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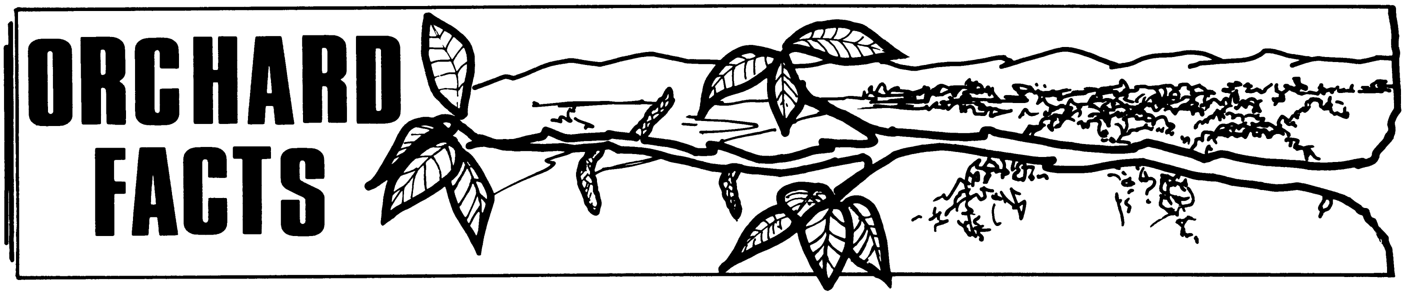

July 13, 2006
Vol.VIII, No. 4

In This Issue

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Sacramento Valley Dried Plum Newsletter

Prune Harvest Timing

Bill Krueger, UC Farm Advisor, Glenn County, and Wilbur Reil , UCFarm Advisor (Emeritus), Yolo County

The goal of harvest timing should be a smooth efficient harvest which results in the maximum possible return. Ideally, prunes would be harvested when soluble solids (sugars) have accumulated to 24% and fruit pressure has dropped to 3 or 4 lbs. Prunes will cease to accumulate dry weight at this point (Figure 1) and fruit drop will increase as the fruit softens. Any increase in soluble solids from this point on is due to dehydration of the fruit on the tree. Typically soluble solids will increase about 2% per week and fruit firmness will drop 1.5 to 2 lbs. per week prior to harvest (more rapidly with cool weather and more slowly with hot weather).

The following study was first done by Wilbur Reil, Yolo County Farm Advisor Emeritus, to demonstrate the importance of proper harvest timing. I have reworked the numbers to reflect current prices. The study uses a price of $1400 per dry ton for all sizes and 3.8 dry tons per acre at the normal (ideal) harvest time. If a premium is paid for larger sizes, the normal, late and very late fruit would have a higher return.

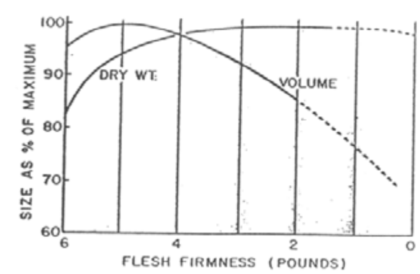

Fig. 1. Dry weight and volume of fresh French Prunes in relation to flesh firmness. (Optimum) harvest would be done when flesh firmness is 3 to 4 pounds.

Tables 1 and 2 show estimated effects of harvest timing for a crop of this size during a typical harvest season. As soluble solids increase and fruit firmness drops, fruit drop increases. Dry fruit size increases with increasing soluble solids which result in lower drying ratios. Green tonnage peaks when the fruit reach 24% soluble solids and 4 lbs. pressure and begins to decline as fruit drop increases. Dry tonnage decreases to a lesser degree because it is partially offset by a improved drying ratio. Harvest costs are reduced with later harvest due to reduced green tonnage (assuming costs are per green ton and not per acre or per tree). Total return peaks at “normal” harvest and then declines slightly with later harvests. Reduced harvest cost associated with the later harvest offset total returns to where return minus harvest and assessment costs are very similar for the three later harvests.

