Haim Time

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SOIL SALINITY

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Soil salinity is the salt content of a given soil and increasing the salt content is known as salinization. Salts are invariable components of soils and water. The ions sodium (Na^+), potassium (K^+), calcium (Ca^{++}), magnesium (Mg^{++}), and chlorine (Cl^-) are responsible for salination.

In nature, salt increase is caused by mineral weathering and salt release as well as salt laid down as dusts and in rainfall. In dry areas with limited rainfall, inadequate leaching out by soil drainage water can also increase salt content. Human intervention adds to soil salinity by land use practices such as the clearing of trees for agricultural use in dry-lands, and the addition of salts in chemical fertilizers and irrigation water.

Soils in which sodium Na^+ predominates, termed sodic soil, are notable for their poor structure - limiting or preventing water infiltration and drainage. Accumulation of elements such as boron and molybdenum, both of which are toxic to plants, can also occur. Gypsum is commonly applied for the reclamation of sodic soils.

How does salinity affect plant growth and soil quality? For the plant, excess salinity decreases plant-available water and causes plant stress. This is the result of salt in the water demanding more energy from the plant to extract water from the soil. Soil physical properties, within the limits not imposing on plant health, may actually show a beneficial effect. Flocculation, the process by which fine particles bind together into aggregates, enhances soil aeration, root penetration and root growth.

Sodium has the opposite effect of salinity in soils, causing soil dispersion, clay platelet and aggregate swelling. This results in a hardening of soil, which in turn can block water flow, making it more difficult for plants to grow, and ultimately in increased runoff and erosion. The disruption in water flow causes the upper soil layer to become water logged and swollen, resulting in an anaerobic environment with a subsequent decrease in plant growth and organic matter decomposition. Sodium burdened soils will also suffer from surface crusting and this restricts water infiltration and plant emergence.

Soil texture also plays a role in regard to the affects of soil salinity. Clay soils with smaller particles can hold more water than coarse soils and are slower to drain than coarse textured soils that have larger pore spaces for the water to pass through. As a consequence, sandy soils with larger pore space will tolerate higher salinity levels in irrigation water because leaching will remove more salts from the root zone. Clay particles that have a larger surface area provided by their tiny size are more likely to bind excess sodium in clay soils and cause dispersion.

Ultimately management practices have to take into account factors such as climate, soil type, crop and plant species in determining acceptable levels of salinity and sodicity of irrigation water and fertilizer applications.

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