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Spring & Early Summer Orchard Considerations

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April

✓ **Crop assessment:**

Good fruit set weather at bloom was sandwiched between two freeze events (February 24 and April 12). Large fruit is worth more than small fruit, so growers must carefully check crop load (and what percentage of that fruit may have frost damage and not stay on the tree) to decide if thinning is needed to maximize crop value. See the crop assessment article in this newsletter for details on how to determine crop load and decide if thinning is required, with consideration of recent freeze damage.

✓ **Irrigation:**

○ A particularly dry winter will affect water supplies for the 2022 season. For irrigation strategies in the event of reduced water availability, see sacvalleyorchards.com/prunes/irrigating-during-a-drought-scenarios.

○ It is more important than ever to monitor tree water status and manage irrigation carefully to maintain crop quality and orchard health. Spring water stress can be especially problematic, as applying water to very dry trees can cause end cracking in fruit. Varying crop load may also affect water use in an orchard, making typical expectations of irrigation timing unreliable. Pressure chamber readings are the most direct way to measure water status of trees and are a powerful tool when used in combination with ET and soil moisture sensors. Pressure chamber info can be found at: sacvalleyorchards.com/manuals/stem-water-potential. Weekly ET reports are published at: sacvalleyorchards.com/et-reports. A helpful primer on soil moisture sensors and monitoring is at: ucanr.edu/sites/Tehama/files/20513.pdf.

✓ **Fertilization program starts:**

○ Following your crop load assessment, develop the Nitrogen (N) budget for the 2022 season and begin applications in April once the crop load has been determined. A large prune crop (3-4 dry tons/acre) contains 40-50 lbs. of N/acre that will leave the orchard in the fruit bins at harvest. Roughly 30 lbs. N/acre should be allotted for the tree (shoot growth, spur growth, etc.) and 70% efficiency (0.7 lb. N into the tree for every pound of fertilizer N applied to the soil) can be assumed with multiple (2-3) applications before harvest. The annual N budget/acre for a mature prune orchard with a good to heavy crop should be 100-115 lbs. N/acre. For best efficiency, make several smaller (for example, 25-40 lbs. N/acre) N applications through the season and inject liquid fertilizer late in the irrigation set and then flush with at least 1-2 hours of clean water.

- If using foliar potassium nitrate sprays as your potassium (K) program or to supplement soil applied K, begin spraying in late April and make additional applications every 2-3 weeks. More details at sacvalleyorchards.com/prunes/horticulture-prunes/prune-orchard-nutrition-thoughts-for-2017.
- ✓ **Aphid:** Monitor for leaf curl plum aphid and mealy plum aphid since colonies can grow quickly as orchards leaf out. Oil sprays any time from petal fall to May 15 can reduce mealy plum aphid to acceptable levels with good to excellent coverage. Oil is not effective against leaf curl aphid during this period as the spray can't reach inside the curled leaves where the aphids are feeding. Other pesticides are effective in controlling aphids during the spring but be careful to avoid flaring mites with pyrethroids (Asana®, Warrior®, etc.) or neonic (Actara®, Provado®, etc.). BeLeaf® can also provide excellent aphid control when monitoring shows a need. More information on monitoring and management of aphid populations at: sacvalleyorchards.com/prunes/aphids-spring-summer-management/
- ✓ **Peach twig borer (PTB) and Oblique-banded leaf roller (OBLR):** These worms feed on the fruit surface later in the season, damaging the fruit skin and “opening the door” for fruit brown rot infection later in the season. Don't assume earlier sprays worked to control these populations. Place and monitor pheromone traps to establish biofix dates for these pests. Begin accumulating degree days after the biofixes to inform when to begin fruit inspection. PTB biofix in prune can differ substantially from almond, so don't rely on information from other fields.
- ✓ **San Jose Scale (SJS):** If a biofix was not established using pheromone traps in February, apply double-sided sticky tape around limbs in early April to detect SJS crawler emergence. Monitor for increased SJS populations if neonics are applied for aphid management. Find more details on SJS at ipm.ucanr.edu/PMG/r606302111.html.

May

- ✓ **Irrigation:** Continue monitoring pressure chamber, soil moisture and/or weekly ET to manage irrigation and maintain adequate orchard moisture. May and June are the most critical months for end cracking. Also, watch the weather forecast for sudden jumps in temperature that can occur in late May or early June as the weather switches mode from spring to summer. Sudden 15-20 degree increases in temperature can result in fruit sunburn damage; making sure orchards are not behind on irrigation when the heat hits may reduce damage.
- ✓ **Rust:** Monitoring commences with the start of the month, surveying 40 trees weekly until July 15. Check lower parts of the canopy for leaf symptoms (spots) and pay close attention to non-bearing replants, exceptionally vigorous trees, and previous hot spots. Consider treating when the first leaf with rust is found. For more on rust see: ipm.ucanr.edu/PMG/r606100611.html
- ✓ **Peach twig borer (PTB) and Oblique-banded leaf roller (OBLR):** Inspect fruit 400 degree days after the first PTB biofix. Look for larval entry points on the fruit (ideally 15 fruit from 80 trees), especially at fruit to fruit or fruit to leaf contact points. Treat if 2% or more (24+ of 1,200) of the fruit have damage. For OBLR, begin fruit inspections at 930 degree days after biofix for that pest, following the same sampling protocol and treatment threshold. More on PTB at: ipm.ucanr.edu/PMG/r606300211.html and on OBLR at: ipm.ucanr.edu/PMG/r611300511.html

