MANAGING SODIC SOIL

Sodicity

Soils with high levels of exchangeable sodium (Na) and low levels of total salts are called sodic soils. Sodic soils may impact plant growth by:

- **specific toxicity to sodium sensitive plants**
- **nutrient deficiencies or imbalances**
- **high pH**
- **dispersion of soil particles that causes poor physical condition of the soil.**

Sodium levels

Sodic soils tend to develop poor structure and drainage over time because sodium ions on clay particles cause the soil particles to disperse.

Sodium levels in soil are often reported as the sodium adsorption ratio (SAR). This is a ratio of the amount of cationic (positive) charge contributed to a soil by sodium, to that contributed by calcium (Ca) and magnesium (Mg). The SAR is determined from a water extract of a saturated soil paste. If the SAR is above 13, the soil is classified as sodic. However, sodium can cause soil structure deterioration and water infiltration problems at SAR levels below 13 in some cases.

Good high mounded beds with the addition of compost and gypsum.

Soil Sodicity facts

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Sodic soils:

- are poorly drained and tend to crust
- respond to continued use of good irrigation water, good irrigation methods, and good cropping practices
- are often reclaimed by adding a calcium-based soil amendment
- are hard and cloddy when dry and tend to crust
- water intake is usually poor with sodic soils, especially those high in silt and clay.

When soils are high in sodium, the goal is to replace the sodium with calcium and then leach the sodium out.

Some labs report high sodium levels as ESP (exchangeable sodium percentage). An ESP of more than 15 percent is sometimes used to classify a soil as sodic. This means that sodium occupies more than 15 percent of the soil's cation exchange capacity (CEC). Be aware that sensitive plants may show injury or poor growth at even lower levels of sodium.

Diagnosing Sodic Soil Problems

Symptoms and causes of salinity, high pH, ion toxicity, and sodicity are frequently confused. Each of these conditions can have adverse effects on plant growth.
Visual symptoms can be used to help identify these problems, but ultimately a soil test is the best way for an accurate diagnosis. When salinity is suspected from a high water table, you may be able to measure groundwater depth by boring holes with an auger. If free water collects in holes less than 1metre deep, a drainage problem is indicated.
Normally, high pH soil doesn't look much different than soil with neutral pH, although most times the soil may have a white powdery substance on the surface. Plants growing in these soils sometimes give clues about the problem. High pH reduces the availability of some nutrients (zinc, iron, phosphorus). Signs of high soil pH include yellow stripes on middle to upper leaves (signs of zinc and iron deficiency); or dark green or purple coloring of the lower leaves and stems (signs of phosphorus deficiency).

If a soil is sodic, dispersion of soil particles normally results in crusting, when dry and impaired drainage.

Treatment of sodic soil

The addition of free lime or gypsum in adequate amounts as determined by a soil test, this will add calcium. The most common form of calcium used for this purpose is gypsum. Calcium chloride, which reacts more quickly, can also be used, even though it is usually more expensive. After broadcasting the calcium source on the soil surface, mix it, and make sure adequate moisture is present to dissolve it.

Sodic Soils

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Correctly diagnosing soil problems is the key to determining effective management strategies.

High pH, salinity or sodicity can hamper plant growth.

High levels of salts and sodium may come from irrigation, a high water table, manure/fertilizer inputs, or from the soil parent material.

To effectively manage the problem, you need to know the source of the salts.

Although 4.0 dS/m is used as a general threshold EC to define saline soils, many sensitive crops such as some vegetables will show symptoms and reduced yields at ECs of 2-4 dS/m.

Likewise, many soils will begin to have reduced infiltration and increased crusting at SAR levels well below 13.

Restoration of sodic soils is slow because soil structure, once destroyed, is slow to improve. Growing a cover crop in the early stages of reclamation and cultivating in crop residues or manure adds organic matter which will increase water infiltration and permeability to speed up the reclamation process.

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