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Mechanical Pruning Trial on Tulare County Prunes

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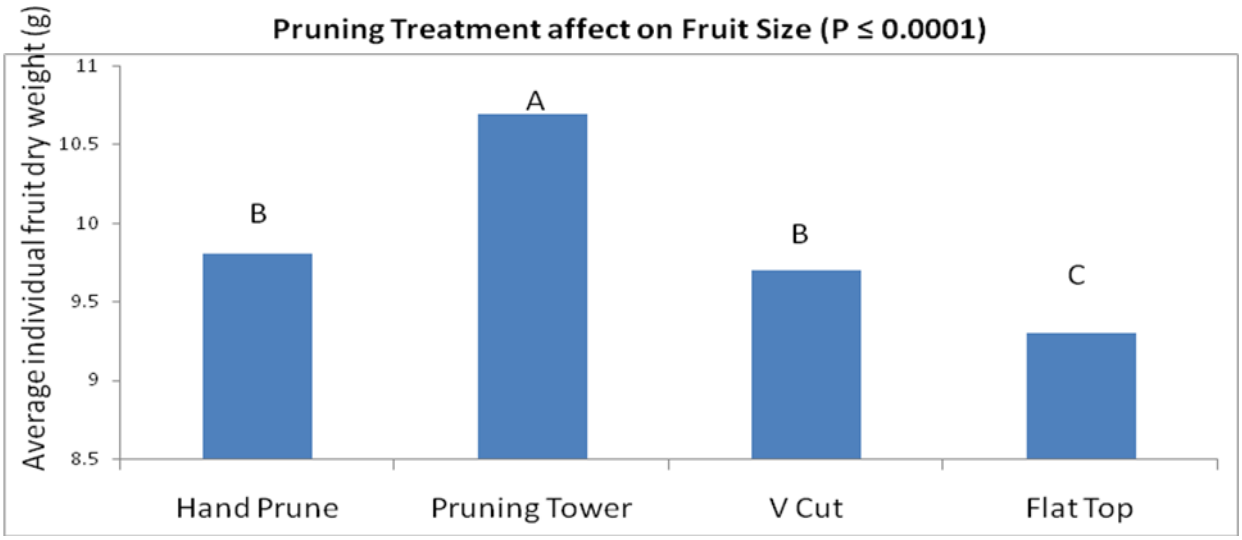
After the encouraging results from a mechanical pruning trial on prunes conducted by Farm Advisors Bill Krueger (Glenn Co.) and Franz Niederholzer (Sutter and Yuba Cos.), a similar trial was established in Tulare County to determine whether mechanical pruning techniques may be incorporated into prune culture in the southern San Joaquin Valley. One field season of the Tulare County trial is now complete, and preliminary results are in. Multiple years of further investigation, however, are required to adequately assess the long-term impacts on yield, orchard vigor, and cost effectiveness of implementation of these pruning treatments.

In northern California, mechanical pruning to create a "V" in the top of prune trees, followed by dormant pole pruning from the ground, resulted in increased yields over standard hand-pruned trees without compromising fruit size. Additionally, the "V" cut plus dormant pole prune treatment cost over 50% less per acre than the standard hand-pruned plots in the northern California study. The incorporation of mechanical pruning costs approximately $40/acre; however, the mechanical pruning expense is in addition to some ground work. Consequently, the economic savings of adding a mechanical pruning component is still determined largely by the cost of the subsequent hand labor component.

In February 2010, plots were established in a commercial prune orchard near Porterville, CA. Four pruning strategies were incorporated into the trial: mechanical V-cut, mechanical topping, use of pruning-tower, and standard hand-pruning from ground and ladders. Mechanically-pruned plots and those pruned with the aid of a pruning tower also had a more cursory hand-pruning operation follow the mechanical treatment to enable addition of select cuts. Two techniques were utilized to assess the impact of pruning treatments on overall tree size. The first technique was implemented approximately one month after pruning, and consisted of a measurement of tree height in a random sample of trees within each plot. Trees in Flat-topped plots were statistically shorter than trees in other plots; however, the affect on tree height was not visually apparent in the field. The second technique, a measurement of canopy light interception, was implemented approximately one month before harvest. Bruce Lampinen (Extension Specialist, UC Davis) and Sam Metcalf (UC Davis, Plant Science) provided equipment and technical assistance in measuring light interception in the orchard.