- ✓ **Aphids:** Leaf curl plum aphids move to summer hosts in May, but mealy plum aphid stay in orchards until mid-July. Heavy infestation of mealy plum aphid can limit flower bud development this year, which can mean less crop next year.
- ✓ **Fertility:** Continue with nitrogen and potassium fertilization program if a good crop is set. More than 50% of annual N budget should be applied before June 1st.

June

- ✓ **Pest and disease management:** Continue monitoring for aphids and rust.
- ✓ **Spider mites:** Begin scouting by checking two different sections of the orchard each week. Spend about five minutes in each section, checking 2-3 leaves (some inside and outside of the canopy) on 10 trees. Look for spider mites as well as predators (predaceous mites and six spotted thrips). Treatment decisions should be based on population levels of both mites and predators. If more than 20% of leaves have mites, but less than 50% of the leaves have predators, treat for mites. If more than 60% of leaves have mites, treat even if most leaves have predators. For more, see: ipm.ucanr.edu/PMG/r606400411.html.
- ✓ **Irrigation:** Mild to moderate tree water stress (-12 to -16 bars, measured by a pressure chamber) can help avoid excessive vegetative growth and associated pruning costs next winter without slowing fruit sizing this season. Maintain this water stress until fruit has reached physiological maturity (when fruit averages 4lbs internal pressure), typically in early to late August.
Learn more at sacvalleyorchards.com/prunes/irrigation-prunes/pre-and-post-harvest.

Note: In late June, consider the weather forecasts when deciding on irrigation through early July. Traditionally, many growers reduce irrigation going into the July 4 Holiday in an effort to reduce orchard humidity and chances of fruit side cracking caused by dew events if the weather suddenly cools. Reduced irrigation to reduce side cracking may increase the risk of fruit sunburn if the weather stays hot. The weather is hard to get right but adding sunburn risk to the conversation along with side cracking risk is suggested. Side cracking is more of an economic risk in years with light crop and larger fruit while sunburn may be a higher economic risk in heavier crop years with less extra-large fruit. See more information on sunburn (“blue prune”) at sacvalleyorchards.com/prunes/blue-prune-drop/.

New UC Davis Prune Varieties Prove Promising

Sarah Castro & Dr. Ted DeJong, Plant Sciences Department, UC Davis



UC Davis Prune breeding program is eager to patent a new variety as well as promote new promising French-type cultivars. The new variety, Yolo Gold, offers superior flavor and a late harvest date. The French-types have a variety of harvest dates, bloom dates and all have low dry away ratios that are sure to draw attention from prune growers who are interested in lowering their operational costs. Many of the cultivars have been test-processed and dried using commercial dehydrators in cooperation with interested growers. This is a prune tree that has yellow fruit that can begin to dry on the tree before there is substantial fruit drop. The tree blooms approximately 4 days before ‘Improved French’ and is ready for harvest approximately 10 days after ‘Improved French’. The fresh fruit is oval shaped and maintains its oval shape when dried. Fresh fruit weight is larger than ‘Improved French’ and dried fruit ranges from 9.8 to 11.9 g (38-46 ct/lb). Fresh to dry fruit weight ratios range from 2.5-3.1

depending on sugar content and fruit maturity. Fruit sugar contents range from 22 to 25 °Brix and fruit sugar

content appears to be more affected by over-cropping than fruit size. The flowers are pollen self-compatible. The tree grows fairly upright and bears primarily on spurs and short shoots. The tree is more precocious than 'Improved French', meaning it will produce fruit earlier in its life. This tree has been selected primarily for its consistent bearing and dried fruit quality and flavor. Was successfully dried and pitted by Mariani in 2020, then Sunsweet in 2021.

