Sacramento Valley Prune News
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In This Issue

Franz Niederholzer
UCCE Farm Advisor
Sutter, Yuba, Colusa Counties

Fall & Winter Prune Orchard Management Considerations

Drew Alonso Wolter, UCCE Junior Specialist Horticulture Intern, UC Davis Graduate Student
Franz Niederholzer, UCCE Orchard Advisor, Sutter/Yuba and Colusa Counties
Dani Lightle, UCCE Orchards Advisor, Glenn, Butte & Tehama Counties
Emily J. Symmes, UCCE Area IPM Advisor, Sacramento Valley

Orchard clean up:

- Remove existing *Cytospora* cankers by cutting branches several inches to a foot below the symptoms. Information on identifying cankers and photos of a "clean" pruning cut can be viewed at sacvalleyorchards.com/prunes/pruners-pocket-guide-for-cutting-out-cytospora
- Clean up "barked" trees damaged at harvest. Trunk/limb damage from harvester can result in *Ceratocystis* canker infection and possible tree death. Cut away any loose or damaged bark back to "tight" bark with a sharp knife or chisel and hammer. If you want to, paint the wound with commercial wound sealer. This can protect damaged trunks while healing.
- Flag dying or weak trees for removal. Backhoe out old trees, making sure to get as many roots out of the hole as possible

Pruning:

- Avoid pruning immediately prior to rainfall events. Consider following pruning with a fungicide spray (Topsin-M® or Topsin-M + Rally®) to protect the fresh wounds from infection from rain-splashed spores.
- Remove and burn prunings (if permitted) to reduce in-orchard inoculum levels of bark cankers like *cytopsora*.
- Skipping pruning for a year is a significant cost-savings but be prepared to shaker-thin if needed next spring. If thinning isn't done when needed, the savings from skipping pruning may turn into a net-loss after setting a large crop of small fruit and suffering increased sunburn and broken limbs. Careful nitrogen fertilizer management during the growing season following winter pruning can help minimize vigorous regrowth and reduce subsequent pruning time and cost.
- If you are training a young orchard, consider intermediate or long pruning for earlier yields, but be prepared to tie your trees to support the longer growth. See the article in this newsletter for more details.

Orchard topping:

- If you are going to top your orchard, fall, with no rain in the forecast, is the time to do it. Cuts get a chance to harden off before seasonal rains. Young, well-irrigated trees topped before mid-October will show some regrowth before leaf fall. Topping young,

vigorous trees before a big wind will reduce risk of blow-over. If rain is in the forecast, be sure to protect fresh wounds from infection by rain-splashed spores with a fungicide spray (Topsin-M® or Topsin-M® + Rally®). This must be done **before** the rain!

Nutrition:

- Soil applied potassium (K) should be banded in the fall. One dry ton of crop removes 26 lbs of potassium from your orchard. A common maintenance rate is 400-500 lbs/ac of K fertilizer (potassium sulfate). Growers can also opt to apply fertilizer K through a drip irrigation system (fertigation) and/or multiple foliar applications once a crop has been set.
- Foliar zinc (Zn) to correct zinc deficiency can be applied at the beginning of leaf drop (late October/early November). 20 lbs of 36% zinc sulfate at 100 gallons water/ac may also hasten leaf drop, reducing risk of blow over and/or disrupting aphid reproduction.
- Tree nitrogen (N) uptake is limited in the fall (there is nothing to feed) and trees will not take up N once leaf drop has begun. N should not be soil applied after September to avoid N leaching by winter rains.
- A fall foliar nitrogen (N) spray of 10-20 lbs N/acre may help reduce bacterial canker incidence next spring in young orchards, especially if summer leaf N levels are low.

Insects:

- Aphids: fall and winter can be an effective and ideal time to preventively treat orchards with a history of problems, particularly if no dormant sprays will be applied for scale or peach twig borer. Detailed articles on prune aphid management can be found at sacvalleyorchards.com/prunes/
- Scale**:** obtain a dormant spur samples looking for San Jose scale and European fruit lecanium, as well as evidence of parasitism in both species. More information on dormant sampling and treatment thresholds ipm.ucanr.edu/PMG/r606900511.html.
- Peach twig borer: during the dormant period, a moderate rate of pyrethroid is effective on aphids and PTB (6-8 oz/acre of Asana) without the need to use the maximum labeled rate (14+ oz/acre).
- Visit sacvalleyorchards.com/prunes/insects-mites-prunes/aphid_management/ for a table of timing, efficacy, and other considerations for treatment of these three pests.