Pruning treatments had no effect on either fresh or dry yield. Pruning treatments did affect prune size, as determined by dry weight of individual prunes (Fig 1), with the largest fruit observed in plots pruned with pruning towers. The standard hand-pruned plots and the plots receiving a mechanical V-cut performed similarly with respect to fruit size, and the flat-topped plots exhibited smaller fruit size. Prunes will be run through a sizer to determine the affect of pruning treatments on commercial fruit size. This data, as well as orchard light interception data, will be presented at the annual Southern San Joaquin Valley Prune Day in February 2011.



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Prune Out Cytospora Cankers to Reduce Disease

Joe Connell, UC Farm Advisor, Butte County
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Dormant pruning renews fruit wood, moderates a heavy crop, and reduces limb breakage, potassium deficiency, small fruit sizes and high dry away ratios. It is also the first step toward eliminating Cytospora cankers and the dead wood associated with them. 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. Cankers will have distinct zonate margins (Figure 1) that are different from the streaking and flecking in the tissue that is characteristic of bacterial cankers.

Pruning out diseased limbs and burning them will reduce disease pressure and spores that can spread disease to new wood next season (Figure 2). Be sure to cut into healthy wood several inches to one foot below any canker symptoms. Check the cut surface of damaged limbs to ensure that all disease has been removed (Figure 3). Incomplete canker removal wastes time and money and won't control the disease.

Cytospora canker is a weak pathogen caused by the fungus *Cytospora leucostoma* that's spread by wind and rain to bark damaged by other stresses. To minimize this disease and the loss of fruit wood, scaffolds, and potentially entire trees, avoid in-season stress factors that predispose prune trees to disease spread such as potassium deficiency, water stress, sunburn, and subsequent borer attacks. The fungus shows maximum growth in hot temperatures around 90^{o}F and is particularly active in late summer to early fall. Trees planted on shallow and/or heavy textured (clay) soils are generally more likely to suffer economic damage from Cytospora.

There are no chemical controls for Cytospora cankers. To manage infection and reduce disease spread, avoid tree stress and remove cankered wood from the orchard and burn it. Prune to minimize sunburn

potential, and paint exposed trunks and scaffold crotches with white interior latex paint to further protect them from sunburn. Maintain adequate orchard water status, especially after harvest, and avoid spider mite 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 (www.ipm.ucdavis.edu) and click on agriculture and floriculture; Prune; and Cytospora canker (under diseases).

Figure 1. Cytospora cankers are detected as sunken areas on the branch where bark has been killed. Arrows point to canker edges, revealed by a knife cut in the second photo.

Figure 2. Pychnidia, black or white pimple-like spore producing structures found on dead wood.

Figure 3. Good cut (1) below canker showing only clean bark. Bad cut (2) not far enough down showing diseased bark (arrows) and canker remaining in the tree.

Controlling Glyphosate - Resistant Weeds in Orchards with Rely®, Understanding the Issue and Managing the Solutions

Brad Hanson, UC Weed Extension Specialist, Davis Doug Munier, UC Farm Advisor, Glenn, Butte and Tehama Counties

By now, many tree fruit and nut producers in the Central Valley are familiar with glyphosate-resistant weed species. In the north Sacramento Valley, glyphosate resistant ryegrass is widespread. In the south Sacramento Valley and through much of the San Joaquin Valley, many horseweed and hairy fleabane populations are no longer controlled with formerly effective glyphosate applications.

With herbicide-resistant weeds, spontaneous changes or mutations in the DNA of an individual plant can lead to changes in plant biochemistry and result in loss of efficacy of a single herbicide or whole classes of herbicides for the new biotype. When a resistant biotype is first introduced into a field, whether from a new mutation or seed introduction from another area, it is usually a single plant or perhaps a few individuals and probably is not a noticeable weed problem. However, if those resistant plants produce seed and the same herbicide is used again (and again) the resistant biotype can become dominant in the population in just a few generations.

