University of California Cooperative Extension • Tulare County

Citrus Notes

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Irrigation Start-Up

Increasing temperatures in the spring raises the question as to when to begin the irrigation season. Fortunately, winter rains have often replenished moisture in the soil profile, so there is not an immediate need to start up the irrigation system. Applying the first irrigation while the soil is at or near saturation, runs the risk of damaging roots. This allows time to make some observations on the moisture status in the profile. Use of an auger or soil tube to sample soil moisture at several locations and at several depths (6, 12, 18, 24 inches) provides a picture of how much moisture is present. Most of the roots are often present in the 0-24 inch depth. Different soil types (sand, sandy loam, clay) with varying levels of moisture will behave differently when a sample is kneaded in the hand. A description of the method of estimating soil moisture is available in a one-sheet answer at the Cooperative Extension office. Being familiar with these behaviors allows one to draw a sample and get an idea as to whether the soil is at saturation (water is draining from the soil) at field capacity (maximum moisture the soil will hold after an irrigation) or after fifty percent of the moisture present at field capacity has been used. The goal would be to start the irrigation season with the rootzone at field capacity and not overly dry with the tree in stress or saturated and at risk of root damage from the first irrigation. Water use by the trees will be from shallow depths. Initial irrigations replenishing moisture at this depth only will avoid adding moisture to deeper possibly saturated zones with the risk of root damage.

Chlorosis

Winter temperatures frequently result in tree canopies taking on a yellow color often referred to as winter chlorosis. Low soil temperatures during the winter months result in reduced root activity. This may result in a reduced assimilation of iron. A reduction in the iron level affects the production of chloropHyll. Iron is a building block of chloropHyll, the pigment which gives the green color to the tissue. With warming soil temperature in the spring, uptake of iron increases and the normal green color generally returns to the canopy. A continuing yellow cast to the foliage may be the result of a saturated soil condition which has persisted, beyond just a brief condition following an irrigation. In this case, oxygen concentration in the soil is low which reduces iron uptake by the roots. Some soils in which citrus orchards have been established over the years have lime present in surface and subsoil. Some rootstocks are less efficient in extracting iron in the presence of lime in the soil resulting in a condition referred to as lime-induced chlorosis.

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Among the commercial rootstocks, trifoliate rootstock is the most notable in this regard, followed by Troyer and Carrizo, which are related to trifoliate. If the tree roots contact lime at some point, iron assimilation by the tree may be reduced. The presence of the lime raises the pH of the soil which decreases the solubility of the iron, making the iron less available for assimilation by the roots. Carbon dioxide produced by roots during respiration reduces the pH making the zone between root and soil particle more acid increasing the solubility of iron present and more available for assimilation. The extent of the rootstock's ability influence the pH is believed to be genetically controlled. The amount and location of lime present varies with the soil. Correction of iron chlorosis in citrus has been studied for many years. Addition of iron in various forms to the soil has been studied, as well as direct injection into the tree, all with limited success. Chelated forms of iron applied to the soil have been more successful, however they are often more expensive. Application of acidifying materials which react with the lime can be helpful. This would include materials such as soil sulfur or acids such as sulfuric. Sulfur applications are slow in influencing the lime condition because of the soil mass involved in the rootzone. Acid treatments may react more rapidly with the lime but generally require additional safety precautions and equipment during application. Application of various formulations of iron to the tree has also been studied extensively, again with limited success. Some materials are taken in by the leaf tissue but are not then translocated throughout the tree.

Bicarbonate in irrigation water is a problem. Bicarbonate reacts with calcium and magnesium in the soil forming insoluble carbonates, (calcium carbonate being lime). As this happens sodium in the soil replaces the calcium and magnesium on the soil particles. Soil particles with excess sodium tend to run together. When this occurs it reduces the rate of water entering and moving through the soil profile. In this instance, the production of lime is a potential problem regarding iron deficiency and excess sodium interferes with water penetration.

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