pH	N	P	K
Soil Test Report				
Bucket Average				

- On the soil test report, look for the recommended nutrient applications for crop yield.

Reflection

- How well did our Lamotte test do at quantifying nutrient levels?
- On the soil test report, look for the recommended nutrient applications for crop yield. How might these change if our P level was lower? If our K level was higher?