For most conventional fruit and nut producers, rotating herbicide modes of action is a critical first step in reducing problems with herbicide resistant weeds while ensuring the viability of currently available herbicides. However, wherever feasible, non-chemical weed control techniques like mowing, tillage, and handweeding should also be used to supplement chemical weed control tactics.

One postemergence herbicide that is becoming more important in tree and vine crops is glufosinate, commonly sold in California as Rely®, Rely 200®, or the newest formulation Rely 280®. Rely® is a very good, broad spectrum herbicide that can provide control of many common weeds, including several glyphosate-resistant species. However, similar-sounding chemical names and Rely® marketing strategies have led to some confusion about the relative strengths of glyphosate and glufosinate.

The biggest difference in weed control efficacy of these two herbicides is related to the translocation, or systemic movement, of the active ingredient once it enters the plant. Glyphosate is generally very well translocated in susceptible plants, while glufosinate translocation is much more limited. Because of the reduced levels of translocation, good coverage (adequate water volume, nozzle and pressure selection) is much more critical for glufosinate compared to glyphosate.

On small broadleaf weeds, glufosinate and glyphosate often provide very similar levels of control, as long as spray coverage is adequate. Because the growing point of grass weeds is below the soil surface, these weeds can be more difficult to fully control with glufosinate; good burn down of treated tissue is usually observed, but regrowth can occur. Similarly, in established perennial weeds, glufosinate is usually less effective than glyphosate due to regrowth after the initial burn down.

Although Rely® does not have the same weed control properties as glyphosate, especially, for grasses and perennial weeds, it is a very useful herbicide for reducing selection pressure for new glyphosate-resistant weed biotypes and for managing existing glyphosate-resistant populations. Glufosinate and glyphosate have completely different target enzymes in different biosynthetic pathways. Thus far, there are very few reports of resistance to glufosinate and no reports of glyphosate-resistant weeds also being resistant to glufosinate.

Thumbnail comparison of glyphosate and glufosinate herbicides.

Chemical name	***Glyphosate***	***Glufosinate***
Trade name(s)	Roundup®, Durango®, Honcho®, etc	Rely®, Rely® 200, Rely®280
Mode of action	Inhibits EPSP synthase (EPSPS) enzyme.	Inhibits glutamine synthetase enzyme
Selectivity	Non-selective	Non-selective
Soil activity	Essentially none	Essentially none
Translocation	Very good	Limited
Coverage needed	Less critical	Critical – especially on larger weeds
Broadleaf weed control	Broad spectrum. Good control of small to medium plants but can vary with large weeds.	Broad spectrum. Good control of small weeds, less effective on large weeds or dense stands due to coverage.
Grass weed control	Broad spectrum. Usually good control of vigorously growing grasses.	Broad spectrum. Control can vary by size - seedling grasses often controlled, small established grasses may be burned down but regrow, some success with medium-sized grasses nearing maturity.
Perennial weed control	Good – can vary depending on plant size and time of year.	Poor – burns tops; however plants often regrow from roots/rhizomes.
Resistance reported	Yes, in California – ryegrass, horseweed, hairy fleabane, others suspected. 19 species worldwide.	Not in California. Ryegrass in Oregon, goosegrass in Malaysia.

When used as part of a well-planned weed management program, Rely® can be an effective weed control and resistance management tool for orchard crops on which it is labeled. It is important to remember that Rely® does not translocate as well as glyphosate and applications should be planned accordingly. Best season-long weed control and reduced selection of herbicide-resistant weed biotypes is likely to be obtained using combinations of preemergence herbicides, postemergence applications of glyphosate and glufosinate or other burndown materials, and non-chemical control tactics wherever possible.

Rely® is currently labeled for use in apples, grapes, and tree nuts; however, the manufacturer is seeking additional registrations for stonefruit and other perennial crops. Always read and follow current label instructions to avoid crop injury and illegal herbicide applications.

