

7. Soil Nitrate Test (NO_3^-)

Use the same sample prepared for the EC and pH tests to measure soil nitrates. **If you are starting with a fresh soil sample, read the introduction and follow Steps 1-3 in the EC Test Chapter on preparing the sample.**

Materials needed to measure soil nitrate:

- filter paper
- 120-mL plastic container with lid
- eye dropper
- nitrate/nitrite test strips
- stopwatch or timer
- distilled water

Did You Know?

Soil nitrates are good measures of plant-available nitrogen, but they can be readily lost from the soil by leaching and volatilization.

① Fold Filter

Fold the filter paper in half (into a semicircle). Fold it again, but not quite into a quarter-circle. Leave the edges a little uneven as in **Figure 7.1** (A black line is drawn for demonstration purposes.)



Figure 7.1

② Insert Filter Paper into Subsample

Open the filter paper into the shape of a cone and push it (pointed part first) quickly into the jar with the soil/water mixture until it touches the bottom of the jar (**Figure 7.2**). **Wait** until about an eye dropper-full of the solution has seeped through to the inside of the filter paper. (**Note: Inserting the filter paper quickly prevents it from wetting up and tearing as it is inserted.**)



Figure 7.2

[For Steps 3 & 4, it would be helpful to first familiarize yourself with the directions on the side of the bottle of nitrate strips.]

③ Place Drops on Nitrate Strips

Using the eye dropper and one nitrate/nitrite test strip, place 1 or 2 drops of the filtered solution on each of the strip's two pads. **Note the time.**

NOTE: One pad measures the amount of nitrite, and the other measures the amount of nitrite and nitrate combined. Nitrite rarely occurs in measurable amounts in soils, so nitrite readings from the test strips are not recorded.

④ **Measure and Record Nitrate** 

- Align the nitrate/nitrite test strip with the bottom of the bottle with your thumb corresponding to the diagram on the bottle.
- **After 60 seconds**, compare the first pad (furthest from your thumb) along the nitrate scale as shown in **Figure 7.3**. Estimate the nitrate amount according to the degree of color change. Enter the value from the nitrate scale on the Soil Data worksheet in ppm. This value is an estimate of nitrate-N concentration in the extract.



Figure 7.3

NOTE: The nitrate test strips have a shelf-life. Check the expiration date on the bottle.

CALCULATIONS:

Estimated (lb NO₃-N/acre) =

$$\frac{(\text{ppm extract NO}_3\text{-N}) \times (\text{depth of soil sampled in cm}) \times \text{bulk density} \times 0.89}{10}$$

Exact (lb NO₃-N/acre) =

$$\frac{(\text{ppm NO}_3\text{-N}) \times (\text{volume water used}) \times (\text{depth of soil sampled, cm}) \times \text{bulk density} \times 0.89}{(\text{dry weight of soil}) \times 10}$$

$$\text{Volume water used} = 30.0 \text{ mL} + [\text{dry weight of soil} \times \text{soil water content (g/g)}]$$

Note: The maximum nitrate-N reading on the nitrate/nitrite test strip container is 50 ppm. If the sample reading falls into the 50 ppm category, the sample can be diluted to get a better estimate of the actual amount over 50 ppm. To dilute the sample, fill the eye dropper with filtered solution and place five drops in a plastic container. Add five drops of distilled water; mix gently by swirling the container. Take a reading with a new test strip as stated in Step 4. Multiply the estimated nitrate-N in ppm by 2 before using the calculations. If the nitrate reading falls into the category of 50 ppm again, repeat the dilution steps, and multiply the estimated nitrate-N in ppm by 4.

Did You Know?

Water samples may be taken from drinking water, well water, tile drainage, drainage ditches, and ponds. Dip a nitrate/nitrite test strip into the water and estimate the nitrate or nitrite concentration from the color chart on the test strip bottle. This test can give you an idea of how much N fertilizer is lost from the soil. (See Chapter 12).