



COOPERATIVE EXTENSION ... UNIVERSITY OF CALIFORNIA

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FALL PRUNE NUTRITION by Richard Buchner - UCCE Tehama County

Sacramento Valley prunes are most typically deficient in nitrogen, potassium and zinc. 2004 tissue samples from 23 orchards in the Integrated Prune Farming Practices (IPFP) project showed 67 percent of the sites were nitrogen deficient (less than 2.2%), 72 percent were zinc deficient (less than 18ppm) and none were deficient in potassium (less than 1.3 %) or boron (less than 30ppm). Current production economics may be responsible for less applied nitrogen and more orchards in the deficient range. Fall application of nitrogen is not suggested since uptake efficiency is very poor as leaves fall and trees enter dormancy. Fall is an excellent time to address zinc and/or potassium nutrition.

POTASSIUM

Potassium deficiency can be a problem in the Sacramento Valley. Many farmers are following a good potassium program, which along with an extremely light crop for 2004 may explain why none of the IPFP surveyed sites were deficient. Potassium deficient trees show symptoms in early to mid summer, maybe earlier for severe deficiencies. Leaves become pale and leaf size, shoot growth and fruit size are reduced. By mid summer, leaves turn a buckskin color and develop marginal scorch. Scorch can involve the entire leaf especially after hot weather or with a heavy crop. Fruit sunburn and shoot dieback may occur. Tree vigor, water stress, diseases and/or sunburn can mimic potassium deficiency. A July leaf sample is useful to confirm if potassium is low. When you have confirmed a potassium deficiency you can pick a solution that works best for your orchard. Not every technique will fit every orchard.

Fall Prune Nutrition Continued...

For fall applications, potassium sulfate (54%K₂O) or potassium chloride (63%K₂O) are the most common choices and are soil applied about leaf drop. Potassium chloride has been used safely but can cause chloride toxicity if chloride remains in the root zone. One way to improve the safety of potassium chloride is to apply it slightly later to avoid any chloride uptake if leaves are still on the tree and active. Potassium chloride should not be used on weak trees, young trees, orchards with water tables, hardpan, stratified soils or any restriction which would prevent chloride from moving out of the root zone. Chloride should be applied early enough to provide for adequate leaching (approximately 10 inches of rainfall). If rain fall is insufficient then winter irrigation would be recommended. If in doubt, use potassium sulfate.

One strategy is a massive application using 1500 to 2500 pounds per acre. Massive applications have the best chance for quickly correcting deficiency, last for 3 to 5 years depending on application and yield, but are expensive in the year of application. Retired Butte County Farm Advisor Bill Olson developed a maintenance program using about 500 pounds of potassium sulfate (270 lbs K₂O) per acre per year. Potassium is applied by banding or shanking down each side of the tree row about 4-5 feet away from the tree trunk. Remember where the band is and apply each year to the same location. Shanking is preferred in disced orchards and broadcast applications have not worked well. The strategy is to concentrate potassium and get it as deep into the root zone as possible.

Prune Orchard Potassium Use in pounds of actual Nutrient and Fertilizer amount Assuming 50% Efficiency

Yield (Dry tons/acre)	Potassium (lb. K ₂ O) in crop	Potassium Sulfate 54% (lbs/acre)	Application at 50% 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

ZINC

Zinc deficiency symptoms appear early in the season. Symptoms are delayed budbreak of both vegetative and flower buds. Developing leaves are small, chlorotic and appear in tufts (little leaf). Severe zinc deficiency usually results in terminal shoot dieback and smaller fruit. Leaves mildly deficient are slightly smaller with chlorotic areas between lateral veins. Often by mid summer, shoot growth tends to hide zinc deficiency symptoms making diagnosis more difficult. July leaf samples are useful for confirming zinc deficiency. Look for values below 18 ppm for prunes.

Many techniques are available to correct zinc deficiency, each has advantages and disadvantages. Probably the easiest and most effective correction for prune, are fall foliar applications of zinc sulfate (36% metallic zinc) applied at 10-15 lb/ac. Rates can be adjusted upward to achieve leaf removal but watch for phytotoxicity.



