Sacramento Valley Prune News
Fall, 2014

University of California
Agriculture and Natural Resources | Cooperative Extension

In This Issue

Franz Niederholzer
UCCE Farm Advisor
Sutter, Yuba, Colusa Counties

Fall Orchard Considerations

Dani Lightle, UCCE Farm Advisor Glenn, Butte, & Tehama Cos
Franz Niederholzer, UCCE Farm Advisor Colusa, Sutter, & Yuba Cos

Pruning & Topping

- A pruning and/or thinning program should be in place to maintain large fruit sizes.
- Topping in the fall will produce somewhat less regrowth next season than a dormant topping, and can reduce winter blow over. Vigorous trees may regrow if topped before mid-October.
- Ensure that pruning crews fully remove *Cytospora* cankers (see article, this newsletter).

Fall Fertility

- Apply potassium (K) in the late fall so winter rains will help move K into the root zone (see article, this newsletter).
- Foliar zinc (36% zinc sulfate) can be applied at the beginning of leaf drop in late October or early November at about 20 lbs/acre in 100 gal water/acre. In irrigated orchards, zinc may drop leaves and disrupt aphid reproduction.
- Tree 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 applied after September to avoid N leaching by winter rains.

Insect Pest Management

- Conduct dormant spur sampling between mid-November and February to determine the need for scale control. See sampling protocols and treatment thresholds here: ipm.ucdavis.edu/PMG/r606900511.html.
- For controlling only scale, a delayed dormant treatment (February) of oil will control moderate populations.
- For controlling only aphids, low rates of pyrethroid or diazinon pesticides can provide excellent control when applied November (pyrethroids) or December (diazinon) through February. Oil provides no aphid control and is not needed in a spray just targeting aphid.
- For both scale and aphid control, use a dormant spray of oil plus pesticide. Spraying in February is more effective than December/ January for scale.

Weeds

- Conduct a weed survey to evaluate this year's management program and make changes for next season. (see article, this newsletter).
- Apply pre-emergent herbicides for winter weed control mid to late fall. Apply shortly before rainfall so that rain will move the herbicide into the soil. If germination has already occurred, include a contact or translocated herbicide with the preemergent. Evaluate herbicide efficacy by observing weed establishment over the winter.

on the margins and drop early. Weak canopy growth can encourage sunburn, making trees vulnerable to *Cytospora* canker. After harvest, K deficient trees often show bare upper shoots and branches, as K deficient leaves are removed by the shaker.

If you see symptoms of deficiency in leaf color or tree growth, you're probably already losing yield potential. Leaf sampling can give an earlier warning of deficiencies. July leaf levels of 1.3-2.0% K are considered adequate. Leaves under 1% K are deficient.

Maintaining and Replacing

Around 70% of the K used by a heavily cropping, mature prune tree is removed at harvest in the fruit. Thus, when planning K management, it is important to consider the size of the crop just harvested. If your leaf samples showed adequate K and symptoms of deficiency were not observed, focus on maintaining adequate K levels by replacing what was removed. If you had low yield this year, you may dial back your K application. If you had an above average harvest, an above average K application would be appropriate.

The table below considers possible yields per acre and breaks down how much K is removed in the crop (column 2), how much potassium sulfate would be needed to replace that K if every bit applied were taken up by the tree (column 3), and how much potassium sulfate actually needs to be applied estimating that only about 50% of what is applied will be taken up (column 4). Thus column four lists how much is reasonable to apply to replace what was taken off in the previous harvest.

Potassium Application Necessary Based on Harvested Yield

Yield (Dry tons/acre)	Potassium Removed with Crop (lbs K_20)	Potassium Sulfate (lbs/acre) Required to Replace Potassium Removed with Crop	Potassium Sulfate (lbs/acre) Needed at 50% Application Efficiency
1.0	26	49	98
1.5	39	73	146
2.0	52	97	194
2.5	65	121	242
3.0	78	145	290
3.5	91	169	338
4.0	104	193	386
4.5	117	217	434

Table by R. Buchner, UCCE Tehama

Application

Potassium ions are positively charged (K^+) and are thus adsorbed to the negatively charged surface of soil particles, much like opposite poles on a magnet are attracted to each other. Since K adsorbs to clay particles and prunes are often planted on heavy (high clay) textured soils, sufficient material must be concentrated in small areas to overwhelm the soil's ability to hold K and keep some K in soil solution for uptake by the trees. For this reason, K needs to be banded or shanked, not broadcast, and always applied to the same area year after year. Banding should be 4 to 5 feet from the tree row. Calcium ions (Ca^{++}) have a two plus charge and can replace K^+ on the negatively charged clay particles making more K available to tree roots in the soil solution. Gypsum ($CaSO_4$) banded at a rate of 1000 to 4000 pounds per acre in the same location as previous potassium bands may improve K availability.

