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ORCHARD FACTS

April 21, 2009
Vol. X, No. 2

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Sacramento Valley Prune Newsletter

Steps for Producing Large Prunes

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Early observations of prune set in the Sacramento Valley look good. Of course, it is a long time before harvest and many things can happen. With a large crop comes the potential for small fruit. Growers should talk with their handler to determine desirable fruit sizes. Most will likely say that they need pitable stock (A and B screen) and that is likely where the best money will be. What can you do to produce good size fruit?

Pruning is the first line of defense against excess cropping. Pruning can help improve fruit size, drying ratios and reduce the negative impact of excessive crops. Blocks that received a good dormant pruning will be less likely to over crop than those that did not. Keep this in mind as you watch the crop develop and make decisions to manage the crop you set.

Irrigation. Prune trees have been shown to be relatively tolerant of water stress. Moderate water stress may result in modest increases in return bloom and improved drying ratios without a reduction in yield. More severe water stress, particularly during stage II growth (early May to mid July) will reduce fruit size and this effect will be more dramatic in heavy crop years.

Potassium Nutrition. Adequate levels of potassium (K) are necessary to ensure consistent production of high quality fruit. One of the consequences of K deficiency is reduced fruit size. In the past there has been a tendency to focus on potassium to the point where K levels were sometimes excessive. In survey work done during the late 1990s, no beneficial relationship was found between fruit size, drying ratio or dry yield when spring or summer (June or mid July) leaf K levels were greater than 2%. It is important to note that K demand will be greater with larger crops and leaf levels can drop dramatically in late summer. If K levels are marginal, with a heavy crop, it may be necessary to apply foliar applications to keep trees from going deficient.

Mechanical Thinning. Thinning fruit early in the season will allow remaining prunes to grow larger, increase sugar content and improve the drying ratio. Mechanical thinning with harvest equipment is the most practical way of reducing crop load. A short description of this procedure follows. More details can be found in the May 2008 edition of this newsletter (http://ceglenn.ucdavis.edu/newsletterfiles/Orchard_Facts13993.pdf).

Experience and past production history will allow you to estimate the tonnage you can produce at the desired fruit size and determine how many fruit per tree at harvest will result in this yield. For example, 4 tons (8000 lbs) X 70 dry fruit per

pound divided by 150 trees per acre = 3733 fruit/tree at harvest. Adjust this number upward by the estimated pre harvest drop (20% is the commonly used value) to determine how many fruit should be left after thinning. Using 20% drop, 3733 divided by .8 = 4666 fruit per tree after shaking.

The earlier thinning is performed the more likely it will achieve the desired results. In early May, estimate the number of fruit per tree by shaking and or picking and weighing all the fruit on several representative trees. Weigh a representative sample (at least 100 fruit) and count the fruit to determine the count per lb. Smaller yellow fruit in the sample which are about to drop are not counted. Total weight in pounds times the fruit count per pound will estimate total fruit per tree. Subtract the desired fruit per tree from the estimated fruit per tree to determine how much to remove. Shake a tree and, using the same methodology, calculate how much fruit was removed. Adjust the shaker time and repeat the procedure until the desired amount of fruit is removed.

Irrigation with Reduced Water Supplies

Richard Buchner – UC Farm Advisor, Tehama County
Allan Fulton – UC Farm Advisor, Tehama County

Reduced water supplies represent a real challenge for irrigation managers. The traditional methods of determining when to irrigate and how much water to apply are complicated by the impacts of water stress on tree and crop performance. Ideally, prune orchards are irrigated to meet evapotranspiration (ET). If adequate irrigation water is not available, then additional management strategies are necessary. Exactly how to manage reduced water deliveries will depend upon orchard soils, root zone characteristics, canopy architecture, irrigation system and available irrigation water. Management decisions with a 10% water reduction would be drastically different than an 85 % reduction. Once all the constraints are identified, a best management plan can be designed.

When water supplies are in short supply, one of the first management steps is to make sure irrigation systems are working as designed and managed properly to apply water efficiently. Good system design and operation will minimize water losses to runoff and percolation below root zones. The second strategy is to schedule irrigations as accurately as possible. Many devices are available to monitor soil moisture. Soil augers are useful to visually evaluate soil moisture. Tensiometers and resistance blocks are available to measure soil moisture tension. Capacitance and neutron probes are available to measure soil moisture content. Capacitance and neutron probes are more technical to use and are usually supported by irrigation consultants. They may be cost prohibitive for smaller farms.