Table 1. Expected soluble solids, fruit firmness, percent drop, dry fruit count per pound, green fruit tonnage, fruit drying ratio and dry tonnage with different harvest timings.

	% S. S.	Fruit Firmness	% Drop	Green Ton	Drying Ratio	Dry Fruit/Lb.	Dry Ton 10% off grade
V. early	**20**	**8**	**0**	**10.4**	**3.4:1**	**69**	**2.8**
Early	**22**	**6**	**2**	**11.4**	**3.2:1**	**63**	**3.2**
Normal	**24**	**4**	**4**	**12.0**	**3.0:1**	**59**	**3.6**
Late	**25**	**3**	**14**	**10.8**	**2.8:1**	**59**	**3.4**
V. late	**26**	**2**	**24**	**9.6**	**2.7:1**	**59**	**3.2**

Table 2. Expected Effect of Harvest Timing on Grower Returns

	$ Per Ton	Total Return	Harvest Cost	Prune Board Assessment	Return Less Harvest and Assessment
Very early	**$1400**	**$3920**	**$1373**	**$62**	**$2485**
Early	**1400**	**4480**	**1505**	**70**	**2905**
Normal	**1400**	**5040**	**1584**	**79**	**3377**
Late	**1400**	**4760**	**1426**	**75**	**3259**
Very late	**1400**	**4480**	**1267**	**70**	**3143**

It will not be possible to harvest all fruit at the ideal maturity and it may be necessary to harvest some fruit before or after the ideal maturity is reached. Use fruit firmness, soluble solids and management to harvest as close to the ideal time as possible. Lighter cropped blocks may achieve good soluble solids while fruit is still greater than 4 lbs. and would be good candidates for earlier harvest. The above example indicates a harvest later than ideal would generally be better in terms of return than an early harvest. Risks of later harvest include weather events such as high winds which can increase drop, potential increased losses if Brown Rot is developing in the orchard and limited harvester and dryer capacities which can further delay harvest.

Glyphosate Resistant Ryegrass in California and Resistance Management Considerations

Joe Connell, UC Farm Advisor, Butte County

The development of herbicide resistance by weeds is not a new phenomenon. It is a naturally occurring evolutionary process that responds to the selection pressure of an herbicide. Ryegrass resistance to glyphosate in California was first observed in 1998 in rigid ryegrass (*Lolium rigidum*), a monocot weed in the Poaceae (grass) family. Although initially found infesting almond orchards in the Chico area, ryegrass is one of the most variable species in the world and as a result it can readily develop resistance. Ryegrass hybridizes freely, and today, the most common species that is resistant to glyphosate is probably Italian ryegrass (*Lolium multiflorum*). Resistance of Italian ryegrass to Group G/9 herbicides (known as glycines, inhibiting EPSP synthase) has now been documented throughout California. Greenhouse trials comparing a known susceptible ryegrass biotype with resistant ryegrass biotypes have been used to confirm glyphosate resistance. Plants taken into the greenhouse were sprayed with glyphosate, grown to seed, and successfully replanted.

Local weed scientists' estimate that Group G/9 resistant ryegrass in California infests more than 100 documented sites and that the numbers of sites are increasing. They also estimate that there are probably well over 10,000 acres infested with Group G/9 resistant ryegrass and that the area infested is increasing. In order to maintain the effectiveness of glyphosate in California, it is imperative that growers, PCAs, and others involved in weed control, work to prevent herbicide resistance. It is important to recognize when resistance is occurring and implement tactics to resolve it as soon as possible.

What is herbicide resistance?

- A select number of plants show significant re-growth following treatment at the recommended label dose and weed growth stage.
- A select number of plants completely escape the treatment, even though they were treated at the recommended label dose and time.
- Higher than label rates are needed for control.
- A shift in weed species occurs after years of treating with the same herbicide(s), even though they were controlled previously at the same recommended labeled rates.

