Some Soil Test Information is Important; Some isn't

George Rehm, University of Minnesota, November 12, 2002

Soil test results often provide a basis for determining fertilizer needs for future crops. But information in soil test reports can be confusing, says soil scientist George Rehm of the University of Minnesota Extension Service. Some of the information in soil test reports is important and some is not, Rehm points out.

Rehm says pH is usually the first piece of information that appears on a soil test report. The soil pH is a measure taken when the soil is mixed with water. If the soil pH is less than 6.0, the soil sample is placed in a buffer solution and the buffer pH is measured. The buffer pH is the basis for the recommended amount of lime to apply.

A measure of residual or carryover nitrogen in the form of nitrate-nitrogen is a key piece of information when planning fertilization of sugarbeets, corn and wheat in western Minnesota. The amount of carryover nitrogen is usually reported as lbs/acre. An accurate measure of carryover nitrogen requires soil from depths below six inches.

There are three analytical procedures for testing soil phosphorus in Minnesota. Most labs use the Olsen procedure if the soil pH is 7.4 or higher. At lower values, they use Bray and Kurtz or Mehlich III.

"The Bray and Kurtz #1 procedure has also been referred to as the 'weak' Bray test," says Rehm. "Some labs also report a 'strong' Bray value. However, the results of the 'strong' Bray test have no relationship to crop response to phosphate fertilizer. Therefore, you should ignore the 'strong' Bray test results when determining fertilizer needs."

The test for potassium is a routine procedure. However, potassium test results can vary substantially over two or more years. This is due to soil moisture at the time of sampling rather than the laboratory analytical procedure, says Rehm.

While some laboratories analyze for sulfur and use the results to make recommendations on sulfur fertilization, Rehm says this approach is not reliable. "Considerable research in Minnesota and neighboring states has led to the conclusion that there is no analytical procedure that will accurately predict the need for sulfur fertilization," he says. "Soil texture is a more accurate predictor of the need for sulfur. Sulfur added to soils with a loamy sand or sandy loam texture will usually increase yields for alfalfa, corn and small grains."

Rehm recommends ignoring test information on ratios for potassium: calcium, potassium: magnesium and calcium: magnesium. He says extensive research has shown these ratios have no relationship to crop fertilizer needs. Magnesium itself can be important for crops on acid, sandy soil, but the magnesium measurement is not important if soils aren't sandy.

The cation exchange capacity is another figure to ignore, says Rehm. It's an indicator of soil texture and has no relationship to fertilizer recommendations in Minnesota.

A procedure known as DTPA tests for the micronutrients zinc, copper, manganese and iron. Rehm says the test is reliable for predicting crop needs for zinc. However, it will not predict the severity of iron chlorosis in soybeans. And except for the organic soils in northern Minnesota, the copper measurement has no relationship to crop needs for copper. Since the need for manganese fertilization has not been documented in Minnesota, the manganese measurement can also be ignored.

Analysis of soil samples for boron has little value in Minnesota, says Rehm. This test is worthwhile only for farmers who plan to grow alfalfa on the coarse-textured soils in east central Minnesota, he points out.

Rehm says there has been some thinking that a measurement of soluble salts combined with a measure of calcium carbonate can predict iron chlorosis severity in soybeans. "Research results from the past three or four years indicate these measurements might be helpful," he notes. "However, there are currently no firm recommendations for interpreting these measurements."