What does a soil test report indicate?

CERTIFIED CROP ADVISER

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A soil test is prerequisite to know what sort of soil reaction (acidic, neutral or alkaline), fertility and health a soil has and what needs to be done to obtain the targeted/or economic maximum yields. A soil test report will be a pointer to that. Main components of a soil test report are:

1. Sample ID and Lab #

2. pH: indicates the soil reaction. Soils with pH 6.5-7.5 are considered neutral (nutrient availability is maximum in this range); soils below this pH range are considered acidic and above this range are considered alkaline. If the soil pH is below 6.0, Buffer pH (pH measured from soil and buffer solution suspension rather than soil water suspension that is the case for normal pH measurement) is measured to know how much lime would be required to raise the soil pH to neutral.

3. Cation Exchange Capacity (CEC): Expressed in meq/100 g, is an inherent soil characteristic, is the total capacity of a soil to hold exchangeable cations and is difficult to alter significantly. It determines the soil's ability to retain essential nutrients and provides a buffer against soil acidification. Soils with a higher clay fraction/and organic matter usually have a higher CEC. Soils with a low CEC (<10) could develop deficiencies of basic cations such as potassium (K^+) and magnesium (Mg^2+), whereas high CEC soils (10 or more) are less likely to allow leaching of these cations.

4. Base Saturation (%): The percentage of the CEC that a particular cation occupies is known as the base saturation percentage. A 65% base saturation of Calcium, 15% Magnesium, 5 % Potassium and 15 % Hydrogen is considered ideal though it could vary with the soil texture and other factors. More the Calcium in a soil, looser it is; more Magnesium it has, tighter it is. A high Calcium soil will have more Oxygen, drain more freely, and support more aerobic breakdown of organic matter, while reverse is true for high magnesium soil.

5. Total Salts (EC; mmhos/cm): are dissolved inorganic solutes, which are more soluble than gypsum, e.g. the cations calcium (Ca^{+2}, magnesium (Mg^{+2}), and sodium (Na^+) and the anions chloride (Cl^-), sulphate (SO_4^{-2}), and bicarbonate (HCO^{3-}) as also the smaller quantities of potassium (K^+), ammonium (NH_4^+), nitrate (NO^{3-}), and carbonate (CO_3^{-2}) that are also found in most soils. Excessive soluble salts in the soil could be a limiting factor for crop production. Soluble salts are measured using electrical conductivity (EC), which refers to the ability of a material or solution to conduct an electrical current. The higher the salt content, the greater the EC will be. Soils with EC values below 2.0 are considered non-saline and EC values exceeding 2.0 (more so in irrigation water) are generally considered harmful for plants.

6. Organic Matter (%): consists of plant and animal residues at various stages of decomposition, cells and tissues of soil organisms, and substances synthesized by soil organisms. It is a source and exchange site of plant nutrients and food for soil microorganisms. Organic matter (OM) in cultivated soils usually ranges from 1% to 6% of the top soil.

7. Nitrogen (NO_3^-N ppm): is the prime form in which crop plants take up nitrogen (N). Plant available N in kg/ha is = Nitrate N in ppm X 4.0. If nitrate N in a soil is 25 ppm it has 100 kg N/ha. Pre seeding nitrate N test will help in precisely knowing the N requirements of a crop. A 25 ppm nitrate N test would obviate the need for application of N to spring cereals.

8. Phosphorus – P (ppm): It is the plant available P (also known as Olsen's P) and extracted by sodium bicarbonate. Critical limit of Olsen's P in soils is 20 ppm. OMAFRA accredited soil test tables will indicate corresponding P application rates (and also application rates for other nutrients) for a range of soil test values and crops (Refer to the Agronomy Guide for Field Crops).

9. Potassium – K (ppm): It is the plant available K; extracted by ammonium acetate. Critical limit of available K in soils is 120 ppm, though higher amounts could be ideal for high K requiring crops such as corn, alfalfa and soybean.

10. Magnesium – Mg (ppm): 100-500 ppm Mg is considered optimum in the soil.

11. Calcium – Ca (ppm): Optimum levels of ca are considered to be 600-1000 ppm.

Apart from contents of individual nutrients, the ratio(s) in which these are present are important. Ideal ratios are Ca:Mg 6.5:1, Ca:K 13:1, and Mg:K 2:1.

12. Sodium – Na (ppm): Is not a concern in Ontario soils. A test higher than 920 indicates excessive amounts of Na, limiting crop production.

13. Sulphate Sulphur – S (ppm): Less than 10 ppm is considered low; 30-40 ppm would be ideal.

14. Micronutrients (Zinc, Manganese, Copper, Boron, Iron, Chloride and Aluminium): Optimum soil tests for zinc, manganese, copper and boron are: 3-20, 11-20, 1 and 1-2 ppm, respectively. Ontario soils are not limiting in iron availability. Chloride content in the soil shouldn't increase 100 ppm. Zinc and Manganese Index are calculated from the soil test result and the soil pH. Aluminium is high in low pH soils restricting root growth and P availability. Its levels should be below 2000 ppm.

15. Fertilizer and Lime Recommendations: You will find it at the end of the report for the crop(s) to be grown at particular yield goals considering supportive information such as application of manure and previous legume crop/and if the soil is acidic.

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