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## July and August Prune Management Considerations

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### YIELD PROJECTION

The 2017 CDFA/USDA California prune crop estimate of 105 thousand tons is a projection near 2014 and 2015 yields, and a 106% increase from reported yields in 2016. For more information:

[nass.usda.gov/Statistics\\_by\\_State/California/Publications/Fruits\\_and\\_Nuts/2017/201706prunf.pdf](http://nass.usda.gov/Statistics_by_State/California/Publications/Fruits_and_Nuts/2017/201706prunf.pdf)

### JULY

Initial harvest prediction: Expect to harvest approximately 30 days after you first see healthy fruit begin to change color (this excludes so called “blue prunes”, for more information please see: [sacvalleyorchards.com/prunes/horticulture-prunes/blue-prune-drop/](http://sacvalleyorchards.com/prunes/horticulture-prunes/blue-prune-drop/))

Updating harvest prediction: Following first color you can refine your prediction of harvest timing by following the fruit maturity development once a week in each orchard block with your refractometer and fruit pressure gauge. Sample five fruit per tree on five trees per block, taking fruit randomly from both the inner and outer canopy. Take two pressure readings on each fruit (one per side/cheek), averaging the two pressures per fruit, the five fruit per tree, and finally the average of all five trees. To measure soluble solids with your refractometer, take a single blended sample of 25 half fruits. Fruit pressures should drop (soften) by 1-2 pounds per week, with an ideal fruit pressure at harvest between 3-4 pounds. Predicting harvest timing (3-4 pounds of pressure) can be a moving target, with faster pressure loss during cooler weeks and a slower loss of firmness under hotter conditions. Keep checking your fruit to update your harvest prediction!

Irrigation cut off: Use your harvest prediction to help inform your pre-harvest irrigation cut off. Healthy orchards may be able to go without irrigation for five to six weeks prior to harvest. Properly timed irrigation cut off can reduce premature fruit drop, improve dry-away ratio, reduce brown rot infection under flooded orchard conditions and help reduce barking at harvest. However, potassium (K) uptake is reduced as the soil dries down (consider a foliar K application) and *Cytospora* cankers spread more readily in water stressed trees. Grower experience is the key in deciding when to cut off irrigation to each orchard block.

Take leaf samples: Collect 50-75 leaves per sample (1-2 leaves per tree) from non-bearing spurs on representative healthy trees across each block. Have your agricultural laboratory analyze for nitrogen (N), phosphorus (P), potassium (K), and for chloride (Cl) if you use muriate of potash (MOP, potassium chloride) as a potassium fertilizer source. The sufficient range for these constituents is 2.3%-2.8% (N), 0.1%-0.3% (P), 1.3%-2.0% (K), with levels over 0.3% Cl being excessive.

Potassium (K) is a particularly critical nutrient and because the result is an average of higher and lower nutrient level trees; consider aiming for 2.0% K to avoid having any trees below 1.3%. Please consult the [Prune Production Manual](#) or your local UC Orchard Systems Farm Advisor for assistance with interpreting your leaf analysis results.

***Managing brown rot:*** Fungicide treatment may reduce fruit infection in orchards where brown rot has been or might be a problem. However, fungicide treatments are preventative (not eradicated) and are intended for uninjured and uninfected fruit 4-6 weeks before harvest. UC research has shown that high spray volumes (150+ gallons per acre) and the spray tank addition of a 1-2% (1-2 gallons oil per 100 gallons of spray) 415 spray oil (summer oil), may improve brown rot control, especially when fruit is found in bunches. Consult your PCA, as well as UC fungicide efficacy results: [ipm.ucanr.edu/PDF/PMG/fungicideefficacytiming.pdf](http://ipm.ucanr.edu/PDF/PMG/fungicideefficacytiming.pdf) (pg. 59)

***Protect the leaf canopy:*** As harvest approaches monitor blocks for spider mites, rust, water stress and K deficiency. Consider a pre-harvest potassium nitrate spray if you need to both suppress adult spider mites for 2-3 weeks and “top off” tree potassium levels to avoid leaf scorch. Protecting the canopy, and avoiding leaf loss from mites, rust, water stress, and leaf scorch prevents harvest slowdowns, keeps extra leaves out of the bins, and protects scaffold branches from sunburn during hot postharvest weather. If no rust lesions or spider mites are found by July 15<sup>th</sup>, treatment is likely not warranted. Monitoring information can be found in the Integrated Prune Farming Practices (IPFP) Manual or at the UC Integrated Pest Management website [ipm.ucanr.edu/PMG/selectnewpest.prune.html](http://ipm.ucanr.edu/PMG/selectnewpest.prune.html).

