HEALTHY FOOD SYSTEMS • HEALTHY ENVIRONMENTS • HEALTHY COMMUNITIES • HEALTHY CALIFORNIANS

University of California
Agriculture and Natural Resources
Making a Difference for California

Sacramento Valley Prune News

Spring, 2019

In This Issue

Luke Milliron
UCCE Farm Advisor Butte, Tehama, Glenn Counties

With special thanks to **Barbara Bechtel** Office Specialist Butte County

Butte County Newsletters are Going Online!!!

Sign-up today for full color, full content, and immediate newsletters and other updates delivered to your e-mail! New issues can be e-mailed to you, and old issues will be archived at ucanr.edu/buttenews

Starting January of 2020, we will no longer be mailing hard copy newsletters, unless you make a special request by calling the office at (530) 538-7201 (note: substantial delivery delay, limited content, and no color).

ucanr.edu/ButteGoesOnline

2019 IPM Breakfast Meetings

Join Area IPM and Farm Advisors to discuss current pest management and production issues. We will largely focus on orchard crops (but everything is on the table for discussion!). These meetings are open to all interested growers, consultants, PCAs, CCAs, and related industry.

Meetings will be held the **second** Friday of each month (8:00-9:30am ***note new start time***) from March through October and will cover a wide range of timely pest and orchard management topics. Meeting locations will be rotated throughout the Sacramento Valley each month. Please contact Emily Symmes to request topics or bring your questions to the meeting!

2019 meeting dates:

- June 14th, 2019 (Glenn County): Location TBA
- July 12th, 2019 (Butte County): Location TBA
- August 9th, 2019 (Yuba-Sutter-Colusa Counties): Location TBA
- September 13th, 2019 (Tehama County): Rockin' R Restaurant, Red Bluff
- October 11th, 2019 (Glenn County): Berry Patch Restaurant, Orland

Additional details will be posted on the events page at sacvalleyorchards.com

RSVPs required at (530) 538-7201 or ejsymmes@ucanr.edu

DPR and CCA Continuing Education hours requested

Industry Partners: Sponsorships for venue and refreshment costs are welcome and appreciated. If you would like to sponsor one or more of these meetings, please contact Emily Symmes to inquire.

Cooperative Extension Butte County ♦ 2279-B Del Oro Avenue Oroville, CA 95965 Office (530) 538-7201 ♦ Fax (530) 538-7140 ♦ cebutte.ucanr.edu/

Prune Management Considerations: Spring -- Summer

Franz Niederholzer, UCCE Farm Advisor, Colusa, Sutter and Yuba Counties
Emily J. Symmes, UCCE Area IPM Advisor, Sacramento Valley
Luke Milliron, UCCE Farm Advisor, Butte, Glenn and Tehama Counties

APRIL – MAY

Crop/cropload

- **Got a crop?** Check crop load in late April or early May and decide whether to shaker thin. See article in this newsletter for more information.
- **Late Harvest?** Late bloom plus the cool April weather in the forecast could make for a later-than-normal harvest. UC has developed a prediction model that uses heat units (**G**rowing **D**egree **H**ours) in the first 30 days after full bloom to predict the number of days between full bloom and fruit maturity. Check out the model by visiting fruitsandnuts.ucdavis.edu/Weather_Services and clicking on "Harvest Prediction Model" for peaches, plums and nectarines. If prune harvest is late, custom harvester availability could be an issue.

Nutrition

- Plan fertilizer applications for the season based on crop load. Nitrogen applications should favor April-June to support fruit and shoot/spur growth. Prunes use 12-13 lbs N per ton of dried fruit. Vegetative growth N needs for prune are not known, but should be in the range of 30 lbs N/acre. Shoot extension growth is usually finished by June 1. If no fall potassium (K) was applied to the soil, inject K with irrigation water in equal amounts from April through July. If the ground is still wet once you can see a crop is set (mid-late April), consider applying some dry fertilizer (ammonium sulfate, urea, etc.) ahead of forecast rain to get N to the trees early in the growing season. See sacvalleyorchards.com/prunes/horticulture-prunes/prune-orchard-nutrition-thoughts-for-2017/ for more details on estimating amount and timing of nutrient demand.

