

Irrigation Management Pre and Post Harvest

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Over the years, there has been considerable interest in withholding irrigation water at certain times during crop development. The current concept is Regulated Deficit Irrigation or RDI. To be successful, an RDI strategy would need to identify specific stages of prune tree growth and crop development when moisture stress could be safely applied to achieve a beneficial effect or at the very least be tolerated by the tree. The benefits might include water/power savings, improved drying ratio, potential increases in return bloom and improved fruit quality.

Field research shows that prune trees can take some preharvest water stress without harming trees or grower returns. University of California Cooperative Extension Irrigation Specialist Dave Goldhammer (1989) experimented with cutting water off 44, 37, 30, 23, 16 and 9 days prior to harvest. Results showed soluble solids tended to be higher and dry ratios lower in the longer cutoff regimes with no differences between treatments in fruit drop or fruit size. Glenn County Farm Advisor Bill Krueger (1995) applied midseason water stress to prunes and found dry ratio was improved with mid season stress and fruit drop, count/lb., yield and fruit size were unaffected. University of California Cooperative Extension Orchard Specialist, Bruce Lampinen demonstrated MILD levels of mid season stress improved fruit set, sustained fruit size, avoided fruit cracking and increased fruit sugar content. These experimental results taken collectively have lead to a water management strategy for prunes, which gradually increases tree moisture stress as harvest approaches (figure 1).

Accurately manipulating tree stress is easier to talk about than actually achieve. Moisture stress effects occur on an orchard-to-orchard basis depending upon orchard history, soil characteristics, climate and irrigation system to name a few. One approach would be to make pre-harvest irrigation cutoff decisions based upon experience from previous growing seasons. Every year is different so repeated success is not always good using this approach. Gradually reducing applied water based upon fractions of evapotranspiration estimates for an unstressed orchard is a possibility but again levels of actual tree stress are unknown. Soil moisture measurements might work if monitoring sites accurately reflect the root zone but again offers no direct reflection of prune tree water status.

Recently, pressure chamber technology has become available to directly measure prune tree moisture stress using Midday Stem Water Potential (MSWP). Figure 1 suggests how MSWP might be utilized to make irrigation decisions. Pressure chambers used for plant based monitoring are available in various configurations and costs. If this technique interests you, check with your local Farm Advisor for more information.

When using an RDI strategy to gradually increase stress going into harvest, soil will be relatively dry after harvest. Consider a postharvest irrigation or irrigations, depending upon the system, to restore adequate soil moisture as trees approach dormancy.

Pressure Chamber Reading (- bars)	<u>DRIED PLUM</u>
0 to -2.0	
-2.0 to -4.0	
-4.0 to -6.0	<p style="text-align: center;">Not commonly observed</p>
-6.0 to -8.0	<p style="text-align: center;">Low stress, common from March to mid April under fully irrigated conditions. Ideal for maximum shoot growth.</p>
-8.0 to -10.0	<p style="text-align: center;">Suggested levels in late April through mid June. Low stress levels enabling shoot growth and fruit sizing.</p>
-10.0 to -12.0	<p style="text-align: center;">Suggested mild levels of stress during late June and July. Shoot growth slowed but fruit sizing unaffected.</p>
-12.0 to -14.0	<p style="text-align: center;">Mild to moderate stress suggested for August to achieve desirable sugar content in fruit and to reduce “dry-away” (drying costs).</p>
-14.0 to -18.0	<p style="text-align: center;">Moderate stress acceptable in September.</p>
-18.0 to -20.0	
-20 to -30	<p style="text-align: center;">Moderate to high stress levels. Most commonly observed after harvest. Generally undesirable during any stage of tree or fruit growth. Most appropriately managed with post-harvest irrigation.</p>
Below -30	<p style="text-align: center;">High stress, extensive defoliation</p>

Figure 1. A suggested strategy or game-plan for interpreting stem water potential measurements for prunes. These guidelines are tentative and subject to change as research and development with the pressure chamber and midday stem water potential progress.