Interpreting a Water Analysis for Orchards or Vineyards

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Summer and Fall are a good times to perform a water analysis. During summer, district water is under high demand and water tables are being drawn down. Summer is when the analysis is representative of when most water is used. It is not critical exactly when samples are taken. It is useful to take samples the same time each year so they are comparable. Conduct well water analysis every 2-3 years to determine any chemical problems that may be developing. Contact your irrigation district about what testing they do and whether any drainage water is pumped into the system upstream from where you draw out the water. You may want to do your own analysis.

Water quality problems will ultimately result in soil problems and symptoms in the crop. Tree and vine crops are usually more sensitive to the effects of salinity and toxic elements than most field crops and even some vegetable crops. Water high in calcium or with a high pH can reduce the effectiveness of pesticides and may need buffering or conditioning when mixing. Well water may also contribute significant amounts of nitrogen, and the fertilizer program must be adjusted accordingly.

The laboratory report will often include some interpretive information to assist you in reading it. You can also call the lab, ask your Pest Control Advisor, or a UC Farm Advisor for more explanation. Most UC ANR production manuals have a discussion on water quality and how to interpret the numbers.

pH This is the measure of how acidic or basic the water is. Ideally it should be near neutral (7.0) or slightly acidic (6.5 to 7.0). Within this range there will be no pH related problems with plants or with pesticide mixing. A slightly higher pH of 7.5 or even 8.0 is tolerable depending on the pH and chemistry of the soil.

EC An abbreviation for "electrical conductivity," is the main indicator of the salt content in the water. With orchards and vineyards values should be below 1.0 to avoid salt accumulation. Salts in the water can lead to salt accumulation in the root zone. Conversely, some irrigation district waters from the Sierra Nevada Mountains can have an EC so low that it can cause a permeability problem in some soils. Traditionally EC has been expressed as millimhos per centimeter (mmhos/cm). A more modern unit of measurement is deciSiemens / meter (dS/m). One mmhos/cm = one dS/m. A full discussion can be found in *Agricultural Salinity and Drainage* – ANR publication #3375, available at the **anrcatalog.ucdavis.edu** web site.

TDS Total dissolved salts is an alternative indicator of salt in the water. It is usually expressed as milligrams salt per liter (mg/L) or as parts per million (ppm). One mg/L = 1 PPM. A TDS of 640 mg/L approximately equals an EC of 1.0 dS/m more most waters.

B In some areas of the state boron can be high enough to cause toxicity in sensitive crops. In the Central Valley B toxicity is more commonly found on the west side of the Valley – especially along I-5. A value of <0.5 ppm suggests no risk, 0.5 to 3.0 suggests increasing risk, and severe toxicities can result from > 3.0 ppm.

Cl Chloride can be toxic to plants – especially fruit crops. A value of <140 ppm or < 4.0 meq/liter is desirable.

Na Sodium toxicity can develop if water has >70 ppm. Sodium, expressed as milliequivalents per liter is used in calculating the SAR.

Adj. SAR The Adjusted Sodium A**d**sorption Ratio is used to determine the potential sodium hazard of irrigation water. It is a function of the balance of sodium, calcium and magnesium in the water. SAR values >3 may cause problems over time with water infiltration and the accumulation of salt in the soil.

Bicarbonates & Carbonates Waters that are high in these can lead to plugging the drippers or micro jets and with deposits on leaves. Problems can develop with bicarbonate levels > 2 milli-equivalents/liter

N Nitrogen is usually present as nitrate (NO_3) in water. It can exist in high quantities in well water. Many labs will express it as nitrate-nitrogen. Ask the lab to also express the amount present, as pounds total N per acre-foot of water. That will make it easy to calculate how much N you are applying with each irrigation. Here are some handy conversions:
PPM nitrate x 0.61 = pounds nitrogen per acre-foot of water
PPM nitrogen x 2.72 = pounds nitrogen per acre-foot of water
PPM nitrate–nitrogen x 2.72 = pounds nitrogen per acre-foot of water
PPM nitrate x 0.226 = ppm nitrogen

More information: A good discussion can be found in Chapter 12 of Peaches, Plums & Nectarines - ANR publication # 3331; also in Chapters 5 & 26 of the Almond Production Manual - ANR publication # 3364; Chapter 15 of Raisin Production Manual – ANR publication #3393. Check your local Cooperative Extension office for availability. The almond manual may be out of print while waiting to be updated.

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