PRUNING MATURE DRIED PLUMS by Bill Krueger-UCCE Glenn County

Hand pruning is the most expensive cultural practice in prune production and can cost from 200 to 300 dollars per acre or more. With low returns to dried plum growers and increasing costs there has been a tendency to reduce costs by reducing pruning.

Mature trees are pruned to improve fruit size, reduce alternate bearing, remove diseased or dead wood and control tree size. Prunes are prone to over cropping and alternate bearing. Excessively cropped trees will produce small fruit with a higher drying ratio. Over cropped trees may suffer from limb breakage, sunburn and potassium deficiency. Crops following heavy crops will likely be light leading to excessive vegetative growth and excessive cropping the following year (alternate bearing).

Pruning Basics

Pruning can be thought of as light management within the tree canopy. Fruit size and drying ratio are directly related to the light regime close to where the prunes are growing. Pruning can insure that there is adequate light in proximity to the fruit.

Trees are pruned using a combination of thinning and heading cuts. Thinning cuts are where the limbs are removed as close as possible to the parent limb. Thinning cuts are used to open up and thin out canopies and fruit wood and to control tree height. Thinning cuts result in overall invigoration because more of the tree reserves are available to the remaining wood. With heading cuts a portion of the existing limb is removed. Heading cuts are locally more invigorating than thinning cuts and usually result in vigorous upright growth near the cut. The more severe the cut, the more vigorous the growth response. As the distance from the cut increases the response decreases. Heading cuts are used to invigorate trees and insure branching at specific sites.

Pruning mature dried plums consists mostly of thinning cuts to thin out the canopy and fruit wood. Heading cuts can be used in the tops of the tree or where invigoration or stimulation of branching is desired. With pruning we are attempting to balance vegetative growth with reproductive growth. Signs of under pruning include undersize fruit, limb breakage and limited vegetative growth. Over pruning is indicated by excessive vegetative growth and reduced crop.

Alternative Pruning Strategies

Alternant year pruning. A study of alternate year pruning conducted by UC researches during the eighties at four locations in the Central Valley showed that alternate year pruning may be feasible for growers interested in reducing pruning costs in a particular season. However, pruning time and costs will be increased in the year that the trees are pruned compared to annual pruning. Fruit sizes and revenues were not significantly different over the four years of the trial. However sizes and revenue were reduced in certain locations in certain years. Alternate year pruning, if used, should be implemented prior to an expected heavy year to help moderate the heavy crop. Another strategy may be to have different pruning levels in deferent blocks to spread risks of low fruit set. If the set is excessive in the lighter or non pruned blocks it can be adjusted with mechanical thinning around pit hardening.

Mechanical Pruning. Hedgers and toppers have long been used to reduce pruning costs. Unfortunately mechanical pruning is a non selective type of pruning which removes all of the vegetation in the area that is pruned. Most of the cuts are heading cuts. In a trial conducted in Glenn County during the eighties, various mechanical pruning strategies were compared to hand pruning in a hedgerow planting. The bottom line was that if the mechanical pruning was severe enough to result in similar fruit size and drying ratio as the hand pruned, the yield was reduced. Mechanical pruning in the dormant season may be useful where invigoration of the trees is desirable or heading cuts in the top of the tree are desired such as in young developing orchards. It could also be used in combination with hand pruning to make heading costs in the tops of the trees and reduce the cost of hand pruning.

Other strategies to reduce pruning costs worth considering include pneumatic or hydraulic equipment and pruning towers or positioners to improve worker efficiency.



STRATEGIES FOR FALL APHID MANAGEMENT

by Joe Connell - UCCE Butte County

Prune aphids include leaf curl plum aphid (LCPA) and mealy plum aphid (MPA). MPA excrete honeydew and large populations can result in significant fruit cracking. Heavy LCPA populations deform shoot growth and cause small fruit to drop.

