

ALMOND SALINITY HAZARD AND LEACHING REQUIREMENTS

All irrigation water contains dissolved mineral salts, but the concentration and composition of the salts vary, depending on the specific water source. Over time, salts can build up in the root zone and without removal by leaching, can reduce orchard production.

Salt accumulation poses distinct hazards to almond orchards:

- Excess total salinity creates an osmotic stress, which reduces crop production.
- An accumulation of sodium, chloride and boron can have a toxic effect.
- Increased sodium salts can decrease water infiltration rates.

Measuring total salts

Total salt content of the water used for irrigation and the salinity of the saturated soil extract is reported as electrical conductivity (EC) in units of decisiemens per meter (dS/m, which is the same as the older unit mmho/cm).

How much leaching is needed?

- An estimate of how much leaching is required for almonds can be determined by knowing the average salt content of the applied water.
- The table values below indicate the percent of seasonal applied water that needs to pass through the root zone and the additional water in inches required for water use in Zone 15 (Bakersfield to Los Banos), assuming steady state conditions and the average soil salinity at the beginning of the season is below the tolerance level for almonds of 1.5 dS/m. No leaching rainfall is assumed.

Irrigation water electrical conductivity (dS/m)	Leaching requirement % to maintain root zone salinity at 1.5 dS/m (%)	Water required in addition to crop water use in Zone 15 (inches)
0.25	3	1.8
0.50	7	3.9
0.75	11	6.4
1.00	15	9.3
1.20	19	12.0
1.50	30	21.9

Measuring salts in the root zone to determine when to leach

- Measure soil salinity at points in the root zone to get an average. An example would be a sample of each foot of depth of a 4-foot root zone. If the average soil salinity is near the tolerance level of 1.5 dS/m, leaching should be considered.
- If samples are taken at the end of the season, leaching can be accomplished in some part or in total by effective rainfall in amounts needed to fill the root zone.
- If samples are taken at the beginning of the season and salts are significantly lower than the 1.5 dS/m level, leaching can wait until after the season.
- However if salts are near 1.5 dS/m, in-season leaching using irrigation water is needed.



Toxic salt effects

In addition to the salinity or total salt effect on the orchard, certain elements such as sodium, chloride, and boron can build up in the root zone and be taken up by the tree to a toxic level, burning the leaves and reducing photosynthesis. It is important to note that there are differences in tolerances between rootstocks and varieties. Tissue analysis is the best indicator of the toxic element hazard. These specific salts can be leached — just as total salts. However, boron and sodium are more difficult to remove, especially when compared to chloride.

Salt leaching considerations

- Salinity leaching may not be needed every season. Soil and irrigation water testing will help determine when leaching is necessary or how much is needed.
- Rainfall may be adequate in reducing salts when it fills the root zone to field capacity and then provides the leaching water requirement. In areas of lower rainfall, early fall dormant irrigation can recharge the root zone and leverage the rainfall amount.
- To the extent possible, time the irrigations to leach salinity during fallow or dormant periods. This will avoid critical periods of crop growth and development when nitrogen uptake and fertilization should not be occurring.
- If salinity in the root zone is at the threshold at the start of the season, in-season leaching will be necessary to prevent yield loss.
- The use of partial coverage irrigation systems — drip and microirrigation — result in non-traditional salt buildup patterns. Typically, the salts build up on the edge of the wetted zone. Leaching with the irrigation system is not as effective as with traditional surface-applied full coverage systems.
- Irrigation to fill the root zone near the end of season to leverage any effective rainfall is a good practice. This practice tends to keep accumulated salts moving away from, rather than into the root zone.

Visit Almonds.com/Irrigation to learn more about available irrigation resources, including the Irrigation Calculator.



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