Potassium is commonly applied as potassium sulfate or potassium chloride. Potassium sulfate (0-0-50; sulfate of potash) applied in the fall or winter should be banded in non-tilled orchards with solid set or micro-sprinklers, or shanked in where orchards are cultivated or flood irrigated. Orchards on well-drained soil can use potassium chloride (0-0-60; muriate of potash) at about the same rate, provided ample rain occurs to leach chloride out of the root zone (at least 10 inches of rainfall by 6 weeks before bud break). Applying after leaf-drop will help avoid chloride uptake by the tree. Potassium chloride should not be used on young or weak trees, or in orchards with fluctuating water tables, hardpans, stratified soils or any other restriction that would keep the chloride from moving down out of the root zone with excess soil water.

Cytospora cankers can destroy an orchard

Joe Connell, UCCE Farm Advisor Emeritus, Butte County
Franz Niederholzer, UCCE Farm Advisor, Colusa/Sutter/Yuba Counties

Extreme heat, potassium deficiency, water stress, or heavy cropping can result in sunburn and borer attacks followed by cytospora cankers caused by the fungus *Cytospora leucostoma*. Cytospora canker is a weak pathogen that is spread by wind and rain to bark damaged by other stresses. Recent work suggests that cytospora can enter prune trees through pruning wounds (Figure 1). The fungus shows maximum growth in hot temperatures (around 90^{o}F) and is particularly active in late summer to early fall.

These cankers first girdle branches causing branch dieback. If not pruned out properly, cankers continue to grow down into primary scaffolds killing more wood as they expand. Major scaffold limbs will die with trees compromised sufficiently to require tree removal if these cankers are not eliminated early enough through proper pruning.

To identify limbs killed or weakened by cytospora cankers, look for dark, sunken cankers on the bark of limbs showing dieback, or branches where dead leaves are still attached. Active cankers have distinct zonate margins (Figure 2). Small white spots called pycnidia found on dead wood confirm the presence of *Cytospora* (Figure 3).

If the pruning crew is not paying enough attention to their cuts to eradicate the infection they are wasting their labor and your money! Poor pruning (incomplete eradication) won't control the disease. If limbs are not cut below the cankers the problem is not solved and trees will continue to decline. Pruners must cut into healthy wood several inches to one foot below any canker symptoms. Have them check the cut surface of pruned limbs to ensure that all disease has been removed (Figure 4).

Cutting out cytospora in vigorous orchards must be balanced with orchard performance and how much bearing surface is left after all damaged scaffolds and branches are cut out. All older orchards show some cytospora. Well-managed orchards – adequate water, nitrogen, potassium, etc. – will not be as impacted by cytospora as weaker blocks. In order to maintain production in strong orchards, a grower may elect to leave some limbs with bark damage in the tree, even if sunburned or cytospora infected. If production is off and the orchard is filled with cytospora cankers, but strong water sprouts are found in the crotches and lower branches, remove larger older wood with cankers and improve irrigation and fertility. For a weak orchard riddled with cytospora and wood rot, the best approach might be replanting. Bottom line: all growers should spend a day with a saw and the pocket guide found later in this newsletter to evaluate each orchard.

There is no chemical control for cytospora. Cankered wood must be removed from the orchard and burned. After cankers are pruned out, paint exposed trunks and scaffold crotches with white interior latex paint to protect them from sunburn. Maintain adequate orchard water status, especially after harvest, and avoid potassium deficiency, spider mite infestation, or prune rust defoliation that can increase sunburn and disease potential.

For more detailed information on disease management and for excellent photos of disease symptoms and fungus signs that will help you know what to look for, visit the IPM web page http://www.ipm.ucdavis.edu/PMG/r606100311.html.