## AUGUST

***Pre-harvest orchard clean up:*** Cut out dead and dying limbs and suckers prior to harvest. This will reduce harvester and tree damage and make for a faster, cleaner harvest. For more information on managing wood diseases please see the *Cytospora* and bacterial canker articles in this issue.

***Run a field sizer:*** Find out what your packer will pay for different sized fruit, especially small fruit. If your packer won't pay for small fruit, run a sizer and don't deliver the small fruit. If your packer is paying for small fruit, consider running just a small (for example, 15/16") sizer to remove garbage and damaged fruit. Additionally, don't rely only on fresh fruit size when deciding what size chain to run. Measure your sugar levels at harvest and use this information to select chain size. This is because sweeter fruit dries to a larger count prune than fruit of the same fresh size, but less sugar. For example: a fresh prune with 28% sugar will be 8-13 counts larger when dried to 18% moisture than a fruit of the same fresh size, but with 20% sugar.



## Root Asphyxiation (Waterlogging)

*Dani Lightle, UCCE Orchards Advisor, Glenn, Butte & Tehama Cos.*

July may seem like a strange time to talk about water logging, but depending on location, many growers are still experiencing after-effects from the winter rains. With the recent hot spells, trees with compromised root systems may be suddenly collapsing. Proper irrigation practices for your particular soil type is still one of the key ways that you can minimize the risk of root damage from water logging.

Prolonged soil saturation is a problem because water displaces oxygen in root zone soil pores. Of course, most of you know that plants produce oxygen as a product of photosynthesis. So why do roots need oxygen in the soil if the plant is already producing it? The basic photosynthetic reaction is:

Photosynthesis:  $\text{CO}_2 + \text{water} + \text{sunlight} = \text{sugar} + \text{oxygen}$

Sugars produced by photosynthesis are the main energy source for plant cells. Plant cells not exposed to sunlight - such as roots - cannot produce their own sugars, and instead create energy through respiration:

Respiration:  $\text{sugar} + \text{oxygen} = \text{CO}_2 + \text{water} + \text{energy}$

Without oxygen present, the root cells cannot respire, which will eventually result in cell death – they are literally drowning.

Root dieback begins with fine feeder roots and progresses from there depending on how long the saturation persists. Above ground symptoms may include yellow leaves, leaf drop, wilting, lack of new growth, or whole tree collapse. Below ground, inner tissue of the root will begin to turn brown and the bark may separate from the rest of the wood. Prolonged anaerobic conditions may cause a sewer-like odor (methane produced by anaerobic decomposition). If you dig a backhoe pit at the site, in addition to the odor, you may see soil with a bluish colored staining.

The brown inner tissue can be mistaken for *Phytophthora* root rot. However, drowning the roots is enough to kill a tree *without* a pathogen even being involved. Waterlogging is most common in heavy clay soils, or soils with a subsurface boundary layer that inhibits water drainage. Plum rootstock is generally more resistant to water logging than other *Prunus* species, but even they can only survive so long without available oxygen.

There may be several management steps you can take to help alleviate water logged conditions:

- Reduce compaction and improve water penetration. Depending on the cause of poor water infiltration, courses of action may include gypsum or cover cropping.
- Modify irrigation schedules so that water is not ponding on the soil surface for long periods.
- Recognize that a symptomatic tree may have some of the same symptoms as an under watered tree. Do some investigation to check out soil moisture levels before adding more water and compounding the problem.