Irrigation

- Plan initiation of irrigation based on soil moisture monitoring, an evapotranspiration (ETc) water budget, and/or stem water potential (pressure bomb readings). Wet spring should mean later timing for first irrigation. Pressure bomb readings are the most direct measure of when irrigation is needed. Recent research in walnuts has shown that waiting until stem water potential indicates at least mild water stress (-2 bars below baseline) can both save water and possibly promote a healthier and more robust root system.
  For more information see: sacvalleyorchards.com/almonds/irrigation/early-season-irrigation-do-we-know-when-to-start/

Insects & Mites: *With rainfall limiting orchard access this winter, pay close attention to potential spring and summer applications (especially for aphids, scale, and worms) if dormant treatments were not applied.*

- Monitor orchards for aphids this spring and summer to determine whether applications are needed. More information on spring monitoring (with video demonstration) is available at ipm.ucanr.edu/PMG/r611900811.html.
- Monitor San Jose scale (SJS) for crawler treatment timing. If fruit check last harvest or dormant monitoring indicated economically-damaging levels of SJS, AND dormant applications were not applied, consider treating the spring crawlers. If adult San Jose scales were caught in pheromone traps this year, treatments at 600 to 700 degree-days from first trap catch are effective at targeting the crawler stage. Alternatively, limbs can be wrapped with double-sided sticky tape to monitor crawler emergence and time treatments accordingly. Check with your PCA regarding materials and rates. Insect Growth Regulators (Esteem®, Sieze® or Centaur®) control scale without harming many beneficial insects and/or mites that help control spider mites and other pests.
- Peach twig borer (PTB) and obliquebanded leafroller (OBLR) pheromone traps should have been placed in prunes by early April in the Sacramento Valley. For both pests, set your biofix when moths are consistently caught in traps on two consecutive checks, and begin accumulating degree days (DD). Fruit sampling to determine if a treatment needed should begin when 400 DD (PTB) or 930 DD (OBLR) have accumulated from the biofix. More information on fruit sampling below.
  PTB/leafroller fruit feeding sites are entry points for brown rot. Controlling these worms is an important part of a good fruit brown rot management program.

Diseases

- Stay ahead of brown rot. Research indicates that latent brown rot infections can occur around pit hardening (early May this year?). Latent infections can become full blown brown rot infections as fruit "sugars up". To minimize this risk, consider a fungicide application, especially if rain continues into May.
- Monitor for rust by looking for bright, angular spots on leaves. Check low branches, replants, vigorous growth, and previous hot spots. Spray when the first rust spot is found.
- Dead limbs are apparent after leaf-out. Once the bulk of spring rains have passed, prune out branches that are dead or damaged by *Cytospora*. Cut several inches below canker margins to remove all of the infected tissue. If there is rain in the forecast (within the next two weeks), wait to prune. Spores from dead wood become airborne, so make sure to remove prunings and dead wood from the orchard. Cleaning up dead limbs/branches in an orchard also helps make harvest run more smoothly.

Weeds

- Tall weeds can interfere with harvester clamp seal as well as using water and nutrients that the crop needs. Survey weeds after summer annuals have germinated to identify 'the ones that got away' and how future weed management could be improved. A weed survey sheet and weed ID photos can be found at ipm.ucanr.edu/PMG/C606/m606fcweeds.html.

JUNE

- Continue monitoring for aphids and rust.
- PTB and OBLR: Begin scouting for PTB and OBLR at 400 and 930 DD from biofix, respectively. Visual inspections of fruit for larvae or damage will indicate whether treatments may be warranted (ideally 1,200 total; 15 fruit each from 80 trees). Pay particular attention to leafrolls, fruit-to-fruit, and fruit-to-leaf contact points. UC IPM suggests a treatment threshold of greater than 2% of fruit with larvae and/or damage present. More information is available at ipm.ucanr.edu/PMG/r606300511.html and ipm.ucanr.edu/PMG/r606300211.html#MONITORING.
- Begin scouting for spider mites. Check two different sections of the orchard each week. Spend about five minutes in each section checking 2-3 leaves (some inside and outside of the canopy) on 10 trees. Look for spider mites and predators (predaceous mites and sixspotted thrips). Treatment decisions should be based on population levels of both mites and predators. If more than 20% of leaves have mites, but less than 50% of the leaves have predators, treat for mites. If more than 60% of leaves have mites, treat even if most leaves have predators. For more on mites, see ipm.ucanr.edu/PMG/r606400411.html.

