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WHAT IS IN YOUR IRRIGATION WATER

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Almost everything is to some degree dissolved by water, so as the relatively pure water of falling rain and melting snow makes its way off the hills, and down the stream beds or through underground channels, it picks up minerals of many kinds. Most of these minerals are salts. The salt best known to most of us is common table salt. Also present in most well water are large amounts of gypsum.

Of what concern are the salts in irrigation water to a farmer? We know that rain water which is free of salts is excellent irrigation water. We know that sea water which is about 3% salts of many kinds will kill common plants. Irrigation water is somewhere between these two extremes, and the closer it is to rain water the better.

Why are salts harmful to plants? We do not think of these salts as poisonous, because they are present and even necessary in small quantities in all living things. The water in a living plant may be called sap. Sap has a certain degree of saltiness. It is the salty nature of sap that draws moisture from soil into the roots. When two solutions of salt are separated by a thin membrane such as the skin of the root hair, water moves through the membrane from the weaker solution into the stronger solution of sap in a root. Sap can become only so salty in a living plant. When the saltiness of soil moisture exceeds the saltiness of sap in a plant's roots, the plant cannot take water from the soil, and it dies for want of water although its roots are in moist soil.

Soil having too much salt is commonly called alkali soil. This is a poor name for it because the word alkali makes us think of an alkaline reaction. Saline is a better name for a soil with too much salt because a saline soil may be nearly neutral.

A poor quality of irrigation water may develop a saline soil if its poor quality is due to excessive salts. With each irrigation, salts are added to the soil. Between irrigations, water is removed by evaporation from the soil surface and from greater depths by plant roots. Except for a small amount removed by plants, the salts remain in the soil. Each irrigation adds more salts.

If water is high in sodium as compared with calcium, more goes on than just the addition of salts. Sodium replaces calcium on clay particles. When clay particles are loaded with calcium, they tend to form groups or microscopic clods. Between these microscopic clods are spaces through which air and water move freely. When sodium replaces the calcium on these clay particles, the microscopic clods fall apart. The clay particles are then unorganized, and they drift into spaces between larger particles of soil, filling these spaces and blocking the passage of water and air. These sodium loaded clay particles also act as a cement, making the soil sticky when wet and hard when dry.

Most farmers have no choice but to use the water that is available. Much of it is not of good quality. The problem is how to make the best use of poor quality irrigation water. Salts left in a soil by irrigation water must be removed. Where water quality is good, and winter rains wet the soil to a depth well below the root zone, all is well. The small amount of salt left by the irrigation water is leached out. When water leaves a large accumulation of salt in the soil, leaching is necessary. The same poor quality irrigation water that caused the trouble will serve to wash excessive salts out of the soil. Leaching may be accomplished either by putting on a small excess of water with each irrigation or by an occasional heavy irrigation using two or three times the usual amount.

Leaching alone is not enough where water is high in sodium. Calcium of the clay, replaced by sodium, is leached out of the soil leaving sodium attached. Furthermore, leaching of a soil with a high sodium water is difficult because water moves through it so slowly. High sodium water can be improved by adding gypsum to the water before it reaches the soil. A similar effect can be had by adding gypsum to the soil before using high sodium water.

A small amount of boron may make a water unsuitable for irrigation. Boron is the main constituent of borax; it is essential for plant growth but toxic when present in amounts greater than a few parts per million. The only things a farmer can do with irrigation water having too much boron is to dilute it with water relatively free of boron and use it on boron tolerant crops. Some crops can stand four times the amount of boron that would harm sensitive plants, such as citrus or avocado.

Avocados are among the most sensitive of crops to boron and salt in the soil. Boron symptoms are difficult to describe, but salt injury is easily recognized by fading and then burning of the leaf tips. Water with more than 0.5 parts per million of boron or a conductance of over 200 is not recommended for avocados.

What do you know about the quality of your irrigation water? Commercial agricultural laboratories analyze and appraise irrigation water. If you have an analysis report for the water you are using, your farm advisors can advise you of its quality and limitations and suggest how to make the best use of it.