In addition to our new release, we have obtained very encouraging results from a set of four new advanced selections that mature before and after 'Improved French'. Like 'Improved French', these selections are pollen self-fertile (J2N-79 is still in the confirmation process). All of these selections develop fruit with very high sugar content and have low dry away ratios and taste great (see Table 1). They offer differing harvest dates but produce dried fruit that would be able to be easily mixed with Improved French. **We are looking for grower cooperators to plant test trees of the items listed below.**

J2N-128 This prune tree produces purple fruit that harvests a week or two after 'Improved French'. The fruit has a fresh to dry weight ratio of 2.2-2.4 with a sweet, satisfying prune flavor. The fruit does not typically get softer than 4 lbs. pressure because the fruit will start to dry on the tree rather than softening and falling off. This leafy tree is upright in structure and is more spur bearing than 'Improved French'. The tree blooms about a week before 'Improved French' and harvests approximately 10 days after. Tree has never been test pitted, but will likely have no problems being dried and pitted. The tree is precocious, meaning it will produce fruit early in life, usually after its first leaf.

J2N-127 This prune tree produces purple fruit that can begin to dry on the tree before any substantial drop. It harvests with or around 'Improved French' time, but blooms about 10 days before 'Improved French'. The fresh fruit size is about 15.8-25.5 g and the dried fruit weight ranges from 7.3 to 9.5 g. Fruit sugar contents range from 27.1 to 37.4 °Brix. The fresh to dry weight ratios range from 1.9 to 2.9. To obtain the lowest possible fresh to dry ratio, the fruit needs to hang on the tree, and start to shrivel. This item combines the convenience of a really low fresh to dry weight ratio while also having good, dried fruit quality. The trees are very precocious; they can produce fruit on first leaf trees. The trees are fairly upright, spur bearing and consistently set a crop. If over-cropped, the fruit size will decrease, but no biannual bearing has been detected in subsequent years after good crops. A one-acre test planting with bare root trees is being planted near Yuba City in 2022.

J2N-79 The prune tree produces dense purple fruit that harvests around or after 'Improved French'. The fresh to dry weight ratio ranges from 2.0 to 2.9 depending on how long the fruit hangs on the tree before harvest. The fruit does not soften like 'Improved French', sugars increase due to fruit partially drying on the tree and consequently the flesh does not soften. The dried fruit is very dense and tough in its natural condition before pitting, but the processed fruit is very pleasant to eat with soft flesh and texture. The fruit size varies depending on crop load. This tree should not be over-cropped. The flowers typically bloom 6 days before 'Improved French', and the pollen is likely self-compatible, but this is being confirmed in 2022. Tree structure is upright with a tendency to be spur-bearing.

Harvest date in Winters, CA	Item Name	Fresh Weight (g/frt)	Pressure	Brix	Dry count per lbs.	Dry Away Ratio	Average Bloom days before Imp. French	Fruit Type
8/24/2021	J2N-127	29.3	6.7	32.4	44.1	2.2	-12	French
8/24/2021	I12S- 6	28.3	4.3	29.7	40.2	2.5	-11.5	French
9/6/2021	J2N- 79	34.1	5.8	32.3	33.5	2.4	-6	French
9/6/2021	Yolo Gold	35	4	28.2	36.1	2.9	-5	gold gourmet
9/6/2021	J2N-128	23.3	5	34.9	48.6	2.2	-8	French

Table 1. Newest promising items available for testing from the UC Davis Prune Breeding program. Many items start to dry on the tree before harvest and all have had at least 4 years of promising fresh and dried evaluations.

The UC Davis breeding program would like to thank participating grower cooperators. Because of you, the program was able to perform multiple tests this year. A few growers not only grew the trees but helped transport fruit and encouraged their processors to get involved. The collaboration between growers, the breeding program, and the processors is essential for determining the acceptability of these items for commercial production. Thank you to all the reduce yield in infected trees and be a source of infection to other trees. A free Pocket Pruner's Guide to Cutting out *Cytospora* is available [on-line](#) and in this newsletter to help pruners recognize when the disease has been completely removed from a branch. If all the disease isn't cut out, the job isn't done. Spraying the orchard with Topsin®-M fungicide after pruning or cutting is another investment in long-term orchard health as damaging diseases and wood rots enter the tree through those cuts if not protected ahead of rain.

Growers and Processors who are involved. If you are interested in becoming a grower cooperator, please notify the program manager, Sarah Castro (scastro@ucdavis.edu).

The prune breeding program is funded by the Prune Board of California. The goal of the breeding program is to breed new cultivars that will save growers on operational costs and stabilize prune production in California. The main costs the program tries to reduce are drying costs (via dry away ratio) and pruning costs. The program has many new items every year that are commercially viable candidates for future release. The items in the seedling test blocks prove to be more and more remarkable as the years unfold. The program is confident that they have items that can save growers production costs and stabilize cropping. Many of the new items in Table 1 have been budded by Sierra Gold Nursery and are ready for grower trials.



For more information about these items please contact Sarah Castro at scaastro@ucdavis.edu.



