

Agri *Resource*

Electrical Conductivity (EC) Soluble Salts

Soluble Salts for soils are technically defined as those dissolved inorganic solutes that are more soluble than gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$). The most common soluble salts in soils are the cations calcium (Ca^{+2}), magnesium (Mg^{+2}), and sodium (Na^+) and the anions chloride (Cl^-), sulfate (SO_4^{-2}), and bicarbonate (HCO_3^-). Smaller quantities of potassium (K^+), ammonium (NH_4^+), nitrate (NO_3^-), and carbonate (CO_3^{-2}) are also found in most soils.

Sources of soluble salts in soils include commercial fertilizers, animal manures, municipal sewage sludges, soil organic matter, runoff from areas where salt or ice-melt products have been used and irrigation water that is high in dissolved salts.

At normal concentrations, soluble salts have little harmful effect on plant growth. However, if excessive soluble salts exist, plant injury, such as reduced germination rates and leaf burning, or death may occur.

The usual method to quantify the soluble salt concentration in soils is to measure the **electrical conductivity (EC)** of either the soil solution or a soil-water extract. Electrical conductivity refers to the ability of a material or solution to conduct an electrical current. As soluble salts increase in the soil, the soil solution becomes a better conductor of electricity and EC increases. The unit most commonly used for EC in soil solutions or in soil-water extracts is mmhos cm^{-1} but the official international unit for EC is siemens per meter (S m^{-1}). One mmho cm^{-1} is equal to 0.1 S m^{-1} .

Interpretation

Table 1: Interpretation of the saturated paste soluble salts test. (Dahnke and Whitney, 1988)

Degree of salinity	Electrical Conductivity (Mmhos cm^{-1})
Non-Saline	0.0 – 2.0
Slightly Saline	2.1 – 4.0
Moderately Saline	4.1 – 8.0
Strongly Saline	8.1 – 16.0
Very Strongly Saline	16.1 +

Interpretation of EC in soil: The water extract method demonstrates that the relationship between EC and crop growth varies with soil texture.

Table 2: Interpretation of the soluble salts test soil; water extract (Dahnke and Whitney, 1988)

Soil Texture	Degree of Salinity (EC (mmhos cm ⁻¹))				
	Non-Saline	Slightly Saline	Moderately Saline	Strongly Saline	Very Strongly Saline
Coarse sand to loamy sand	0 - 1.1	1.2 - 2.4	2.5 - 4.4	4.5 - 8.9	9.0 +
Loamy fine sand to loam	0 - 1.2	1.3 - 2.4	2.5 - 4.7	4.8 - 9.4	9.5 +
Silt loam to clay loam	0 - 1.3	1.4 - 2.5	2.6 - 5.0	5.1 - 10.0	10.1 +
Silty clay to clay	0 - 1.4	1.5 - 2.8	2.9 - 5.7	5.8 - 11.4	11.5 +