JULY

- Continue monitoring for aphids, rust, and spider mites. Late summer (preharvest) outbreaks of rust and/or spider mites can cause leaf drop at harvest, slowing conveyor belts at harvest in order to better blow out the leaves and keep the bins clean.
- Consider preharvest treatments for brown rot according to UC IPM guidelines (link above). See timings and material efficacy at: ipm.ucanr.edu/PDF/PMG/fungicideefficacytiming.pdf
- Late bloom + cool spring = later harvest? When color just begins to show along the suture, fruit will be mature in roughly 30 days. Begin measuring fruit internal pressure once fruit shows color. Warmer weather slows fruit maturity; cooler weather = faster fruit maturity. Fruit lose 1 to 2 lbs fruit pressure per week and are mature at 3 - 4 lbs internal pressure.
  With later harvest a very real possibility this year, track fruit pressure readings to plan harvest timing and irrigation cut off. For example, if shake target is 3 lb fruit pressure and irrigation cut off is 2 weeks ahead of planned harvest, then water shut off should be getting close when fruit hits 6 lbs pressure – assuming pressure drops 1.5 lb/week.
- Take leaf samples in July to evaluate orchard nutrition status. Collect leaves from non-fruiting spurs from representative trees and submit to a lab for analysis. Leaf sampling details at: sacvalleyorchards.com/prunes/horticulture-prunes/july-leaf-sampling-a-critical-task-in-prune-production/

Samples of damaged fruit ahead of harvest will give you an indication of the efficacy of your IPM program for PTB, OBLR, San Jose Scale, and brown rot. Randomly examine 1000 fruit (40 from 25 trees) looking for larvae, worm damage, and halo spots caused by San Jose scale. More information is available at ipm.ucanr.edu/PMG/r606900711.html

The Advantages of Tighter Spacing and Greater Light Interception in California Prune Orchards

Luke Milliron, UCCE Farm Advisor, Butte, Tehama, and Glenn Counties
Franz Niederholzer, UCCE Farm Advisor, Colusa, and Sutter-Yuba Counties
Dani Lightle, UCCE Farm Advisor, Glenn, Butte, and Tehama Counties
Katherine Jarvis-Shean, UCCE Farm Advisor, Yolo, Solano, and Sacramento Counties

Increased Canopy Volume → Increased Light Interception → Increased Yield Potential

Many of California's established prune orchards are falling short of the land's yield potential. Higher yields could be achieved by capturing more light with the choice of a more vigorous rootstock, and/or planting at a closer spacing. We all know that fruit and leaves grow on branches, and that fruit need the sugar production from neighboring leaves to grow and sweeten. Thus, one way to think about the yield potential of an orchard is how many fruit-leaf groupings (also called bearing units) are spread out over the orchard. In other words, increasing the amount of space in the orchard taken up by the orchard canopy (instead of open, unused space) will increase your yield potential per acre.

One measure of canopy size is how much light that canopy intercepts. Light that is intercepted by the leafy canopy and doesn't reach the orchard floor is measured as midday photosynthetically active radiation (% PAR). Work by the laboratory of Bruce Lampinen, UCCE Orchard Specialist at UC Davis, has found that for every 1% of light that an almond orchard captures there is an average of 40 lbs/ac increased yield in all measured orchards (see figure 1). Lampinen has found this relationship between greater light capture and greater yield potential in both almond and walnut production. Light interception isn't the only determinant of yield of course, therefore these are "potential" yields and depend on proper irrigation, fertilization, pest and disease management.