## Bacterial Canker Experience in the Sacramento Valley

*Richard P. Buchner UCCE Farm Advisor Emeritus*

For several years, canker development and tree damage have been problematic for prune production in the Sacramento Valley. The two most commonly isolated pathogens are the fungus *Cytospora leucostoma* and the bacterium *Pseudomonas syringae* responsible for bacterial canker. *Cytospora* infects damaged wood in the upper canopy resulting in wood death from the top downward. Bacterial canker has a blast phase and a canker phase. During the blast phase, flowers and spurs are killed but fortunately the disease does not extend very far into the infected shoot. Presumably infections are walled off or otherwise halted therefore limiting damage. The canker phase is much more serious resulting in scaffold and/or tree death. Infection is thought to occur in the fall or winter with symptoms visible in the early spring. Cankers appear as slightly sunken areas most often on the primary scaffolds at the main branch points with gumming and oozing at cankers. Cutting the bark back with a sharp knife will reveal reddish brown dead tissue. When bacteria completely girdle the branch, the affected branch dies.

Bacterial Canker is a much studied disease that is still poorly understood. It is primarily a problem on young trees. The physiological condition of the tree seems to be extremely important in disease expression. Freezing temperatures are not required but the disease is frequently associated with cold winters or colder portions of orchards. That may explain why we have seen so much damage on prune in the Sacramento Valley. Back in 2013, minimum temperatures for Red Bluff were below freezing from Dec 3 to December 18 with lows in the 23° to 25° F range. In addition, trees most likely did not have the opportunity to achieve full dormancy going into the cold resulting in tissue damage and infection.

Bacterial canker symptoms have been fairly common in the years following 2013. *Pseudomonas* bacteria and other pathogens live/survive on the outer surfaces of plant tissue waiting for an injury or other opportunity to invade. In addition, research suggests that bacteria can be present inside tree tissue without causing symptoms. These

features make it challenging to craft an effective disease control strategy. Dormant treatment with copper materials, reported to be effective in other parts of the world, have not proven beneficial in California prune orchards. For the most part we are counting on the tree to defend itself. Rootstock selection, replant issue management, ring nematode control, proper nutrition and irrigation management and other cultural practices that favor tree health usually help but provide no guarantees. Historically, replanting on Lovell rootstock was one possibility but other vigorous rootstocks may also impart scion resistance to bacterial canker. Our rootstock experiments planted in 2011 may provide additional future choices in rootstock selection which could help with disease management.



### **Advances in *Cytospora* canker management**

*Franz Niederholzer, UCCE Farm Advisor, Colusa and Sutter/Yuba Counties*

*Cytospora* canker infections of scaffold and branch bark have been reported in prune orchards in California's hot, inland valleys for over half a century. The "story" on *Cytospora*, as I learned it in the 1980s and 90s, was of an opportunistic fungus that entered trees through above-ground wounds – sunburn, bacterial canker, insect feeding, etc. (though not pruning wounds). Considered "a weak pathogen of healthy tissue"<sup>1</sup>, it spread more readily in water stressed trees in the fall, and tended to function best at warmer temperatures. *Cytospora* symptoms often appeared in the height of summer when trees were stressed by combinations of low potassium nutrition, high temperatures, sunburn, and/or low soil moisture.

Historically, this was an economic problem in older trees, where the slow growing fungi can eventually kill branches and even whole scaffolds, compared to younger, more vigorous trees. There were no effective pesticides registered for control as of just a few years ago and growers were advised that best management practices were to keep the orchard healthy (water, nutrition, etc.) and cut out and burn damaged wood. Failure to manage *Cytospora* canker aggressively in a prune orchard could lead to lost bearing surface/yield potential. However, prune production in California changed in the last 20 years and so has the *Cytospora* "story". Statewide, prune acreage is down by more than half since 2000, with older orchards making up the majority of remaining acres along with interplanting of young trees within older blocks.

Recent crop disasters and rising costs have led to reduced pruning in many blocks, leaving more standing dead wood – often a source of *Cytospora* spores -- in many orchards. Coincidentally, in the last decade, UCCE farm advisors fielded an increasing number of farm calls about canker damage in prunes, including aggressive cankers found in young trees. Analysis of samples sent to Dr. Michailides' lab at UC Kearney, revealed that *Cytospora* was the only pathogen consistently isolated from the cankered wood samples in every one of seven seasons (2006-2013).