Since tree water use is largely driven by climatic conditions, weather measurements are used to calculate tree water use. Published values make it relatively easy to follow orchard water use. Plant based methods are also available with pressure chambers being the most typical technique. Pressure chambers are particularly useful if the intention is to regulate the soil moisture deficit. ET information and a discussion of monitoring devices are available at http://cetehama.ucdavis.edu. Click on Irrigation and Water Resources.

Other water saving strategies include:

1) Winter irrigation to start the season with full soil moisture (the timeliness of this practice has passed for the 2009 season).
2) Manage vegetation to conserve soil moisture.
3) Avoid runoff, deep percolation and drift/evaporation from sprinklers.
4) Apply water only to tree root systems (particularly important with developing orchards).
5) Longer set times to infiltrate water deeper into the root zone and lessen surface evaporation. This practice needs to be balanced with preventing runoff.
6) Use practices that favor water infiltration, not evaporation (i.e., in some situations water amendments may improve water infiltration).

There is not a great deal of research experience to clearly understand the effects of water stress on prune production. The challenge is to allow moisture stress at a time when the tree and developing crop might tolerate water stress with the least negative impact.
Prune fruits continue to increase in size from bloom to about early August. Significant stress during that time period has

been shown to reduce fruit size. If early season water stress is unavoidable, reducing the crop load might compensate for fruit size resulting from water stress. Moisture stress applied in early summer could impact flower bud development and may reduce shoot growth.

Prune trees probably have the best chance of tolerating moisture stress just prior to and after harvest. If there is not enough irrigation water available to avoid moisture stress, one option would be to manage irrigation so that prune tree stress gradually increases mid July to early August prior to harvest. After harvest, irrigate to recover the tree to modest stress level and then continue to withhold water until the end of the growing season. This approach might save several mid to late season irrigations and research suggests lower dry ratios while minimizing negative effects on the crop

If water availability is reduced drastically, acquiring additional water supplies by developing groundwater or by other means may become necessary. If an orchard is in a situation where acquiring reliable, sufficient supplies of water over the long term is questionable, the appropriateness of producing a permanent crop may need to be reconsidered.

Prune Aphids in Spring/Summer

Joe Connell, UC Farm Advisor, Butte County

If fall or dormant aphid treatments were not applied and you've had aphids before, it will probably be easy to find them in your orchard about now. Leaf curl plum aphid starts out just after leaf out and should have active parasites working on it by this time. Look for aphid mummies, enlarged brown aphid bodies which may have parasite exit holes to indicate parasite activity. The parasites frequently control the aphids if they're not disrupted. Many of these parasites are the result of releases made by the University of California in the late 1990s during the prune pest management alliance project. In spring, populations rapidly build up on new foliage, causing affected spurs to develop tightly curled leaves. In May, the aphids migrate from the orchard to alternate summer host plants. If this is the only aphid you have you may not need to do anything at this time.

Mealy plum aphid can also be active now and if feeding is heavy it can devitalize the tree and contribute to fruit cracking when honeydew accumulates. Wingless mealy plum aphid adults are pale green or whitish green with three dark green, longitudinal stripes on their backs. Their bodies are covered with a white mealy wax. They can have 3 to 13 generations on prunes in one season. The winged form has a dark thorax and transverse bands on the abdomen. The winged adults appear in June and July as warm weather approaches, and they migrate to reed grass or cattails. Wingless aphids that remain on vigorous growth of trees throughout the summer secrete large amounts of honeydew. Tree growth and fruit sugar content can both be reduced by populations of this aphid.

Monitoring for aphids

Monitor trees at the outside edge of the orchard or in known or potential "aphid hot spots." Potential hot spots for aphid infestation are areas of the orchard that have windbreaks or adjacent areas of natural vegetation. Begin monitoring weekly at petal fall. Aphid populations can build up quickly in the spring. It is important to monitor at least once a week. Spend 10 minutes (about 15 seconds per tree) searching 40 whole trees. Look for the presence or absence of aphids and rate the population as significant or not. If aphids (either species) occupy 10% or more of the tree's leaf surface as determined by the visual search, the population is significant and a treatment is required if more than 12 of the 40 trees have a significant population. If you think your orchard may require control, then visit the IPM webpage for more details on monitoring and treatment threshold guidelines (www.ipm.ucdavis.edu). Following the IPM guidelines, spring treatments are effective and may be applied if necessary.

Biological control

There are many natural enemies that feed on leaf curl and mealy plum aphids; however, fruit size may still be reduced and curled leaves will not uncurl even after aphids are suppressed. The recent introductions of *Aphidius colemani* has led to substantial levels of parasitism of the leaf curl plum aphid. Other important predators include lady beetles, green lacewings, brown lacewings, syrphid flies, and soldier beetles.

