Sugar Research Australia

Information Sheet

IS13108

Irrigation water quality

The suitability of irrigation water for long term use is determined by the quality of the water. All irrigation water contains salts, some which are harmful (sodium, bicarbonate) and some which improve soil structure (calcium). Over time, soils will take on the chemical properties of the irrigation water used on them. Thus without proper leaching, saline soils will result from the use of saline water. Water with a high sodicity hazard will produce sodic soils.

The four components of water quality are:

- Salinity.
- Sodicity hazard comprised of sodium adsorption ratio (SAR) and residual alkali (RA).
- The presence of toxic ions.
- The presence of materials that may clog or corrode irrigation systems.

Salinity

Salinity is the total quantity of dissolved salts in the water and is measured by electrical conductivity (EC). The greater the concentration of salts, the higher the electrical conductivity of the water.

Using water with a high EC causes a build-up of salts in the root zone. Salinity in the soil induces water stress within the plant which causes wilting, scorching of the leaves and restrictions to growth.

Sodicity hazard

The *sodium adsorption ratio* (SAR) of water is a prediction of how that water will affect the sodicity of the soil. When high SAR water is used the sodicity (ESP) of the soil will increase. Sodic soils disperse, and are consequently difficult to cultivate and irrigate and have poor infiltration and drainage properties.

Residual alkali (RA) represents the amount of sodium bicarbonate and sodium carbonate in the water, and is another property of water that influences soil sodicity. These salts remove calcium and magnesium from the soil and replace them with sodium, thereby increasing sodicity of the soil.

Toxic ions

Excessive amounts of chlorine, sodium, boron, lithium and other elements may be toxic to some crops. Such toxicity is rarely a problem with sugarcane.

Potential clogging or corrosive materials

The presence of iron, clay or calcium carbonate can cause blockages and shorten the effective life of trickle or spray irrigation systems.

The most important characteristic influencing corrosion rate is pH. Acidic waters with a high proportion of chloride ions are the most corrosive.

Soil dispersion risk

Salinity and sodicity affect the way soil particles aggregate. Sodic soils with low levels of salinity are the most likely to disperse and become difficult to irrigate and work. Saline sodic soils have good structure but the salinity causes other problems with water uptake.

The dispersion risk is determined by the EC and SAR of the irrigation water (Table 1).

Water quality types

Irrigation water is classified into seven types depending on the EC and RA levels. The type of water will determine its suitability for irrigation (Table 2).

EC, SAR and soil dispersion risk					
SAR	EC (dS/m)				
	0 - 0.3	0.3 - 0.9	0.9 - 1.8	1.8 - 2.8	Above 2.8
1 - 10	High	Medium	Low	Low	Low
10 - 18	High	High	Medium	Low-Medium	Low
18 - 26	High	High	High	Medium	Low
Above 26	High	High	High	High	Low

Table 1 (above): Soil dispersion risk.

Table 2 (below): Water quality types.

Water type	Description	Quality	Corrective Measures
Type 1 **Low salinity water** EC: 0 - 0.6 dS/m RA: 0 - 0.2 meq/L	Some light textured soils will disperse and form a slurry preventing adequate water penetration	Poor on light soils	Irrigation waters may be mixed or treat the soil with gypsum or burnt lime
Type 2 **Low salinity water with dispersion hazard** EC: 0 - 0.6 dS/m RA: 0.2 - 2.4 meq/L	Residual alkali in this water increases the penetration problem on light textured soils	Poor on light soils	Irrigation waters may be mixed or treat the soil with gypsum or burnt lime
Type 3 **Average salinity water** EC 0.6 - 1.5 dS/m RA 0 - 0.6 meq/L	This water can be used on all soil types without penetration problems or salt build-up	Good	None required
Type 4 **Average salinity water with dispersion hazard** EC: 0.6 - 1.5 dS/m RA: 0.6 - 2.4 meq/L	Moderate levels of soluble salts allow adequate water penetration. If RA is high poor penetration can result	Good – fair	Light soils may need to be treated as for Type 1 or 2
Type 5 **High salinity water** EC: 1.5 - 2.2 dS/m RA: 0 - 2.4 meq/L	This water can cause a build-up of salts in the root zone, especially on heavy textured soils	Fair – poor	Ensure irrigation is heavy enough to prevent salt accumulation in the soil Deep rip
Type 6 **Very high salinity water** EC: 2.2 - 3.2 dS/m RA: 0 - 2.4 meq/L	Can only be used on freely draining soil and should only be used in extreme circumstances	Very poor	Use on sandy soils only Wet soil to a depth of at least one metre
Type 7 **Unsuitable for irrigation** EC: greater than 3.2 dS/m or RA: greater than 2.4 meq/L		Extremely poor	**DO NOT USE**