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### KNOW YOUR SOIL TEST REPORT

**Soil testing is an essential part of a fertility program.** How much fertilizer should you apply this fall? Your answer may be "The same amount I always have." But are your fertilizer applications efficient and profitable? Universities dedicate many resources to develop profitable recommendations based upon soil test levels. Soil testing is inexpensive and effective and will provide you with the knowledge you need to make wise decisions. However, it is useful only if you are able to understand the reports generated from a laboratory.

**Soil test levels.** Soil testing laboratories often report the levels of nutrients in units of parts per million (ppm) or pounds per acre. If the sample represents soil cores taken to a depth of 6 2/3 inches, you can convert ppm to pounds per acre by multiplying ppm by 2. For instance, a soil test of 15 ppm nitrate is equal to 30 pounds per acre. For nitrate and chloride, these numbers indicate the amount actually present in the soil. However, for the remaining nutrients, the amount reported represents only a portion of the total amount present. For instance, a soil test report with a value of 300 pounds per acre of potassium does not mean that the soil contains 300 pounds of potassium per acre. Instead, the value is an index of the availability of potassium to crops. The number itself is meaningless unless it has been related to yield response. Universities have developed databases that relate soil test levels to appropriate fertilizer rates. Lower soil test levels require higher amounts of fertilizer.

**Soil pH and buffer pH.** Soil pH is a measure of soil acidity. The pH scale ranges from 0 to 14. A pH of 7 is neutral. Values less than 7 are acidic, while values greater than 7 are basic. The availability of soil nutrients depends greatly upon soil pH. The pH range optimum for production varies by crop. At low soil pH values, typically less than 5, aluminum and manganese may become soluble enough to be toxic to some crops. Lime is used to increase soil pH. The amount of lime to apply depends upon the buffer pH value. Buffer pH is an indicator of the soil's ability to resist pH changes. Generally, soils with a higher buffer pH require more lime. Universities and certified soil testing laboratories have databases that relate buffer pH to lime requirements.

**Cation exchange capacity.** Cations have a positive charge. Plant nutrients that are cations include ammonium, potassium, calcium, magnesium, copper, iron, manganese, and zinc. Soils generally have a negative charge, so they are able to hold cations and keep them from being leached away with water. The ability of soils to hold cations is measured by the cation exchange capacity (CEC). The units used by soil test laboratories for CEC are milliequivalents per 100 grams of oven-dry soil (meq/100g) or centimoles of positive charge per kilogram of oven-dry soil [cmol(+)/kg]. Both units are a measure of the positive charge that can be held by the soil. The units are equivalent, so 20 meq/100 g is the same as 20 cmol(+)/kg. Soils with a higher CEC are generally more fertile, since they are capable of providing more nutrients to crops. Soils with a CEC less than 6 meq/100 g should not be fertilized in the fall, since they are unable to keep ammonium-nitrogen or potassium from being leached away with winter and spring precipitation. CEC is also needed for following label restrictions on pesticides.

**Percent base saturation.** In addition to many plant nutrient cations, soils hold aluminum and hydrogen, which are also cations. Hydrogen and aluminum reduce soil pH and are therefore considered acidic cations. Soils with a low pH may have high levels of hydrogen and aluminum, causing plant growth problems. However, in soils with pH levels that are slightly acidic or basic, cations such as potassium, calcium, magnesium, and sodium are more abundant. These cations are therefore considered basic. The percent of a soil's CEC that is occupied by basic cations is termed the percent base saturation.

**Soil testing is essential to profitable crop production.** However, the work doesn't stop when the soil is sent into a laboratory. Spend the time to learn what your soil test report means. Only then can wise management decisions be made.

—TSM—

For more information, contact Dr. T. Scott Murrell, Northcentral Director, PPI, 14030 Norway Street, NW, Andover, MN 55304. Phone: (612) 755-3444. E-mail: [smurrell@ppi-far.org](mailto:smurrell@ppi-far.org).

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