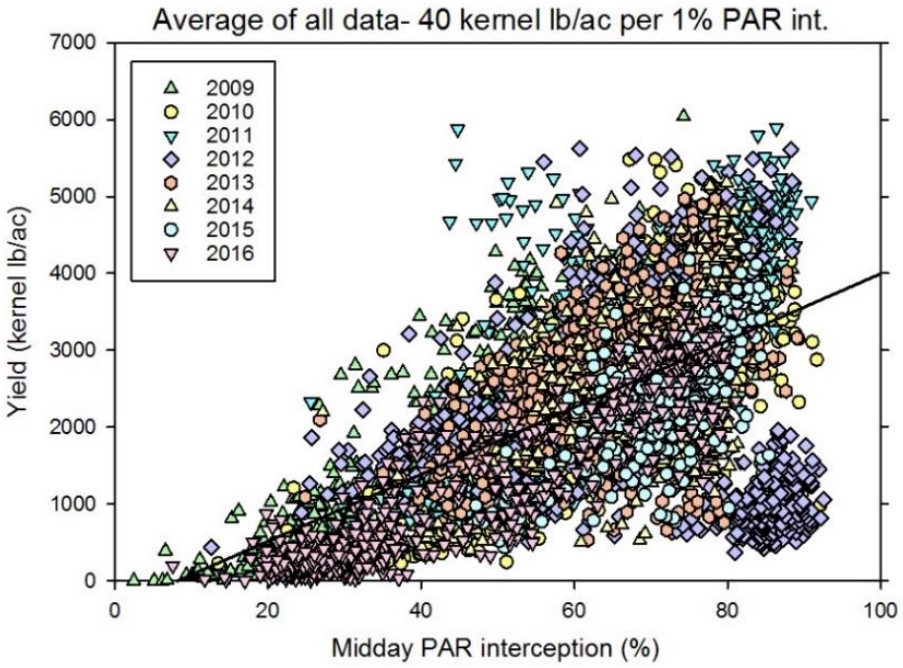

Figure 1. Measuring both almond yield (kernel lbs/ac) and midday photosynthetically active radiation (PAR) percentage have shown a direct relationship of 40 kernel lb/ac per 1% PAR (courtesy of Lampinen Lab, UC Davis).

Light Interception and Yield Potential in Prune Production

Although the relationship between canopy light interception and yield has not been as well studied in prune production, there does appear to be a clear relationship from the limited data available (see Figure 2). Although there is substantial variation, the denser 14' x 17' planting in this example is achieving between 60-80% light interception and is clearly out yielding the wider spaced plantings that are only capturing 30-45% of midday light, common in many California prune orchards. The 16 foot in-row spacings of the wider plantings appear as discrete trees (they do not touch), while the 14' x 17' spacing have created continuous hedgerows (see figure 3). This tighter 14' x 17' (183 trees/acre) spacing illustrates the 6-8 dry tons/ac yield potential of prune orchards in excellent cropping years. Industry spacing preference does appear to be moving towards higher density tree spacings; at a recent UCCE prune meeting, the top three spacing choices voted on by attendees were 14' x 18', 14' x 16', and 16' x 18'. Finally, unlike almond and walnut production, fruit size is critical to profitability in prune production and therefore the most profitable growers have a shaker thinning program in years with good set (e.g. 60 ct average of 14' x 17' orchard in figure 3).

Prune orchard spacing has historically been determined by the constraints of harvest equipment. However, some growers are instead shifting this paradigm and beginning to modify their equipment to get through tighter spacings. Many questions and potential challenges arise due to this shift in paradigm and will be addressed through experimentation by innovative growers and UC researchers.

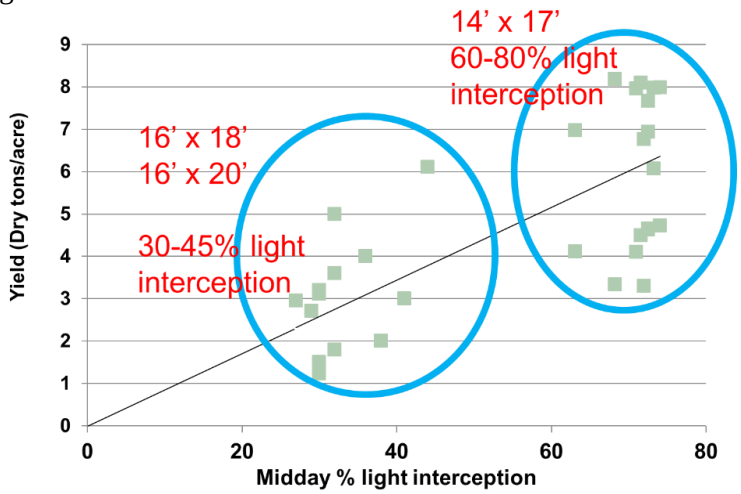

Figure 2. Two clusters of prune yield (dry tons/acre) versus midday light interception (%), grouped by row spacing (courtesy of E. Fichtner and F. Niederholzer).