Each fall the female aphids of both MPA and LCPA return to prune trees from alternate summer hosts to produce a sexual form of female aphid. A few weeks later the male aphids arrive and within a few days these two aphid forms mate and over-wintering eggs are laid in cracks in the bark on spur wood. These eggs are the source of aphid populations the following year.

Zinc Sulfate Defoliation

Many years ago it was discovered that aphids won't return to prune trees to complete their life cycle if the trees don't have leaves on them. One alternative method of reducing aphids is to defoliate prune trees in the fall before the aphids return from their alternate host.

Prune Farm Advisors Bill Olson, Rick Buchner, and Wilbur Reil demonstrated that zinc sulfate applications in the fall affected aphid populations the following spring. In their research trials, defoliated trees had a 75-98% MPA reduction and a 42-55% LCPA reduction compared to non-defoliated trees.

To be most effective, 25 pounds of zinc sulfate per acre in 100 gallons of water per acre had to be applied by the end of September in order to produce significant defoliation by October 15th. It was critical that defoliation occur before aphids returned to the orchard.

Defoliation can effectively reduce low to moderate aphid populations when properly timed. High aphid populations, may require insecticide application.

Other benefits of defoliating an orchard early in the fall include reducing the likelihood of trees blowing over and providing an earlier opportunity to begin winter pruning.

Fall Insecticide Application

Traditionally, dormant insecticides have done a very good job of killing aphid eggs in the winter. The addition of oil enhances control slightly while oil alone in the dormant period provides poor control. To avoid runoff into waterways during the winter, alternative spray strategies must be considered.

In early November 2003, Farm Advisor Bill Olson tested low rate applications of Diazinon, Asana, and Imidan without oil for aphid control (Table 1). He found that this fall application timing completely controlled MPA and LCPA the following year. This timing apparently controls aphids returning to the prune trees before they go dormant and controls aphid eggs that have already been laid. In UC trials in Sutter County, similar materials and rates gave excellent aphid control the following season when sprayed in November, 2003 and 2004.

Treatment	% Trees w/Aphids		% Trees w/ Signif. Aphids	
	<u>LCPA</u>	<u>MPA</u>	<u>LCPA</u>	<u>MPA</u>
Imidan 2.12 lbs/A	0	0	0	0
Imidan 4.25 lbs/A	0	0	0	0
Asana 3 oz./A	0	0	0	0
Diazinon 16 oz./A	0	0	0	0
Untreated Check	14.4	48.8	0	41.6

Table 1. Aphid control with early November insecticide applications.

This early November timing at low rates should mitigate pesticide runoff since application occurs before significant winter rains. Furthermore, Imidan breaks down rapidly when in contact with neutral or basic soil water and should not be a toxic concern in waterways. These low rates of Imidan, Asana, and Diazinon were effective in controlling aphids and are unlikely to find their way into waterways, especially when applied at this early timing.

IT'S TIME TO PLAN YOUR 2005/2006 PRUNE WEED CONTROL PROGRAM

by Kurt Hembree - UCCE Fresno County



Given the high rainfall year and weed growth we had in 2004/05, you can count on a bumper crop of weed seeds next season. Working on a weed control plan now will help keep you ahead of the game and hopefully save you a few bucks later. For cost-effective control, tailor your approach based on your knowledge and experiences in each field. Whatever your approach for weed control in the coming season, be sure you have correctly identified the weeds you have. Now's a good time to make sure your sprayers and other equipment are working properly. Don't forget to calibrate your sprayers (if you haven't done so in some time) so they operate at top efficiency, saving you time and money.

As postemergence products have become very affordable, many growers have switched to postemergence-only programs to battle weeds. While they work well, repeated applications will be needed each year for control. Preemergence herbicides are important because they help reduce the seed bank level in the soil and can help save trips through the field. Given the anticipation of high weed seed banks, it may be wise to include preemergence herbicides this coming season. For economical control, use the proper herbicides and rates for the weeds present, apply herbicides and use mechanical equipment when the weeds are most susceptible, and calibrate spray equipment for the best efficiency.

