SODIC SOILS

Sodic soils have 15 percent or more sodium ions attached to their cation exchange sites (Figure 1).

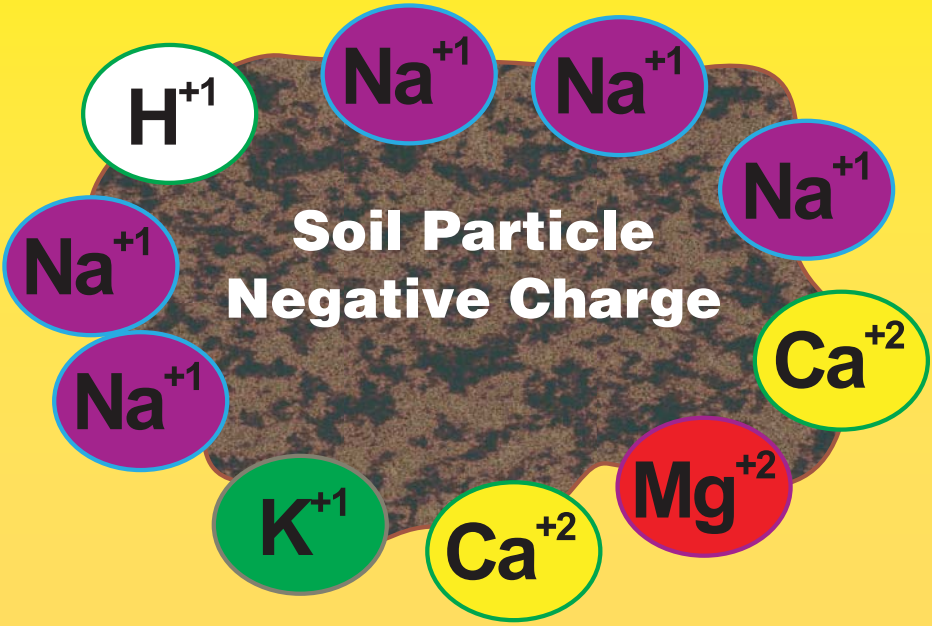

Figure 1. A sodic soil aggregate with more than 15 percent of its cation exchange sites occupied by sodium ions.

- Soil sodicity is measured through soil sodium adsorption ratio or its exchangeable sodium percentage.

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Effect on Plants

- Excessive dispersion of the soils (due to the formation of sodium carbonate salts), resulting in damage to the soil structure by causing disintegration of soil particles (Figure 2)

Figure 2. Degrees of soil dispersion due to soil sodicity through the disintegration of soil particles.

(Photo courtesy of Alison Lacey, Copyright© Western Australian Agriculture Authority, 2009)

- Soil dispersion causing poor physical conditions (Figure 3) and resulting in soils difficult to till, poor seed germination, very slow water infiltration and restricted root growth
- Disintegration of soil aggregates leading to wind and water erosion

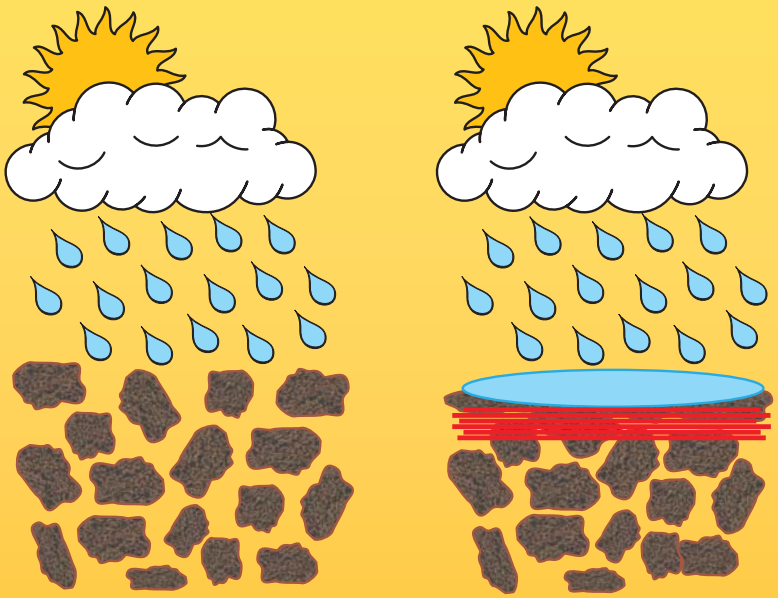

Figure 3. Soil with good physical condition (left) versus a dispersed soil with poor physical condition on the right.

Natural Causes

- Underlying sodium-rich shale in the bedrock below the soil sediments
- Shallow groundwater table with high sodium levels
- High amount of rainfall leading to shallow groundwater table
- Accumulation of excessive sodium in the low-lying areas

Man-made Causes

- Excessive use of irrigation water high in sodium
- Excessive leaching of divalent cations (Ca^{++} and Mg^{++}) leading to domination of Na^{+} in the soil

Rehabilitation

- Analyze the soil for percentage of cation exchange sites occupied by sodium.
- Intercept the surrounding water seeps leading to a shallow groundwater table.
- Supplement calcium-based soil amendments to replace excessive sodium in the soil before the start of the salt leaching process by adequately mixing it in the sodic layers (Figure 4).
  - Gypsum ($CaSO_4.2H_2O$)
  - Calcium chloride ($CaCl_2$)
- Improve soil drainage.
  - More attention to in-field ditches
  - Greater attention to field-boundary ditches
- Lower the groundwater table.
  - Continuous cropping, including cover crops where practical
  - Growing deep-rooted and late-maturing crops such as alfalfa and sunflower
  - Installation of surface or subsurface drainage systems
- Reduce soil surface evaporation through surface mulching or cover crops.
- Improve soil organic matter levels.
- Start with sodium-resistant crops.

Figure 4. Field gypsum application.

(Photo courtesy of Keith Mount Liming of the United Kingdom)

NDSU NORTH DAKOTA STATE UNIVERSITY

For more information, please contact:

Chris Augustin

Extension Area Specialist/Soil Health
North Central Research Extension Center
5400 Highway 83 S., Minot, ND 58701

Phone: (701) 857-7682
Cell phone: (701) 500-7950
Fax: (701) 857-7676

www.ag.ndsu.edu/northcentralrec
www.facebook.com/soilhealth

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Naeem Kalwar

Extension Area Specialist/Soil Health
Langdon Research Extension Center
9280 107th Ave. N.E., Langdon, ND 58249

Phone: (701) 256-2582
Cell phone: (701) 370-0209
Fax: (701) 256-2580

Email: naeem.kalwar@ndsu.edu
www.ag.ndsu.edu/langdonrec

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