Figure 1. Second leaf interplants in a mature orchard with C*ytospora* infections likely caused by pruning wounds. *Cytospora* pycnidia (spore source) are present in the mature trees.

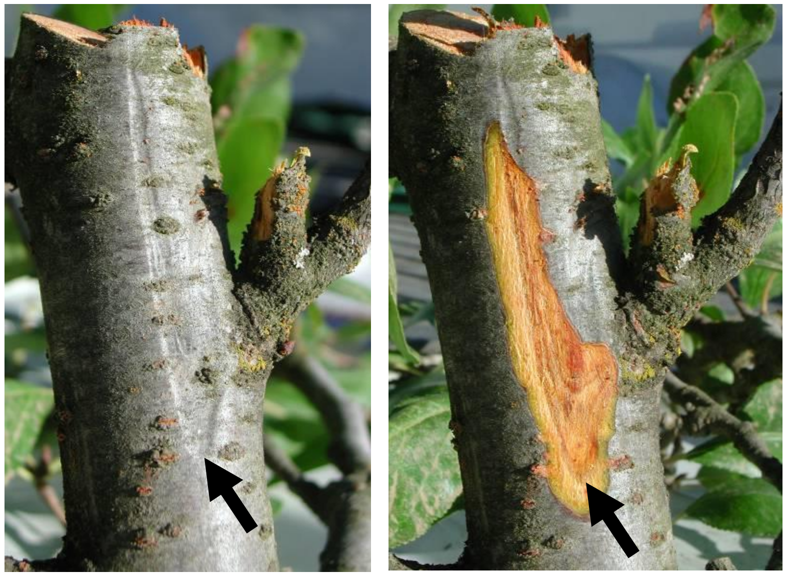

Figure 2. The lower margin of a *Cytospora* canker is detected as a sunken area on the branch where bark has been killed. Arrows point to canker edges, revealed by a knife cut in the second photo.

Figure 3. Pycnidia, characteristic of *Cytospora*, are black or white pimple-like spore producing structures found on dead wood.

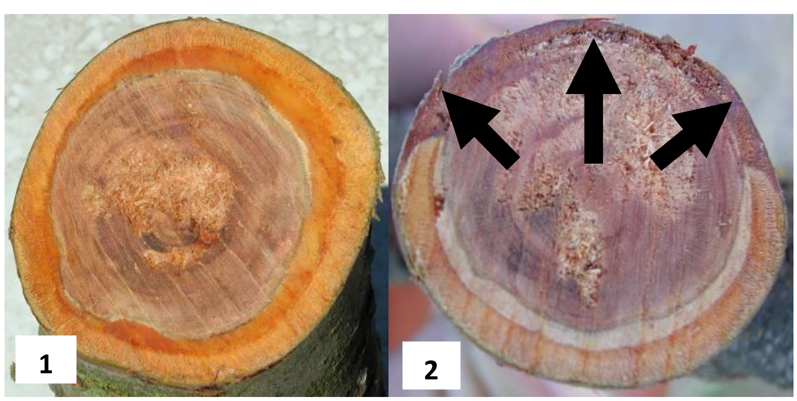

Figure 4. Good cut (1) made below canker margin showing only clean bark. Bad cut (2) not far enough down the limb showing diseased bark (arrows) and canker still remaining in the tree.

University of California
Agriculture and Natural Resources

A pruners pocket guide for cutting out dead and diseased prune wood.

Good cut. Clean, healthy bark all around the cut.

Fold Here

Bad cut. Bark dead & collapsed, in top half of the cut.

Fold Here

Fold Here

University of California
Agriculture and Natural Resources

Bad cut. Darkened, dead bark on the top half of cut.

Fold Here

Bad cut. One quarter of bark is bad. That's too much.

Irrigation System Maintenance

Dani Lightle, UCCE Farm Advisor Glenn, Butte & Tehama Cos
Kevin Greer, TCRCD Mobile Irrigation Lab

Over the last several years, the UCCE's Sacramento Valley newsletters for tree crop growers have emphasized optimizing irrigation efficiency and scheduling through approaches such as soil moisture monitoring, estimated evapotranspiration (ET), pressure chambers, and increasing system distribution uniformity (DU). High DU ratings indicate even water supply across the orchard, a vital key to ensuring that all trees are receiving similar quantities of water. Low DU results in simultaneous over- and under-irrigation occurring across the orchard block, higher water use to meet the demands of every tree, and unnecessarily long pump run times.