Weeds:

- Conduct a post-harvest weed survey (ipm.ucanr.edu/PMG/C606/prune-fallweeds.pdf) to evaluate your 2019 weed control program efficacy. See article in this newsletter for more information.
- Pre-emergence herbicide (combined with a post-emergence burn-down material, if winter weeds have already germinated) should be applied shortly before a moderate rain event (0.25") to move material into the soil. Avoid application prior to a large rain event (> 1"), which can move the product too deep into the soil for good weed control. Avoid spraying root/trunk sucker leaves with any spray containing systemic herbicides such as glyphosate (Roundup, etc.) since those herbicides can enter the tree and cause damage next spring.

Gophers:

- Late fall to early winter is a prime gopher control time because populations can be controlled before adults breed and create more gophers. See gopher control strategies at: ipm.ucanr.edu/PMG/r105600211.html

Long Pruning for Greater Early Yields

Luke Milliron, UCCE Orchards Advisor, Butte, Glenn & Tehama Counties
Katherine Jarvis-Shean, UCCE Yolo, Solano & Sacramento Counties
Franz Niederholzer, UCCE Orchards Advisor, Sutter-Yuba & Colusa Counties

The higher the yield per acre early in the life of an orchard, the sooner the orchard covers development costs and returns a net profit to the grower. Yield per acre in young prune plantings is determined by 1) yield per tree and 2) trees per acre. In this article, we will focus on practices that increase yield per tree in young prune trees. With new, well-anchored prune rootstocks now in the market, especially Krymsk 86 and Viking, it is worth reviewing young orchard pruning trial data.

Eliminating severe heading cuts during tree training increases early production. UC research has shown that early yields can be improved in prunes, almonds and walnuts by reducing the severity of pruning during tree establishment. This has been done by reducing or eliminating the use of severe heading cuts during tree establishment. In pruning, "heading cuts" reduce the length of a limb, while "thinning cuts" completely remove the limb. Historical orchard tree training included severe heading cuts ("short pruning"), where ½ or more of the previous year's growth was removed during the dormant season. However, making less severe cuts or leaving limbs unheaded can lead to earlier and greater production.

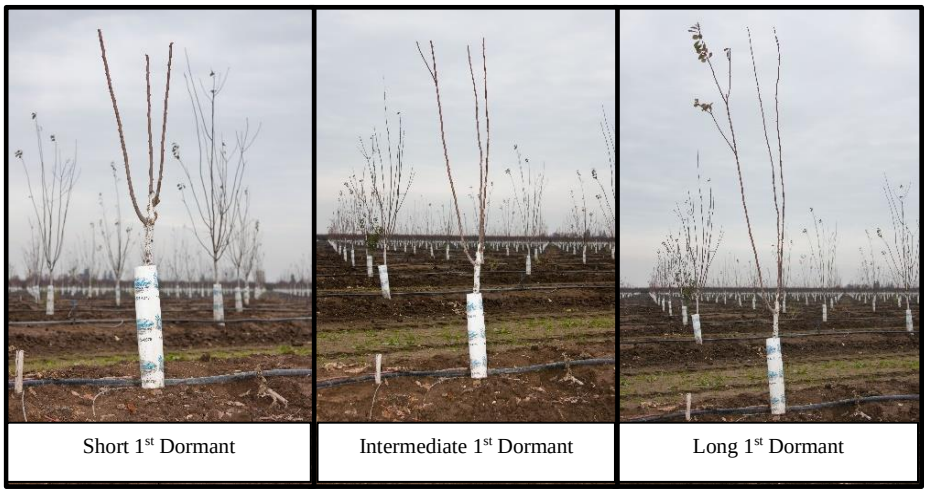

Figure 1-3. Short, intermediate and long pruning after the 1st (primary scaffolds) dormant period (photos: M. L. Poe).

Early prune yields are maximized when pruning is minimized. Pruning works against the objective of early fruit production since it removes the one-year old wood on which flowers are borne and reduces tree size. Bill Krueger (UCCE farm advisor emeritus) and others have tested several pruning regimes for newly planted prune trees (Figures 1-3). In the short pruned treatment the previous year's growth (primary scaffold after first year, secondary scaffold after second year, etc.) was severely headed back to leave only the first 30 inches of the scaffold after the 1st through 4th leaf. With the intermediate pruning treatment, each season's scaffold growth was lightly tipped back 6 to 12 inches. For long pruned trees, the scaffolds were left unheaded each year and only thinning cuts were made to completely remove branches during training.