Making Money Growing Prunes in 2009

Franz Niederholzer, UC Farm Advisor, Sutter/Yuba Counties

It is too early to tell if a crop is set in Sacramento Valley prune orchards, but it's not too late to plan ahead to feed and protect a good crop. If I were a grower, here's what I'd do to give myself the best possible chance of making money growing prunes in 2009.

- Don't over crop the orchard. Too much fruit on a tree loses money. Excess crop load reduces fruit sugar and increases dry away. The risk of branch dieback from potassium deficiency increases with crop load. Too much fruit weakens the tree. Weak trees risk a light crop next year. Strip and count fruit per tree in late April/early May to measure crop load. Shaker thin, if needed, to remove excess fruit.

- Irrigate as needed. Fruit end-cracking occurs when water stressed trees are irrigated. The risk of end cracking is highest in May, June, and early July. To avoid end cracking, irrigate to meet tree water needs at least through the end of June. Test soil moisture to find out if the orchard soil is drying out, or use the "pressure bomb" to determine tree water status. To save drying costs (improve dry away) cut off water as early as possible before harvest. Cutoff date in your orchard will depend on soil conditions and irrigation system.

- Fertilize to feed the crop and keep leaves on the tree. Prune trees need potassium (potash) and nitrogen fertilizer to feed a good crop. The more fruit, the more fertilizer needed. Potassium nitrate sprays help avoid potassium deficiency. Prune trees need around 100 pounds of actual nitrogen per acre per good crop year. In a light crop year, you might get away with applying no nitrogen. However, be careful. Low nitrogen orchards are more vulnerable to bacterial canker infection. A foliar zinc spray may be needed every-other year or every year. Take a leaf sample in July to see how well your fertilizer program is working.

- Manage pests. Keep leaves on the tree to grow the sweetest, biggest fruit possible.

- Prune rust can defoliate trees resulting in less fruit sugar and reduced dried fruit size. Look for prune rust spots once every week beginning May 1. Spray sulfur when the first rust spot is found. Repeat sulfur application if more spots are found. Don't apply sulfur if rust is not found in the orchard. [Sulfur can harm "good" mites that eat spider mites.]

- Spider mites can also defoliate trees and reduce fruit sugar levels. Spider mite numbers can double in one week of 100^{o}F weather. Look for spider mites once a week in the orchard beginning June 1. [Start scouting earlier if it is a dry spring.] Treat if a significant number of spider mites are found and mite predators are absent.

- Fruit brown rot can damage fruit as harvest approaches. A fungicide spray can help control fruit brown rot. Spray fungicide 1-2 weeks before harvest if wet weather is forecast or orchard has a history of fruit brown rot problems.

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Contact your local UC Farm Advisor for more information on these topics. Rust and mite scouting practices are described in detail in the Integrated Prune Farming Practices (IPFP) decision binder available from your local UC Cooperative Extension office for just over $30.

Temperatures 30 Days After Bloom May Influence Fruit Size

Carolyn DeBuse, UCCE Farm Advisor, Solano/Yolo and Ted DeJong, Plant Sciences Dept., UC Davis

Relatively high spring temperatures in the Sacramento Valley have become a normal occurrence over the last few years. Exactly what prune growth and developmental processes this heat is effecting is an ongoing question. We know that bloom temperatures over 75°F decrease fruit set, reducing yields in some years. We have also looked at how the growing degree hours accumulated in the first 30 days after bloom (GDH30) can be used to estimate harvest timing for peaches, plums, and prunes. There is new evidence for peaches that GDH30 may also influence the final fruit size.

Peach final fruit size related to GDH 30

Fruit size is dependent on genetic potential of the cultivar, length of time for fruit growth, and temperature. Length of the growth period is dependent on temperature during that time. Temperature can be quantified by calculating growing degree hours. The relationship between fruit size and temperature has been modeled for an early-maturing peach (Spring Lady) versus a late-maturing peach (Cal Red) using three years of data. The three years used for modeling have very different GDH30 accumulations. 1990 was a so called average spring with 5400 GDH30, 2004 was a warm spring with 8500 GDH30 and 2006 was a cool spring with 3000 GDH30.