Assuming good irrigation system design, elements that contribute to high DU are balanced pressures, matching sprinkler types and nozzle sizes, and system maintenance. The most commonly identified irrigation issues reported in the Sacramento Valley between 2002 and 2013 were pressure and maintenance problems (Figure 1). Poor maintenance is one of the leading causes of systems that are not applying water uniformly to each plant. Greater than 80% of the systems with below average DU (DU < 83%) had pressure and/or maintenance problems. Of the systems with above average DU (DU > 87%), nearly half still had maintenance issues that could be corrected to further improve their DU. System maintenance is an essential (although frequently unmentioned) component of an efficient irrigation system that is easy to overlook amid the numerous demands required to run an effective growing operation.

It is best to purposefully schedule system maintenance during the intensive irrigation season. All types of irrigation systems can benefit from maintenance, although the intensity and amount of time required varies pointedly by irrigation system type. While micro and drip systems tend to be the most uniform in application when well maintained, the amount of attention they require to run at optimal levels is substantially higher than other systems. Regardless of the system, adopt routine maintenance practices.

Irrigation pump

- Clean primary filters (at the pump) and any secondary filters (often located in the field). Backwash to remove organic or particulate matter. If using a sand media filter, check that sand is not caking and replace what is lost in backwash cycles. Be sure you have installed the correct type of filter for the type of debris in your water source.
- Pressure gauges should be installed before and after filters. If there is a 5 to 7 psi difference between the two gauges, check for filtration plugging. Replace gauges (about $15) approximately every 3 to 5 years because reliability decreases in aging gauges.
- Ensure that pressure regulating valves are accurately providing the desired pressure by checking against a quality new pressure gauge.

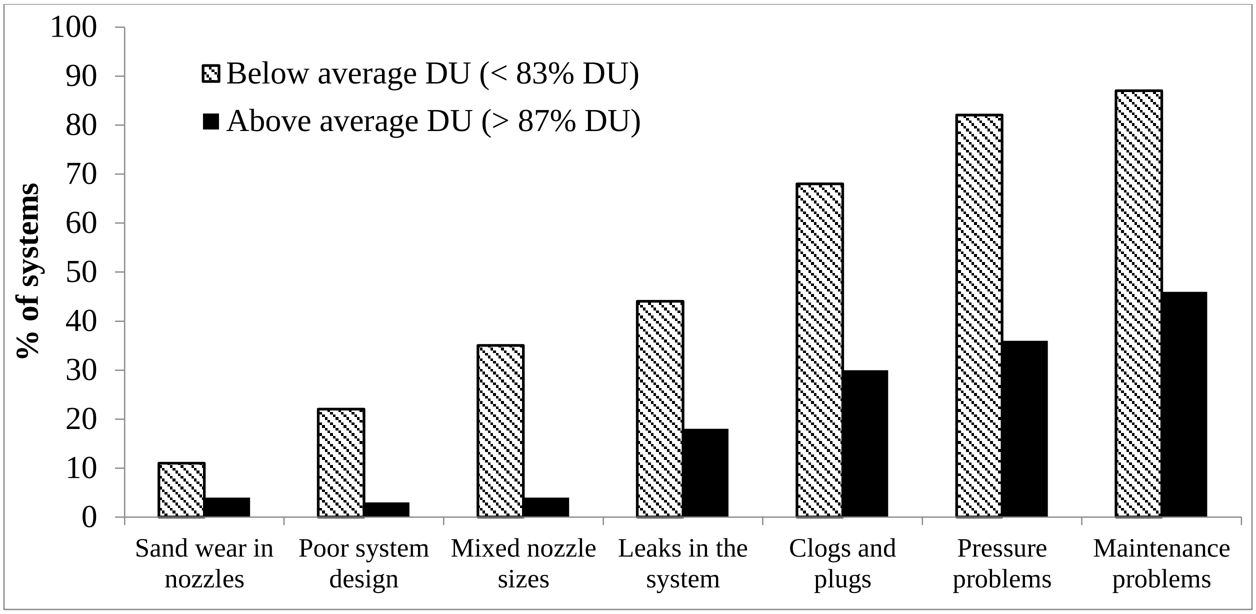

Figure 1. Problems identified in 209 micro-irrigation system evaluations between 2002 and 2013 in the Sacramento valley. Data courtesy the TCRCD Mobile Irrigation Lab.