Scale Pests in Prune Orchards and Keeping a Balance of Natural Enemies to Control Them

Carolyn DeBuse, UC Farm Adviser, Solano and Yolo Counties

Three scale pests are commonly found in prune orchards, with only one known to be of economic importance: San Jose scale (*Diaspididae perniciosus*). The other two, Italian Pear scale (*Epidiaspis leperii*) and European Fruit Lecanium (*Parthenolecanium corni*), are of minor importance but should still be monitored and treated if populations get too high. The dormant season is the best time to monitor the scale populations, but monitoring should continue into summer and through harvest. The best control for scale is a well balanced population of natural enemies within your orchard. While monitoring scale, you should also monitor parasites and predators of scale so that you have the complete picture when deciding if you need to treat. The chemicals you use in the orchard throughout the year can play a very big part in the survival of scale's natural enemies.

Identifying scale

San Jose Scale (SJS) can be found feeding on limbs, fruit wood, spurs, leaves and fruit. Damage is caused by sucking plant juices from the plant and excreting a toxin while feeding. This can weaken the tree and scar the fruit. Female scales are round and have a hard grey covering (fig.1, center). Male scales are oval (to the right of the female in fig.1) and when adult males emerge, they are yellow and winged. They can be distinguished from the yellow *Aphytis* scale parasitoid by a black band across the abdomen. First instar crawlers are yellow and are very small.

Fig. 1, San Jose Scale (photo Jack Kelley Clark)

European Fruit Lecanium (aka. brown apricot scale) is a large domed soft scale that lays its eggs under the cover of the female scale.

Italian Pear Scale is the smallest scale and is often difficult to see because they hide under lichen. You can identify them by scraping the lichen off and seeing the reddish brown female scale bodies underneath.

Monitoring and treatment decisions

Scale is best monitored in the dormant season by spur sampling. Collect 100 spurs from the orchard, choosing older spurs from the interior of the tree. Look for scale using a hand lens or dissecting microscope. Count scale infested spurs and also look for parasitized scale. This is indicated by a small exit hole on the top of the scale. If in the first 20 spurs, 4+ infested spurs are found, treatment is needed. If less than 4 infested spurs, then continue looking at the next 20 spurs.

	Number of infested spurs with San Jose Scale		
Sample number	Stop sampling	Treat	Keep sampling
First 20 spurs	0	4+	1-3
First 40 spurs	1	6+	2-5
First 60 spurs	3	8+	4-7
First 80 spurs	5	9+	6-8
100 spurs	9	10+	-

Table 1. Treatment Thresholds for San Jose scale (table copied from the UC IPM guidelines www.ipm.ucdavis.edu)

When is a no treatment decision reached? See Table 1 for treatment thresholds. Aphid eggs should also be counted while doing spur sampling. If any aphid eggs are found, then a dormant treatment is recommended. For more information on monitoring throughout the year and treatment decisions, go to http://www.ipm.ucdavis.edu/PMG/r606900511.html

Natural Enemies of Scale Insect and Keeping the Balance

Although treatment is sometimes needed when the scale infestation is heavy, more often the naturally found scale predators (lady beetles and lace wings) and parasitoids (*Aphytis* spp. and *Encarsica permiciosi*) keep the scale population under control. Timing of pesticide use and the type of pesticide you choose can negatively affect the natural balance between the scale and its enemies. See Table 2 for a summary of pesticides and the impact they have. Dormant and bloom timing has the least effect over all, and in-season timing can do the most harm. But dormant pyrethroids or spring applied spinosad has a greater effect on scale natural enemies than other pesticide choices or oil used at the same time. Sprays applied in-season can affect parasitoid populations and may increase the need to monitor and treat for scale in the following year. Natural enemies help reduce pesticide use, so promoting the best conditions for them to thrive by carefully thinking out all aspects of pesticide choice will be time saving and economical in the long run.