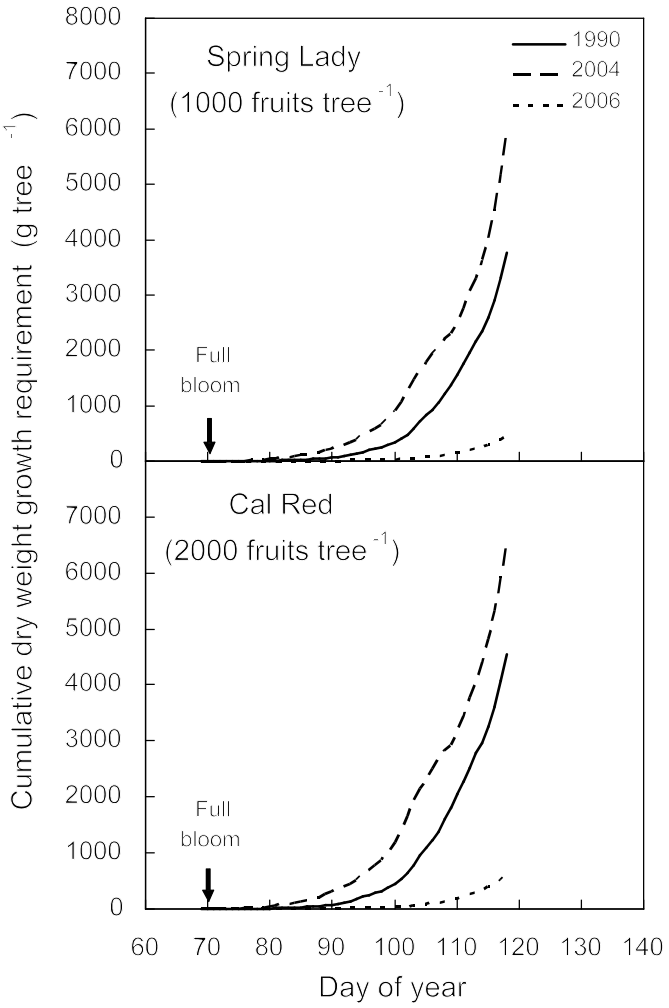

Fig 1. Simulated potential cumulative dry weight growth requirements per tree of early-maturing (Spring Lady), and late-maturing (Cal Red) peaches during three growing seasons with contrasting early spring temperatures.

Comparing relative fruit growth rate and the GDH30 relationship to fruit development, spring temperatures were shown to influence fruit size in two ways. The first was to change the length of time of the total fruit development period. In warm spring years, the development period was decreased by a number of days. This shortening of days until harvest also reduced the total heat that the fruit was exposed to. The second, and maybe more important, was that the difference in the demand of the fruit for carbohydrates was affected by temperature. In years with warm spring temperatures in the 20 to 30 days after bloom period the fruit required 5 to 10 times more carbohydrates for growth compared to cool springs. To reach full potential fruit size after a warm spring the tree requires more carbohydrates at an early time in the season at a faster rate. Figure 1 shows a steep rapid increase in the carbohydrate requirement for year 2004, the year with the warmer spring, compared to a much slower requirement rate in the 2006 cool spring year. This increased carbohydrate demand occurs during a time of year when trees are leafing out and the crop is unthinned. Basically, a bottleneck occurs between carbohydrate availability and demand. In a warm spring young fruit will be in heavy competition with other fruit and emerging leaves for stored carbohydrate reserves. If actual growth does not accompany growth potential over a given time period, then growth potential is permanently lost and cannot be made up over the season. This early fruit size reduction influences the subsequent growth of the fruit because growth is a function of fruit size at the beginning of a growth interval. Similar to compounding interest in an investment account, a reduction in the initial investment will reduce the long-term ability for the investment to grow over time.

What this may mean for final fruit size in prunes

Prunes are comparable to peaches in that they are stone fruits and have similar fruit growth rates. Both should demonstrate similar influence of genetic size potential, spring temperatures, and length of time to final fruit size. Yet prunes differ because they are not thinned to the low crop levels typical for peaches. Heavy prune crop load is correlated to smaller fruit size independent of spring temperatures. The lesson learned from peaches is, in a warm spring with a high GDH30, developing fruit will be in competition for carbohydrates as they rapidly grow. If potential fruit size is important, than thinning early may reduce some of that inter-fruit competition.

Bottom Line:

1) In a warm spring, thin prunes early and try to reduce the crop load significantly if there has been a heavy set.
2) In a cool spring, prunes can be thinned at a later date and a larger crop load can be left on the tree. The longer growing season in a cooler year will allow the tree to size a larger crop.

GDH30 can be calculated by going to the UC Fruit & Nut Research and Information Center web site (http://fruitsandnuts.ucdavis.edu). Select 'Weather Services,' then 'Harvest Prediction Model.' Select the location of the nearest California Irrigation Management Information System (CIMIS) weather station (click directly on the weather station location, not the county) and enter the date of full bloom. The table shows the accumulated GDH during the first 30 days after bloom.

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