Recommendations for herbicide resistance management:

1) Make applications at the optimum time for control (correct weed growth stage and size) using the recommended label rate for the most difficult weeds in your field.
2) Base your decisions on a field-by-field case and use a variety of effective tools available to obtain optimum weed control to minimize escapes.
3) Add ammonium sulfate, suggested on the glyphosate label, to counteract the effects of hard water.
4) Avoid using tank-mixtures that reduce the effectiveness or optimum rates of the herbicide.
5) Revisit the site 2 to 4 weeks after treatment and eliminate weeds escaping treatment.
6) Avoid using the same herbicide or herbicides with the same mode of action year after year.
7) Report any incidences of repeated non-performance to your local farm advisor, retail dealer, or chemical representative.

This article is a review of previous work by UC Weed Scientists Tom Lanini, Joe Di Tomaso, Anil Shrestha, and Kurt Hembree. For additional information regarding herbicide resistance refer to the website www.weedscience.org.

Blue Prune Drop and Leaf Scorch

Bill Krueger UC Farm Advisor, Glenn County

Blue prunes and in some cases an associated leaf scorch has been noted in many Sacramento Valley prune orchards this year. This problem typically occurs in years of cool springs followed by a rapid onset of high temperatures. Symptoms include prunes developing color prematurely, usually in June or July. Usually the more sun exposed fruit are more affected such as fruit in the top or south side of the tree. Often the sun exposed side of the fruit will be sunken or flattened. Leaf scorch may develop in leaves and twigs near the damaged fruit. When damaged leaves dry, the veins may be a darker brown than the rest of the leaf.

The problem is associated with heat stress. Under certain conditions, excessive heat results in damage to the fruit which may produce a toxin which is transported to spurs, leaves and shoots resulting in the leaf scorch symptoms.

Leaf scorch is always associated with blue prunes. It does not occur in areas of the tree where there was no fruit or on young trees without crop.

Anything which affects fruit temperature can have an effect. This could include:

1. Irrigation – Drop and particularly scorch are generally more severe on shallow soils with limited water holding capacity or in orchards which were towards the end of their irrigation cycle at the onset of heat. Adequate moisture insures maximum evapotranspiration and cooling of the plant.

2. Tree Position or Location - Leaf scorch is usually worse on border trees, or on the south side of individual trees (areas with greater sun exposure).

3. Cultural Practices - It is felt that the problem is less severe in orchards with cover corps than in clean tilled or drip irrigated orchards. Evaporation from the cover crop would be expected to contribute to cooling of the orchard.

4. Nutrition - While the problem does not appear to be directly related to potassium deficiency, anything which adversely affects tree health and condition could contribute to higher tree and fruit temperatures.

While we don't have any sure ways of preventing this problem in the future, making sure trees are healthy, vigorous and well supplied with water should help. Because the damage is caused by heat and not a disease, it should not continue to expand in the tree. Damaged wood should be pruned out during the dormant season.

Preharvest Pest Management

Franz Niederholzer, UC Farm Advisor, Sutter/Yuba Counties

While the prune orchards and crops I've seen so far look generally good, there are several hot and dusty months until harvest. This article will review the primary pest management concerns, as I see them, facing growers and PCAs before the 2006 harvest.

Spider mite damage can cost growers money**.** Spider mites feed on leaf cell contents, reducing leaf photosynthesis and potentially defoliating trees. Leaf loss before harvest can reduce fruit sugar content and "dry away" compared with fruit from healthy trees. Defoliated trees also may drop fruit early if rain occurs at or before harvest. Scaffold wood and fruit can be sunburned after defoliation. (Also, prune fruit buds for next year begin to develop in July of this year, and leaf loss may harm fruit bud development.)

Hot weather and water stressed orchards can increase the risk of spider mite "flare ups" and leaf loss. Although beneficial mites can help control spider mites, pest mite populations can increase very rapidly in hot weather (it is 105^{o}F here in Yuba City as I write this on June 23). Female spider mites feeding on water stressed trees live longer (and so lay more eggs). In addition, sulfur sprayed for rust control can harm beneficial mites and increasing the risk of spider mite flare up and leaf damage.