The table below shows the herbicides registered in prunes in California. Refer to the UC IPM web site (www.ipm.ucdavis.edu) for additional information on chemical and non-chemical control, rates, and the weeds controlled in prune orchards. Keep in mind, you may need different control options for each field location.

Herbicides registered in prunes in California (materials with non-bearing-only labels are shaded)

Preemergence products

oryzalin - Surflan, Farm Saver, Oryzalin, etc.

trifluralin - Treflan, Trilin 5, etc.

napropamide - Devrinol

oxyfluorfen - Goal, Galigan, etc.

pronamide - Kerb (at least 1 year old)

norflurazon - Solicam (at least 2 years old) *GWPA*

flumioxazin - Chateau (non-bearing only)

isoxaben - Gallery T&V (non-bearing only)

pendimethalin - Prowl, etc. (non-bearing only)

thiazopyr - Visor (non-bearing only)

GWPA - requires a permit from the agricultural commissioner if in a leaching and/or runoff area

Postemergence products

oxyfluorfen - Goal, Galigan, etc.

paraquat - Gramoxone Max

glyphosate - Roundup, Touchdown, Glyphomax, etc.

2,4-D (Orchard Master CA, etc.)

diquat - Reglone, etc. (non-bearing only)

fluazifop - Fusilade DX (non-bearing only)

MSMA, etc. (non-bearing only)

sethoxydim - Poast (non-bearing only)

clethodim - Prism (non-bearing only)

Several generic brand preemergence herbicides are available at reduced costs. To further reduce costs, apply these treatments to a 4 to 8' strip in the tree rows. These herbicides require rainfall or irrigation for activation (within 7 to 21 days) and only kill weeds before they emerge, so spray them on bare soil. If winter and summer weeds are a problem, apply a treatment in Oct/Nov and again in Jan/Feb. Combinations of oryzalin (2 qt/A) plus oxyfluorfen (6 to 8 pt/A) gives broad-spectrum control. An additional 4 qts/A of oryzalin plus 2 to 4 pints of oxyfluorfen before February 15 gives added weed control thru summer. If nutsedge or bermudagrass is a problem, repeated yearly uses of norflurazon at 2 lb/A helps provide control. You will need a permit from the agricultural commissioner to use norflurazon if you are in a groundwater protection area (GWPA). Refer to the California DPR web site (www.cdpr.ca.gov), the Agricultural Commissioner, or your farm advisor for information on GWPA regulations. Several preemergence herbicides are registered only in non-bearing orchards. For example, Chateau at 12 oz/A gives excellent broadleaf and grass control for about 4-5 months. For season-long residual control, apply 12 oz in the fall and 12 oz in the winter. Tank-mixing Chateau with Prowl at 5 pts/A gives excellent broad-spectrum control in non-bearing orchards. Gallery T&V only controls broadleaf weeds. For nutsedge control in non-bearing orchards, use Visor at 2 pts/A in the fall and 2 pints/A in the winter. If weeds are present when preemergents are sprayed, add a postemergence herbicide, like glyphosate, paraquat, or 2,4-D when the weeds are < 4" tall.

It's Time to Plan your 2005/2006 Prune Weed Control Program ... continued ...

Use appropriate rates of postemergence products for weeds in your field. Don't allow weeds to get too big before treating, as this reduces control and increases costs. Glyphosate applied at 1 to 2 qt/A controls most young weeds well. Consider adding ammonium sulfate (about 10 lb/100 gal water) if you have hard water and add citric acid to bring the spray pH to 5 to 6. Using glyphosate (1 qt/A) plus 2,4-D (1-2 pt/A) gives excellent control of most weeds (including horseweed and hairy fleabane) when they are treated <4" tall. When using paraquat, always add a surfactant and use at least 30 gpa to completely wet the weeds. TwinJet nozzles work well with postemergence herbicides if weeds are larger than 6" or if weed canopy is dense. When weeds are small and easier to kill, flat fan nozzles work fine. Always be careful to avoid drift by keeping the pressure under 40 and using hooded sprayers where possible. Low-volume applicators (3-10 gpa) work well, but cause fine droplets, which can drift, even with shielded equipment, so be cautious. Refer to the appropriate label for proper use of herbicides and for specified pre-harvest intervals.

