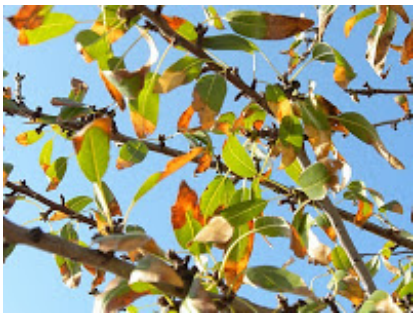
Salt Burn and Stunted Growth – How Almonds Respond to Saline Conditions

Posted by David Doll / September 06, 2010 / Posted in Almond / 6 Comments



Some areas of California are prone to salt damage. Within Merced County, common salt affected areas include the Livingston/Atwater/Hilmar area. The soils in these areas are coarse (Sand to Loamy Sand) and, when irrigated with well water, accumulate high levels of sodium. In other places of California, which include areas of the San Joaquin Valley and Lower Sacramento Valley, sodium, chloride, and boron can be problematic.

Salt burn is typically identified by tissue analysis. This analysis can be through visual or analytical observations. Leaf sampling in Mid-July can be compared to UC critical values to determine the relative level of salt. Severe salt burn appears late in the summer, with leaf tips burning back. Trees severely affected can look golden in appearance and, in some cases, lose their leaves. Once salt burn is visually observed in the tree, considerable crop loss has already occurred. Annual leaf sampling can help determine if salt levels are increasing and if salt reduction strategies are needed (leaching, buffering water, etc.).

Salts dissolved in the soil water reduce growth and yield by osmotic or toxic effects. Osmotic effects are the processes that most commonly reduce growth and yield. Within a root zone unaffected by high levels of salt, the concentration of ions are higher within the root than in the soil. Through the process of osmosis, water moves from the soil into the plant. As the salinity of the soil increases, the difference between the concentration of ions between the plant and soil decreases, slowing the rate of water movement by osmosis, making water less available to the plant. To prevent this from occurring, the plant responds by making more sugars or organic acids or accumulating salts, raising the concentration of salts in the root. These processes use energy that could of been directed to the crop, reducing growth and yield, but otherwise yielding a plant that appears healthy.

Toxic effects of salts are more noticed because of the visibility of the occurrence through scorched leaves. This occurs when salts within the soil water are absorbed by the roots and accumulate within the plant's leaves. The concentration of the salt continues to increase and eventually becomes toxic, resulting in tissue death of leaf tips and margins. Salt burn can also occur when water high in salts is sprayed onto the leaves In these cases, the salt is absorbed into

the leaf through the surface, and accumulates to a toxic level within the plant cells.

Almonds planted on soils affected by sodium, chloride, and boron tend to have stunted growth and late season leaf burn. These conditions negatively affect yields, thus making the application of salinity management practices necessary. The next few entries will focus on strategies to help reduce salt and discuss the genetic tolerance of salts amongst rootstocks.

Reference: Gratton, Stephen. 1993. “How Plants Respond to Salts.” Agricultural Salinity and Drainage. Pgs 3-4.University of California Irrigation Program, University of California, Davis.

About David Doll

David Doll is a University of California Cooperative Extension nut crop pomology farm advisor for Merced County.