In 2013, the California Dried Plum Board began funding Dr. Michailides' lab to do research into canker infections in prunes to determine 1) how trees are infected by cankers and 2) develop management tools to reduce or eliminate canker infection. Since 2013, Dr. Michailides's lab group has documented that 1) prune trees can be infected by *Cytospora* fungi at recent pruning wounds, 2) *Cytospora* was the major pathogen spore isolated from rain samples from prune orchards the last two winters, and 3) at least one commercially available fungicide (Topsin-M®), sprayed on pruning cuts between pruning and rainfall, consistently reduced incidence of *Cytospora* cankers on pruning wounds.

**Both Topsin-M® and Rally® now have 2EE labels for application (spray or paint-on) to pruning cuts on prune.**

Growers are still advised to keep the orchard healthy to minimize *Cytospora* infection, as well as cutting out and burning damaged wood. There now is the additional option to spray or paint Topsin-M® and/or Rally® after cutting out damaged wood. [Note: additional research on *Cytospora* in almonds and other stone fruit is being conducted by Dr. Florent Trouillas (UCCE Plant Pathology specialist) and his lab, but not reported here.]



Dr. Michailides's research has also discovered some tough realities about *Cytospora* on prune. Pruning wounds made in early March on 1-2 year old shoots remained vulnerable to *Cytospora* infection until September, although the average canker severity rating declined from 3.5 (0 = no canker; 5 = dead shoot) to 2.25 in that time period. The infection vulnerability was tested at optimum conditions (wounds sprayed with water+disease spores and covered with a plastic bag for 48 hours to maintain high humidity). Further work is needed to understand the risk of infection under natural conditions from spring through summer and management changes (timing of pruning) that could avoid *Cytospora* infection.

In addition, Dr. Michailides's lab has found *Cytospora* fungi in young shoot tissue where infection symptoms are not visible. These so called latent infections may be sources of damaging infections later in the year or life of the tree. More research is needed to understand what changes/shifts *Cytospora* from a harmless fungal hitchhiker in/on prune shoot wood to a killer pathogen.

Stay tuned for more information on this key pest of prune, as well as details for the prune grower meeting planned for Sept 26 in Chico (see Hold-the-date info for this meeting elsewhere in this newsletter). Dr. Michailides will discuss his research at that meeting.

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Die-back from pruning wounds infected with *Cytospora* on interplant tree. Adjacent mature trees showed *Cytospora* infection symptoms. Yuba County.



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<sup>1</sup> p.185 Diseases and Disorders chapter, Prune Production Manual 2<sup>nd</sup> edition; UC ANR Publication No.3507.

<http://anrcatalog.ucanr.edu/Details.aspx?itemNo=3507>

## **SAVE THE DATE!**

### **Recent Advances in Prune Research**

(and how they impact your prune management practices)

**Tuesday, September 26, 2017**

**Location: Chico (Meeting site TBA)**

Topics/speakers will include:

- **Cytospora canker:** Dr. Themis Michailides, UC Davis Plant Pathology specialist
- **Wood Rot Fungi:** Bob Johnson, UC Davis Plant Pathology Department
- **Prune rootstock trial research:** Rich Buchner, UCCE Farm Advisor Emeritus

The meeting will include researcher presentations (30-45 minutes each) followed by Question and Answer sessions (30-45 minutes) to help growers and PCAs plan to apply research results ahead of the pruning season.

### **Upcoming 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 Tuesday of each month from February through November 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!

#### **Upcoming meetings:**

- Yuba-Sutter: August 8<sup>th</sup> (Perko's Restaurant)
- Tehama: September 12<sup>th</sup> (Rockin R Restaurant)
- Glenn: October 10<sup>th</sup> (Berry Patch Restaurant)
- Butte: November 14<sup>th</sup> (Location TBA)

Additional information for each meeting will be available on the events page at [sacvalleyorchards.com](http://sacvalleyorchards.com) or by contacting UC IPM Advisor Emily Symmes at (530) 538-7201 or [esymmes@ucanr.edu](mailto:esymmes@ucanr.edu).

**\*\*DPR and CCA Continuing Education hours requested\*\***

## Sacramento Valley Orchard Source

*Your source for orchard news & information in the Sacramento Valley*



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Check out the 'Photos from the Field' feature on our website at:

[www.sacvalleyorchards.com/photos-from-the-field/](http://www.sacvalleyorchards.com/photos-from-the-field/).

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