SPREADING PRUNE BLOOM = HIGHER YIELD and MORE \$

by Franz Niederholzer - UCCE Yuba/Sutter Counties



Apply a dormant spray with high oil rate in late December/early January on some acreage to advance bloom in those trees. (CAUTION! Trees are most sensitive to oil burn in the dormant period.) Spray the remaining acres in November or February.

Keep weeds long if hot weather is predicted at bloom and short if cold weather is forecast for bloom.

Consider alternating pruning to avoid high pruning costs ahead of crop set.

Orchards should be managed to spread bloom and reduce the risk of crop loss due to bad weather at bloom. Too much heat **OR** too much cold (frost) at bloom can be the difference between making or losing money. The following is a list of practices that growers may want to consider as bloom approaches in 2006:

- **Dormant oil:** Narrow range spray oil (approx. 4 gallons per acre) applied in late December or the first half of January will generally advance bloom by a couple of days. In the south Sacramento Valley in 2005, this difference in bloom timing was the difference between a good crop and a disaster in at least one location. Many growers use a high rate of oil plus a pesticide as their “dormant spray” to control pests (aphids, mites, peach twig borer, and scale) and advance bloom. After the middle of January, a dormant spray with a high rate of oil generally has little effect on bloom timing or intensity. However, Joe Connell, UCCE Farm Advisor in Butte County, reports that 4-6 gallons of oil/acre will delay bloom when applied about 10 days ahead of anticipated almond bloom. **Note:** Oil can burn prune trees if sprayed on dry trees. Prune trees are most sensitive to oil burn before bud swell (December/January), and less sensitive to oil burn in the delayed dormant period (after mid-February). Growers concerned with insect pests and weather risk at bloom may want to consider spraying some of their acreage with high oil rates + pesticide in late December/early January and the rest in November or the delayed dormant (late February). High oil rates would not be needed for the other half of the orchard unless scale is a problem.] This should spread bloom as much as possible. Some growers have used this strategy for years. Nitrogen fertilizers — such as CAN17 or potassium nitrate — plus a surfactant can advance and tighten cherry bloom. Current UC research, funded by the California Dried Plum Board, is testing these materials in prune to find the best timings and rates to manipulate bloom.
- **Orchard floor management:** Tall vegetation, like long grass or high cover crop, = lower temperatures in the orchard and more risk of frost damage than close-mowed or disced blocks. When bloom weather is warm, tall weeds may increase humidity and decrease temperatures, perhaps helping reduce risk to the crop from high temperatures. (Note: Higher humidity can also increase brown rot risk.) In blocks that are not disced both ways, herbicide strip sprays should be applied weeks ahead of bloom to control weeds and reduce risk of frost damage.
- **Prune light or rotate pruning:** Pruning is expensive, and heavy pruning encourages shoot growth in light crop years. Heavy detailed pruning helps improve fruit size, encourages spur renewal, and fruit removal at harvest. However, in years with heat at bloom (like 2004-2005) that reduces the % set in a block, the more flowers on a tree the higher the yield should be. Some growers are waiting until after bloom to prune, but waiting until fruit have set (mid-April) means that accurate pruning is difficult due to leaf and shoot growth and some of the trees resources will be put into the wood and fruit that is removed. Alternate year dormant pruning is a compromise that can reduce pruning costs for the entire block and spread the risk of light vs. heavy cropping, and allows pruners to work faster and more accurately. A hard, detailed pruning on a third to half of the acreage every year on a 2-3 year rotation can keep spurs rejuvenated and limit the number of hard-to-harvest hangers. In alternate years, some combination of topping, hedging, or mechanical thinning can effectively manage the crop while allowing for maximum set in years of extreme weather at bloom.

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