

## **How are salts harmful to plants?**

Most of us think of only table salt, but salts in irrigation and soil water that we use for our plants are in fact formed from many minerals. These minerals come mostly from the weathering of rocks and soils, dissolved over millions of years. Salts can also come from water tables, sea water intrusion, fertilizers and soil amendments such as gypsum and lime.

Just having salts in the irrigation water is not in itself immediately harmful to plants. The salts are harmful when they reach a concentration too high for the optimum of plant growth and yield. It is important to know what this means, since a plant which is not growing at its optimum often has no visible symptoms other than it is growing and producing less than it should.

Excess concentrations of salts dissolved in soil water are harmful to the plant in two ways. One way is by osmotic influences and the other by specific ion toxicities.

We all learned in high school the process of osmosis, where a solvent (in this case water) flows through a semi-permeable membrane into an area of higher solute concentration. Since the cells in plant roots generally have a higher concentration of solutes (solute being the sugars and organic compounds that the cells carry) than the surrounding soil water, water flows through the semi-permeable cell walls and into the root cells, and the plant takes up water. However, as the salt concentration soil rises, this difference is reduced, and water does not flow as freely into the cells. The plant can compensate by synthesizing organic compounds such as sugars and organic acids, or accumulating salts to raise the concentration between inside and outside. This costs energy, with the result being a plant which is growing and producing at less than the optimum because of this diversion of resources.

Another way salts in the soil water can affect the growth of plants is by specific ion toxicities. Ions are atoms or groups of atoms with a net positive or negative charge. Ions of soil minerals which make up salts, such as chlorine, boron, and sodium, are absorbed by the plant roots and accumulate in the plant stem and leaves over time. These accumulated ions can become toxic to plants, and ions such as boron can be toxic to plants even at low concentrations. Symptoms of ion toxicity can vary by crop tolerance and stage of growth, but oftentimes ion toxicity will manifest itself as “leaf burning” at the leaf edges, especially on the older leaves.

The above has been a brief guide to why salts can be harmful to plants. Please contact Mark Bolda at UCCE Santa Cruz if you have more questions on this topic or any other topics concerning blackberry, raspberry or strawberry production.