Weekly monitoring of known mite "hot spots" near roads or in droughty sections of the orchard for both spider and beneficial mites is essential to avoiding unexpected defoliation and loss of grower income. Early monitoring allows growers time to plan effective control and schedule the most economically efficient spray possible. Simple, 5-minute mite monitoring "how to" directions and recording sheets are available on the internet (http://ipm.ucdavis.edu/PMG/r606400411.html) or in the Integrated Prune Farming Practices (IPFP) decision guide binder at your local UCCE office. A hand lens or pair of high strength reading glasses (2.75+-3.25+) is all the equipment needed to scout for mites. Note: Potassium nitrate foliar fertilizers can control adult spider mites, but not their eggs. UC research has shown that spider mite populations can rebuild quickly to high, prespray levels within 4 weeks of a single potassium nitrate spray.

Fruit Brown Rot infections are favored by rain before harvest. Clustered fruit, and orchards with high nitrogen status (over-fertilized) are more susceptible to brown rot infections. Registered brown rot control fungicides can protect the fruit from infection, but don't stop infections once they have occurred. If rain is forecast between now and harvest, growers/PCAs must decide if a fungicide should be applied. Information on how well different fungicides work is available on the internet at http://ipm.ucdavis.edu/PDF/PMG/fungicideefficacytiming.pdf. Fungicides for brown rot control will not protect damaged fruit, and may not provide complete control under high disease pressure. Early harvest can help reduce brown rot damaged fruit in the bins at harvest, but may lower fruit "dry away" or dry weight (see article on harvest timing in this newsletter). Growers must balance the risk of income loss through brown rot damage with potential for reduced “dry away” with early harvest.

Good spray coverage is key to good disease control. Including 1-2% (1-2 gallons of oil/100 gallons of water) light summer oil with a fruit brown rot fungicide (such as Topsin-M, Rovral, and Benlate – although the latter two are no longer registered for preharvest use) improved spray coverage and disease control in studies funded by the California Dried Plum Board in the early 1990s. This work has not been repeated with the fungicides currently registered for preharvest use. However, the potential benefits of oil + fungicide (such as Orbit or Bumper) may be worth considering if a preharvest fungicide treatment is planned. Note: Oil will remove the waxy bloom from prune fruit, but oil-treated prunes will look the same as fruit not treated with oil after drying. Also, not all fungicides are compatible with oil. For example captan is incompatible with oil and should not be applied in combination, immediately before, or closely following an oil application. Thus, be sure to carefully read the label of the specific fungicide that will be applied.

Prune Rust: This leaf disease was a significant problem in south Sacramento Valley prune orchards in 2005, causing defoliation in some orchards. Orchards should be monitored weekly for rust symptoms until July 15. If no rust is seen in an orchard as of July 15, UC research suggests that rust should not be a problem before harvest. Detailed information on orchard monitoring for prune rust can be found in the IPFP decision guide binder.

Irrigation Management Pre and Post Harvest

Richard P. Buchner and Allan E. Fulton, UC Farm Advisors, Tehama County

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)	DRIED PLUM
0 to -2.0	
-2.0 to -4.0	
-4.0 to -6.0	Not commonly observed.
-6.0 to -8.0	Low stress, common from March to mid April under fully irrigated conditions. Ideal for maximum shoot growth.
-8.0 to -10.0	Suggested levels in late April through mid June. Low stress levels enabling shoot growth and fruit sizing.
-10.0 to -12.0	Suggested mild levels of stress during late June and July. Shoot growth slowed, but fruit sizing unaffected.
-12.0 to -14.0	Mild to moderate stress suggested for August to achieve desirable sugar content in fruit and to reduce "dry-away" (drying costs).
-14.0 to -18.0	Moderate stress acceptable in September.
-18.0 to -20.0	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.
-20 to -30	
Below -30	High stress, extensive defoliation.

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.

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