The short-pruned trees had lower yields than the long-pruned trees each year, and the lowest cumulative yield through the fifth leaf (4,214 dry lbs/ac, table 1). Intermediate, "lightly tipped" trees had intermediate yields (7,065 lbs). Long pruning (unheaded), had the greatest cumulative yield (10,153 lbs). By the sixth leaf, no yield differences were measured within a given year.

Table 1. Effect of differential heading length on dry fruit yield (Prune Production Manual, 2012)

Treatment	3rd leaf*	4th leaf	5th leaf	Accumulated dry yield (lbs/acre)
Short pruned (headed at 30 in)	136 a	727 a	3,350 a	4,214 a
Intermediate (lightly tipped)	324 ab	1,903 b	4,838 ab	7,065 b
Long pruned (unheaded)	521 bc	2,769 b	6,863 c	10,153 c

*Values followed by different letters are significantly different at the 5% level.

Although the short-pruned treatment has lower early fruit production, some feel this style provides more control over tree structure, reduces the risk of blow-over, and may develop a stiffer structure that is less prone to breakage. Conversely, **the greater canopy growth and fruit production with the long pruned (unheaded) style may require a greater level of management, including spring tying (as early as 2nd leaf) to avoid breakage**. Because the risk of limb breakage, you could consider mitigating your risk by trying out long pruning on a few acres and more conservatively pruning the rest of the orchard. Intermediate lightly tipped option can be a good compromise, because management is easier if the potentially fruitful primary scaffold tips are removed (if the branch tips crop, they could pull the branches out of position).

There are, of course variations on your own interpretation of intermediate pruning, based on the growth of your primary scaffolds. For instance, if you had 7 feet of growth and you cut the scaffolds back to 4-5 feet that could still be considered an intermediate option. In research from the 1980's, the greatest early yield reduction occurred when primary scaffolds were headed to 3 feet or less in the first dormant season compared to leaving 4 feet or longer scaffold lengths. Pruning requires careful consideration and there is no universal recipe, each orchard should be treated uniquely.

Whichever training style you choose, strongly consider immediately protecting pruning wounds to avoid a fungal canker infection that could debilitates your trees before they can get a good start. *For more, see the article on Cytospora infections in this newsletter.*

You can learn more about these three training styles on pages 137-141 of the 2012 Prune Production Manual (Publication Number: 3507, anrcatalog.ucanr.edu/Details.aspx?itemNo=3507).

Cytospora: A year-round fight

Franz Niederholzer, UCCE Orchards Advisor, Colusa and Sutter-Yuba Counties
Luke Milliron, UCCE Orchards Advisor, Butte, Glenn & Tehama Counties

Canker diseases threaten the profitability of prune growing in California, reducing bearing wood and killing entire trees early in the life of the orchard. These diseases include bacterial canker, *Botryosphaeria*, *Phomopsis*, etc. but especially *Cytospora*. This article is a review of Cytospora canker and a plea (suggestion?) for growers and PCAs to pay close attention to managing what was once largely a nuisance but now is an orchard threatening problem. We will also review prune orchard management practices that help control *Cytospora* infections.

Why is the postharvest period so important in the year-round fight against *Cytospora*?

Cytospora canker is a bark canker caused by one or more species of the *Cytospora* fungus. *Cytospora* is a perennial canker; once in the tree it doesn't die out in the year of infection. The only way to remove a Cytospora canker from a tree is to cut it out. It is active over a wide range of temperatures (40°F to 90°F), but is most active at higher temperatures (over 80°F). Tree stress is more frequent at higher temperatures (greater risk of water stress and potassium deficiency). Research results show an increased spread of the disease – faster canker growth – with postharvest water stress.

How does Cytospora infect a tree?

Cytospora is a relatively weak fungus that requires an opening in the tree's protective bark to infect prune trees in California. (It doesn't infect flowers.) Such openings include sunburn, bacterial canker damage and pruning wounds. Recent research by Dr. Themis Michailides and his lab has shown that *Cytospora* can enter prune trees through pruning wounds, something that was tested and found to be only a minor infection site in research from the 1970s. The UC IPM page for *Cytospora* management in prunes still states that "Pruning cuts… are not important infection sites." This information is no longer accurate. UC IPM is working to update the entire Prune Pest Management Guidelines.

How does Cytospora spread in an orchard?

Spores oozing from pimple-like structures (pycnidia, see photos in this article) on dead or dying wood are the primary source of new infections. The spores are not released in a dry form to move with the wind, but in a starchy strand (cirrus, see figures 1-3) that must be broken up and moved with wind-blown rain. New infections also require wet surfaces from rain or dew or 100% relative humidity for spore germination. *Cutting out and burning dead/dying, infected wood is a critical management practice for this disease.*

What are some possible reasons that may contribute to Cytospora canker becoming such an issue now, when it wasn't several decades ago?