Table 2. **Relative Impact of the Timing of Pesticide Applications on Natural Enemies** (Source: UC pest Management Guidelines; www.ipm.ucdavis.edu/PMG/r606900311.html)

Natural Enemy	Dormant					Bloom Time				In-Season						
	Oil	Oil+ pyrethroid[1]	Oil+ OP[2]	Oil+ IGRs[3]	Oil+ spinosad	Bt[4]	IGRs[3]	Oil	spinosad	IGR[5]	OP[2]	Pyrethroid[1]	spinosad	Carbamate[6]	Oil	Neo-nicotinoid[7]
Lacewings	L	L	M	L	L	L	L	L	L	M	M	L-M	L-M	H	—	M
Lady Beetles	L	L	L	L	L	L	L	L	M	L	H	H	H	H	—	—
Minute pirate bugs	L	M	M	L	L	L	L	L	L	L	H	H	H	H	—	—
Scale Parasites	L	H	L	L	L-M	L	L	L	H	M	H	H	M	H	—	H

H = high M = moderate L = low — = no information

[1] pyrethroid (e.g. Asana, Warrior)
[2] OP = organophosphate (e.g. Diazinon, Guthion, Imidan, Lorsban, Supracide)
[3] IGR = insect growth regulator (Dimilin, Intrepid, Esteem, Seize)
[4] Bt = *Bacillus thuringensis*
[5] Inseason use of some IGRs (e.g., methoxyfenozide-Intrepid) has a reproductive impact on parasites and lacewings
[6] carbamate (e.g. Sevin).
[7] neonicotinoids (Actara, Provado)
[8] inseason use of OPs on aphid parasites: Diazinon = M, Imidan = L, Lorsban = —
[9] inseason use of pyrethroids on aphid parasites: Asana = L, Warrior = —

Using High Oil Rate Before Bloom: Why Do It?

Franz Niederholzer, UC Farm Advisor, Sutter/Yuba Counties

A high rate of horticultural oil in a dormant spray can give significant benefits to prune growers. However, a high rate of oil can cost $20/acre or more and risks oil burn under the wrong conditions (dry orchard soil or trees), so growers should weigh the benefits against the costs.

"Horticultural oil" refers to superior or supreme oil (440 or 470), regular dormant oil, or dormant flowable emulsion ("mayonnaise"). All these materials are effective at moving bloom and controlling scale. Summer oil (415) is not recommended for dormant application. With superior or supreme 440, a "high" rate is 3-4 gallons/acre. Consider orchard conditions (Tree age, orchard moisture, etc), the product label and your PCA's recommendation when selecting oil rates in dormant or delayed dormant prune orchards.

High rates of horticultural oil can advance prune bloom date 3-5 days when applied in late December through mid to late January. Earlier bloom can help growers avoid heat damage at bloom and can help with equipment and labor management at bloom time if a grower has several orchards and only sprays part of the trees with a high rate of oil.

A high rate of oil before bloom (alone, no pesticide) also gives good control of low to moderate populations of San Jose scale. Add a pesticide (Centaur, Seize, or diazinon) to oil in the spray tank and you get excellent control of high populations of scale. Oil is a great insecticide resistance management choice in a scale control program because it kills scale by suffocation, not by a chemical action. A dormant spur sample, taken anytime from mid-November to mid-January, will show if scale are a problem and need to be treated. Information on dormant spur sampling is available on the internet at http://www.ipm.ucdavis.edu/PMG/r606900511.html or from your local UC Farm Advisor. The best timing for scale control with oil is in the delayed dormant period. Spraying oil for scale in the full dormant timing reduces scale populations, but not as much as the delayed dormant timing.

When should oil be applied to advance bloom? A good ballpark spray window is the old standby -- late December through mid-January. If you want to try to fine tune your dormant oil application, consider applying oil once a certain amount of chilling has accumulated -- 30-50 chill portions using the new Dynamic Model calculations. [This timing usually works out to being from mid-December into late January.] For information on the Dynamic Model and how to use it to time a dormant oil application to advance bloom, see information on the internet at: http://fruitsandnuts.ucdavis.edu/Weather_Services/ and click on "Prune Chilling Prediction Model".

So, heavy oil can be used to advance bloom in the dormant period but gives best scale control when sprayed in the delayed dormant. When should you spray a heavy oil rate in a prune orchard? It depends on the biggest concern in an orchard – bloom timing or scale. If a grower's primary concern is advancing bloom, then spray in the dormant period. This timing will also provide good scale control. If scale control is the biggest concern, apply oil during the delayed dormant period. This timing has less risk of oil burn, but will have little effect on bloom timing.

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