Flood and furrow irrigation

- Ensure that borders are not leaking or seeping into the neighboring dry checks. This occurs as a result of erosion over time. Check for high or low spots within the check and level as needed.
- Verify there is no erosion around the head above the check valve and repair as needed.

Solid set systems

- Compare the flow rates of your sprinklers to the manufacturers' specifications to determine if sand wear is contributing to worn nozzles. Check nozzles after 5 years and monitor thereafter. When replacing worn nozzles, replace with the same type and model. Replace nozzles in the entire orchard on a regular schedule because new nozzles will have different flow rates compared to old ones.
- Following each irrigation, open the flush out valves at the ends of main and submain lines and leave open until water runs clear. If heavy sand is consistently being flushed, there may be problems with the effectiveness of the pump station filter.

Micro & drip systems

- Systems should be inspected at every irrigation event for plugs and leaks in the lines. Any lines that have leaks should be repaired by splicing the lines together. Tape will not work, and plugs will increase the size of the hole or crack over time.
- Check for clogged nozzles with a flow test for reduced output. If changing nozzle heads, ensure you are replacing with nozzles of the same size. Check drip emitters for clogs and examine around emitters for bacteria or calcium build-up. Depending on the type of clogging, chemical treatments may be needed.
- Plugs can be a significant problem at inlet screens. The type and quantity of debris may indicate a problem with filtration effectiveness at the pumping station, which may need an upgrade. If plugs are a consistent problem, some growers remove the screens. If you remove screens, hose line flushing and checking for plugged emitters should be done more frequently.
- Flush the lines approximately every other week and after chemigation and fertigation applications. Begin with the mainlines, followed by submains, then laterals. Check the clarity of the water on the

lines that are hydrologically furthest from the pump station. If water flushed from the lines is dirty, lines need flushed more frequently; if water is clear, the current flushing schedule is sufficient.

- Emitters should be run at the pressure ranges listed in the manufacturers' specs. If pressures are too high or too low, the distribution patterns, flow rates, and overall operation is no longer functioning as designed. Pressure regulators maintain uniform pressures to each inlet. If the pressure leading into the regulators is too low, the regulators will not operate and emitters will not function correctly.
- For further troubleshooting help for common problems such as clogging, see http://micromaintain.ucanr.edu.

Irrigation evaluations can be invaluable for determining the nuances in your orchard, in addition to providing a specific DU rating. Through detailed system information, growers obtain another effective tool that can aid in making accurate irrigation decisions. On site evaluations can be scheduled through the Tehama County RCD Mobile Irrigation Lab. The service is completely confidential and free for growers in Shasta, Tehama, Glenn, and Butte counties. Service to growers outside of these counties is available for a fee. More information can be found at http://www.tehamacountyrcd.org/services/lab2.html or by contacting Kevin Greer at kevin@tehamacountyrcd.org or 527-3013 x102.

Fall Weed Management Considerations in Prune Orchards

Emily J. Symmes, UCCE Area IPM Advisor, Sacramento Valley
John Roncoroni, UCCE Perennial Crops Weed Science Advisor, Napa County

Post-harvest weed surveys are essential for effective integrated weed management programs. Identifying the perennials, germinating winter annuals, and summer species that escaped the past season's control tactics will inform the coming year's control strategies. Weed identification tools are found online at ipm.ucdavis.edu/PMG/weeds_intro.html and wric.ucdavis.edu/. Recently published Weed Pest Identification and Monitoring Cards with descriptions and photographs of growth stages of 48 common California weeds are also handy for field scouting (available for purchase at anrcatalog.ucdavis.edu/Details.aspx?itemNo=3541 or order through your local Cooperative Extension office).