- New, more aggressive species of *Cytospora* may now be present in California orchards compared to decades ago.
- Reduced sanitation via pruning out and burning dead wood due to rising pruning costs and reduced labor availability.
- Increased orchard stress from reduced inputs and grower attention, due to poor prune economics. Warmer, drier fall weather, in general, combined with a possible lack of attention to adequate postharvest irrigation and resulting water stress may also be a factor.
- Increased mechanical hedging, creating multiple pruning wounds vulnerable to infection.

How could growers manage prune orchards with Cytospora canker management in mind?

- Maintain healthy trees:
  - Maintain adequate potassium nutrition by exceeding crop demand and monitor leaf potassium levels
  - Avoid water stress throughout the growing season – especially postharvest – by monitoring soil moisture and/or tree water status (i.e. using a pressure chamber).
  - Avoid sunburn on trunks and scaffolds by painting the bark white, maintaining healthy leaves and tying (roping) branches, when necessary, to prevent the canopy opening too much with crop load
  - Thin crop load when and where necessary, to avoid nutrient stress and canopy opening to sunburn.
- Eliminate spore source:
  - Cut out diseased wood several inches below the external canker margin, following the visual guide at: sacvalleyorchards.com/prunes/pruners-pocket-guide-for-cutting-out-cytospora/. Burn dead wood.

- Protect pruning wounds from infection:
  - Don't prune ahead of forecast rain.
  - If you do prune ahead of forecast rain, follow the pruners (or hedger) with a Topsin-M® spray before rain. Rally® can be added to Topsin-M® to reduce resistance development. However, Topsin-M® is the most effective material tested to date.
  - Even if rain isn't immediately forecast following pruning, remember that wounds are susceptible to rain-splashed infections for approximately one month. Dr. Michailides and his group are doing research this year to test whether immediate treatment after pruning or waiting until just before rain is the best practice.

What can you do during the postharvest period to better manage *Cytospora*?

- ✓ Maintain stress-free orchards until leaf drop with adequate irrigation.
- ✓ Avoid pruning ahead of rain, especially on young trees where large cuts are near the trunk/crotch area.
- ✓ Cut out *Cytospora* infected dead wood. Train pruners to cut far enough to completely remove diseased wood. Use sacvalleyorchards.com/prunes/pruners-pocket-guide-for-cutting-out-cytospora or field examples to train pruners to get all the diseased wood out of the trees.
- ✓ Treat pruning wounds with Topsin-M®, with or without Rally ahead of rain.

Figure 1. White *Cytospora* pycnidia on dead prune wood.
These are the spore source for further infections.

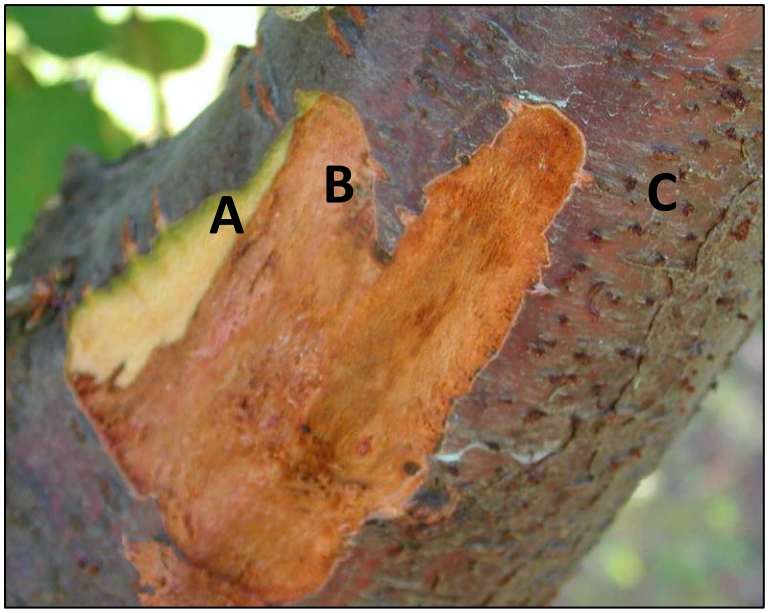

Figure 2. From left to right: cut, living bark tissue (A), cut, dead bark (B), and intact, dead bark emitting red cirrus containing *Cytospora* spores from dark pycnidia (C). Rain water is needed to dissolve the sugary mucus that holds the spores in the cirrus and wind then moves the spores in rainwater.