Figure 3. Two orchards with contrasting spacing, light interception and yield potential (courtesy of E. Fichtner and F. Niederholzer).

Spacing/Light Interception Factors to Consider

- ✓ **Soil:** Spacing selection should always be made in the context of land capability and rootstock selection. Generally, tighter tree densities should be considered on more marginal land, tree canopies have a greater ability to "fill the space" at a slightly wider spacing on good ground.
- ✓ **Rootstock:** Matching vigor of the rootstock with soil type and spacing is a tough challenge at planting. Other considerations include anchorage, suckering, and tolerance to bacterial canker. More information on rootstock trial performance of anchorage & suckering: sacvalleyorchards.com/blog/prunes-blog/prune-rootstock-trial-performance. More information on vigor/yield and survival against bacterial canker: sacvalleyorchards.com/blog/prunes-blog/preliminary-observations-for-new-prune-rootstocks
- ✓ **Site, equipment, operation and expense:** Tighter spacings warrant careful concern regarding equipment clearance and risk of field worker injury. While wider row spacings require fewer passes per acre for insecticide and fungicide applications or harvest operations. Establishment costs such as irrigation design – length of irrigation line and risers – also increases with a tighter row spacing.
- ✓ **Per tree costs:** Any activity performed on a per-tree basis – planting, wrapping, pruning, tying, painting, suckering, etc. will have higher costs with a greater number of trees per acre.
- ✓ **Hedging:** The cost of hand pruning is one of the top concerns of prune growers, and per tree costs of tree training and hand pruning mean this expensive cost only increase at the new higher planting densities. These high per tree costs are moving some growers mechanical hedging programs once tree structure with hand pruning has been completed and orchards are producing.

However, mechanical hedging creates thousands of indiscriminate pruning wounds that are susceptible to *Cytospora* and other fungal cankers. More hedging considerations at: sacvalleyorchards.com/prunes/horticulture-prunes/pros-and-cons-of-mechanical-pruning

Interplanting: Prune orchards have historically been planted at wide spacings (24' x 24', 22' x 22', 20' x 20', etc.) and growers have attempted to increase light interception by interplanting down the tree row, or even on the diagonal. However, interplanting creates a very difficult situation for successfully establishing new trees due to poorly optimized irrigation, and especially the high risk of fungal canker infection in a high inoculum environment. Consider starting over with proper site preparation and establishment practices, instead of interplanting. More information on the risk of interplanting at: sacvalleyorchards.com/prunes/diseases-prunes/interplanted-orchard-hazards/

Special thanks to Mark Gilles (Sunsweet) for his input on prune orchard spacing both historically and currently.

Thinning Prunes

Dani Lightle, UCCE Orchards Advisor, Glenn, Butte & Tehama Counties

This year, processors desire large A screen fruit. To keep your crop from falling through the sizer, you need to do some legwork, estimate your fruit set, and thin if needed. Thinning should occur roughly around the same time as 'reference date', or the point at which 80 to 90% of the fruit have a visible endosperm. The endosperm, a clear gel-like glob, will be found in the seed on the blossom end of the prune (Figure 1) and is solid enough to be removed with a knife point. Typically, the reference date occurs in late April or early May, approximately one week after the pit tip begins to harden. The earlier thinning is done, the greater effect it will have on final fruit size at harvest. However, if you thin too early, you may damage the trees without removing the desired number of fruit.

Figure 1. Extraction of the endosperm on a developing prune.