Surveys should be conducted after the first rain and germination of winter annuals. A fall weed survey form for prunes is available at ipm.ucdavis.edu/PMG/C606/prune-fallweeds.pdf. Use this form to note the weeds present, level of infestation, and locations (in or between tree rows). Map the distribution of weeds in your orchard for early observation of emerging problems (new species, possible resistance) using the space on the monitoring form or a GPS-based method. Early detection and intensive, localized control can prevent problems from becoming widespread. Weed monitoring, coupled with good record-keeping, can help you track the effectiveness of your management practices, detect early problems, avoid over- or undertreating, and ensure the right tactics, materials, and treatment timings are used.

Resistance management should be in the forefront when making weed control decisions. A good monitoring program, as discussed above, can help identify early patterns of weed escapes and possible resistance. However, in order to mitigate development of resistance, an integrated management approach should be adopted BEFORE detection of resistance in the population. In general, recommendations for managing herbicide-resistance in weeds involve non-chemical methods (e.g., mechanical cultivation) coupled with appropriate and effective herbicides. Incorporating multiple herbicide modes of action in the spray program is vital to managing resistance development. Including preemergence herbicides in the spray program reduces dependence on postemergence materials and increases the available modes of action. Tank mixes can increase the range of weeds controlled while also providing diversity in the applied modes of action. Even when using tank mixes containing multiple modes of action, remember that rotation of chemistries throughout the season is central to limiting resistance development. This will avoid the same selection pressures being applied to weed populations generation after generation. Know your product's active ingredient, its efficacy on the target weed(s), and its mode of action to ensure proper selection and rotation of chemicals. A searchable database of weed susceptibility to herbicides is available at info.ucanr.org/weed_sept/. The table below shows the mode (site) of action classification for herbicides registered for use in prune (outlined by red).

Preemergence herbicide considerations:

- Must be applied prior to weed emergence or combined with a postemergence material.
- Efficacy is improved when applied to a clean soil surface. Remove leaves and debris prior to application to improve soil contact and performance.
- Require incorporation for activation within 21 days after application. Rainfall or irrigation (0.25-0.50 inches) works for most preemergence materials. Some materials require almost immediate mechanical incorporation for maximum efficacy. Refer to product label for specific details.
- Treatments should be applied in late winter (before mid-February) or split into two applications (first in fall and second in late winter). Many growers wait for the rainy season to apply because most herbicides are more effective when applied to moist soil. Weeds will have germinated and a postemergence herbicide will also be needed.
- Tank mixes of pre- and postemergence herbicides can be more effective than either one alone depending on the targeted weed spectrum.
- Plan ahead. Preemergence use should be discontinued at least 1 year prior to orchard removal and replanting due to their long residual periods. Use cultivation or postemergence herbicides instead. If replants are necessary and preemergence herbicides have already been applied, use clean, untreated soil to backfill around the tree's roots.

Postemergence herbicide considerations:

- Some growers apply multiple postemergence treatments rather than preemergence treatments or a combination of the two, particularly if orchard access is limited by conditions during preemergence treatment time.
- Postemergence materials are most effective in controlling small, actively growing weeds (less than 4 inches tall). Control of larger and/or moisture-stressed weeds is less effective with postemergence materials.
- Applying after irrigation can improve efficacy of many postemergence materials.
- Spray additives such as ammonium sulfate (AMS), spreaders and stickers, and citric acid can improve efficacy of many postemergence herbicides.
- Tank mix combinations of postemergence herbicides can control a broader spectrum of weeds than individual materials. Be aware of which weed species you are targeting and refer to herbicide susceptibility tables to choose the best material(s) for the job.
- Always be cautious of postemergence applications and the proximity to green crop tissue to avoid tree injury. Watch wind conditions and use hooded sprayers, drift-reducing nozzles, or low-volume applicators mounted to ATVs for good control and reduced risk of drift and herbicide damage.

Hairy fleabane populations with resistance to postemergence products containing glyphosate and glyphosate + paraquat are present in parts of California, increasing the need for careful selection and use of herbicides with alternative modes of action. Even susceptible fleabane populations can be difficult to control with preemergence herbicides alone and postemergence herbicides are effective only when plants are small (fewer than 8 to 10 leaves). Recent UC research has shown that various tank mixes combining one or more preemergence materials with postemergence herbicides were effective in controlling weed populations, including hairy fleabane. Refer to the table below for the pre- and postemergence products registered for use in prune and to compare modes of actions when selecting materials. Always check product labels of all materials included in tank mixes for specific mixing regulations and instructions.