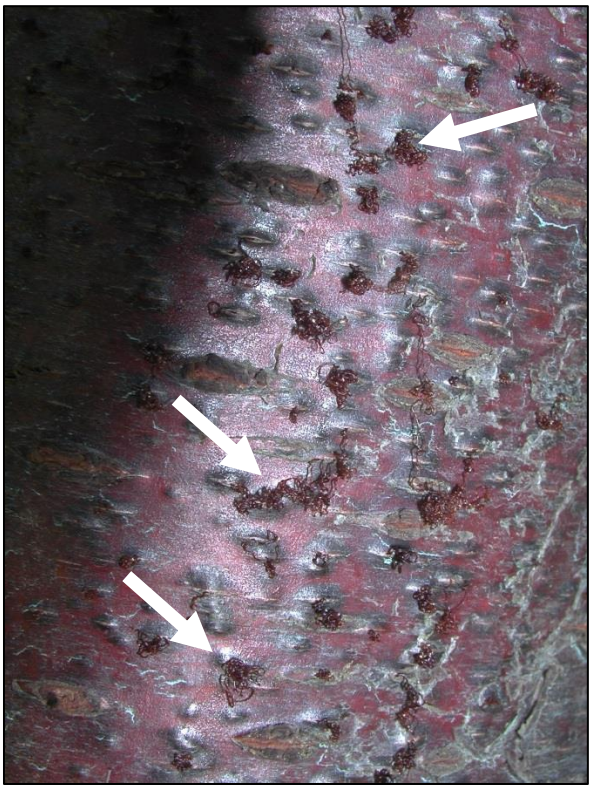

Figure 3. Close up of *Cytospora* cirrus (spore tendrils, see white arrows for examples) emitted from dark *Cytospora* pycnidia.

Increase Your Return on Investment with Post-Harvest Weed Scouting

Drew Wolter, UCCE Junior Specialist Horticulture Intern, UC Davis Graduate Student

Why scout for weeds?

While weeds are present in every orchard, there is variation in the species composition and the density of each population from orchard to orchard. Scouting for weeds is the basis for a good Integrated Weed Management (IWM) plan. Information gathered from weed scouting allows growers to:

- Evaluate the current year's weed control program
- Discover weed stands before they spread throughout the orchard
- Adjust control practices for the following year
- Select the best control option for species of concern, such as:
    - Choosing appropriate herbicide for species
        - Identifying areas for possible spot treatments
    - Selecting best cultivation method for weed stage
    - Where to alter cultural practices to target weed life cycles

Post-harvest scouting offers an opportunity to evaluate the current year's orchard floor management plan, allowing you to see what weed species have escaped the year's management plan, where they are, and how severe the infestation may be. These are all valuable pieces of information, which help design a management program to meet the specific needs of the orchard from year to year.

Keys to Scouting

Most weed species are much more challenging to manage as they mature. Because of this, post-harvest scouting should start early and be repeated a couple of times throughout winter, in order to catch weeds when they are young. Herbicide applications targeting mature weeds are often minimally effective, resulting in a less successful program and increased management costs. Three keys for successful scouting:

1. Record weed infestations and use a map/GPS to show areas of escaped weeds. For a weed scouting template and additional information visit: ipm.ucanr.edu/PMG/C606/prune-fallweeds.pdf
2. Accurately identifying weed species is crucial for effective management because herbicide recommendations, mechanical, and cultural control strategies vary depending on the species. While some species can look similar, they may have drastically different management requirements.
3. Look out for different weeds in different management zones. A good place to start is by checking in the tree rows to evaluate the effectiveness of any previous herbicide applications. Check the ground cover in the row middles for any perennial seedlings. Check orchard borders and at the ends of rows where new species may be introduced.

Herbicide resistance

With the growing number of herbicide resistant weeds in California orchards, control of escaped weeds can considerably reduce the cost of an annual orchard floor management program. For example, spot treating two acres of glyphosate resistant palmer amaranth with a tank mix of Glufosinate and Gramoxone is much more affordable than trying to control it over the entire 50-acre block. There are currently thirty confirmed herbicide resistant species in California (for the complete list visit: ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=29069). Scout now so you can spot treat, rather than having an orchard full of herbicide resistant weeds in the future.

Fig 1. Italian ryegrass (Left) is resistant to both Glyphosate and Glufosinate. Annual bluegrass (Right) is resistant to Glyphosate.

For more information on herbicide resistant weeds, species identification and control options please visit the UC Davis Weed Research and Information Center (https://wric.ucdavis.edu) OR ipm.ucanr.edu/PMG/r606700411.html