To decide whether to thin, **estimate** the number of fruit per tree to produce your desired crop, **determine** the number of fruit on a few (3) representative trees, at or just before reference date, and, using those numbers, **decide** if you need to thin. **Calculate** how much fruit needs to come off if thinning is needed. Finally, **shake** if thinning is needed. Below I walk through the math, step by step. Alternatively, skip doing the calculations by hand and use the prune thinning calculator, available at: http://www.sacvalleyorchards.com/prunes/horticulture-prunes/prune-thinning-calculator/

1. **Estimate** the targeted tonnage from a given block by considering orchard history, age, etc. Let's assume a target of 4 tons/ac, and shoot for 60 dry count/lb. From there, calculate a targeted number of fruit per tree:

(Dry pounds per ac x Dry count per lb) ÷ Trees per ac = Target number fruit per tree

$$8{,}000\frac{lbs}{ac} \times 60\frac{count}{lb} \div 150\frac{trees}{ac} = 3{,}200\ fruit/tree\ \text{(target)}$$

2. **Determine** the actual number of fruit in a sample tree and compare that number to the target of 3,200 fruit (from step 1). Ideally, repeat this procedure on 3 representative trees to ensure accuracy. Place a tarp under the tree and mechanically shake off as much fruit as possible, then hand strip any remaining fruit. Collect all the sound fruit and weigh them (for easy math, let's assume it weighs 100 lbs). Take a 1-lb subsample of the fruit and count how many sound fruit are in a pound (assume 90 fruit/lb). Don't count fruit that looks like it wouldn't have stayed on the tree until harvest - these fruit are light green or otherwise look slightly "off" compared to the strong fruit. Then use those numbers to determine the total number of fruit per tree:

Total tree fruit weight x Number of prunes per lb = Total number of fruit per tree

$$100lbs \times 90\frac{fruit}{lb} = 9{,}000\ fruit/tree\ \text{(actual)}$$

3. **Decide** if you need to thin. Subtract the number of fruit needed at harvest from the number of fruit on the tree now (reference date). In this example, there is roughly 2.8 times the number of fruit on the tree than desired to hit the target of 60 dry count/lb. You don't want to simply remove all those extra fruit, because you need to account for natural fruit drop and variability in fruit per tree across the orchard. Estimates of natural fruit drop range from 10% to 40%. Selecting the appropriate drop percentage should account for orchard history, as well as your own risk threshold. Many growers prefer to leave approximately 50% more fruit on the tree after mechanical thinning than we want remaining on the tree at harvest:

Target number prunes per tree x (1.5% fruit drop buffer) = Adjusted number fruit per tree

$$3{,}200\ x\ 1.5 = 4{,}800\ fruit/tree\ \text{(adjusted target)}$$

4. **Calculate** how many fruit to remove by subtracting the adjusted target number from the actual number of prunes on the tree:

Actual fruit per tree – Adjusted target fruit per tree = Number fruit to remove

$$9{,}000\frac{fruit}{tree} - 4{,}800\frac{fruit}{tree} = 4{,}200\ fruit/tree\ to\ remove$$

5. **Shake** (if needed). Use harvest machinery (shaker) to remove the approximately 4,200 excess fruit. Shake a tree for one second, and following the steps above, calculate how many fruit were removed. If needed, increase the shaking time until the desired numbers are removed. Typical shaking time is 2 to 4 seconds; avoid shaking for longer than 6 to 7 seconds to prevent unnecessary damage. Once you've calibrated your shaking time, go through and thin the block. If you are thinning for more than a week, check fruit per tree and green fruit per pound every few days to make sure that your shake time doesn't need to be adjusted down as fruit grow.

Updated cost of producing prunes now available.

The UC Farm Advisors and UC Davis Ag Issues Center have completed a new Cost of Establishing and Producing Prunes (2018). This publication is available, free, at: https://coststudyfiles.ucdavis.edu/uploads/cs_public/53/8c/538c2e79-e322-4e83-a70b-7663e819ef52/18prunessacvalley.pdf.

This document provides a good reference for comparing practices, costs and potential returns to grower between tree crops in the region. Additional tree crop costs of production studies are available at: https://coststudies.ucdavis.edu/en/current/.

University of California
Cooperative Extension
2279 Del Oro Ave., Suite B
Oroville, CA 95965
Return Service Requested

Non-Profit Org.
U. S. Postage Paid
Permit No. 268
Oroville, CA 95965

Persons with special needs wishing to attend a program should contact the Cooperative Extension Office in advance at 538-7201. Efforts will be made to accommodate your specific need.