Mechanical Pruning Trial in ‘French’ Prune – Through Year Three

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Work continues at the mechanical pruning trial site in Red Bluff. The trial, funded by the California Prune Board and led by Dr. Rich Rosecrance at Chico State, was initiated in 2019 and aims to identify lower cost pruning alternatives for growers without compromising yield or fruit quality. The study site is an orchard planted in 2011 at a spacing of 15’ x 18’ on Myrobalan seedling rootstock and irrigated with buried drip. This is a vigorous, well managed orchard with a history of producing 4-5 dry ton/acre. The study treatments are:

1. Fall: Grower standard -- ladders and loppers pruning, **no topping** (i.e. ‘control’).
2. Spring: Topping and hedging both ways -- **cutting 5 sides of the canopy**, with the tree row and across the tree row, plus topping (i.e. ‘boxed’).
3. Fall: Topping and hedging both ways -- **cutting 5 sides of the canopy**, with the tree row and across the tree row, plus topping (i.e. ‘boxed’).
4. Spring: Hedging both sides of the tree row, no cross hedging -- **cutting 2 sides of the canopy**, no topping (i.e. ‘hedged’).

5. Fall: Hedging both sides of the tree row, no cross hedging -- **cutting 2 sides of the canopy**, no topping (i.e. 'hedged').

Several measurements are collected annually to assess the effects of the pruning treatments. Highlights of 2021 results and planned 2022 measurements include:

- Canopy volume was measured in May 2021. Trees boxed in spring were significantly smaller than the hand-pruned control. Trees boxed in fall or hedged in fall or spring did not differ significantly from the control.
- A bark canker pathogen survey (*Cytospora*, *Botryosphaeria*, etc.) was conducted to establish a baseline of pathogens present in the field. Several canker pathogens were found, and the control treatment had the shortest canker length. A more thorough evaluation of disease presence and severity will be performed in 2022.
- In 2021, a difference in severity of sunburn damage after extreme heat events was observed. The boxed treatments both had significantly less blue prune drop due to sunburn damage than the control or hedged treatments. This was surprising – fruit is typically exposed to higher light environments in the boxed trees. Though there is no definitive cause at the moment, it may be possible that bowing branches in the hedged treatments or reduced water stress in boxed trees due to smaller canopy size may have contributed. We will continue to assess these differences.
- 2021 treatment yields ranged between 3.0 and 4.3 dry ton marketable (A+B screens) yield per acre and no significant differences were found among the treatments in 2021 nor in cumulative yields (Table 1). Large fruit (A + B screens) comprised between 92% and 100% of the four-pound sample from all the treatments (Table 1). The spring hedged treatment did have significantly lower percentage of marketable (A+B screen) fruit than the control and fall boxed treatments.

Treatment	Percent large fruit (screen A+B) 2019	Percent large fruit (screen A+B) 2020	Percent large fruit (screen A+B) 2021		Large fruit yields (A+B screens, dry t/a) 2020	Large fruit yields (A+B screens, dry t/a) 2021	Cumulative Yields (A+B screens, dry t/a)
Control	94	95	100	5.3	3.2	3.5	12
Box in Spring	86	91	98	3.9	2.8	3	9.7
Box in Fall	89	86	99	4.4	2.9	3.2	10.5
Hedge both sides in Spring	89	85	92	4	3	3.7	10.7
Hedge both sides in Fall	89	84	99	4.4	2.9	4.3	11.6
P value	ns	ns	0.02	ns	ns	ns	ns

Table 1. Percent large fruit, canopy circumference trunk and canopy diameter, and pruning weights in 2019, 2020, and 2021.

The most important task of the year.

Dani Lightle, former UCCE Orchards Advisor, Glenn, Butte & Tehama Counties
Franz Niederholzer, UCCE Farm Advisor, Colusa and Sutter/Yuba Counties

There is no more important activity in prune growing than checking the crop load in late April. Knowing the crop load (fruit/tree) in an orchard is the most critical piece of data needed to decide if shaker thinning is needed. [Knowing the crop load can also help growers plan nutrition programs for the year.]

When needed, shaker thinning can significantly improve a grower's bottom line this year and next year. Careful, timely thinning increases A & B size fruit production, limits small, lower value prunes in the bin at harvest and improves return bloom next year.

To find out if thinning is needed, check crop load from 2-3 trees per orchard at or just before reference date, which usually falls between April 20th and May 10th. Reference date occurs when 80 to 90% of the fruit have a visible endosperm (see Figure 1), which is approximately one week after the pit tip begins to harden. The endosperm, a clear gel-like glob, the beginning of the developing seed, will be found in the seed cavity on the blossom end of the prune (Figure 1) and is solid enough to be removed with a knife point. The warmer the spring, the earlier reference data arrives. Checking crop load this year (2022) will be more challenging given the freeze of April 12.



Figure 1. Extraction of the endosperm on a developing prune. When 90% of the fruit cut as in this photo shows endosperm, then the fruit can be shaker thinned if there are too many fruits on the trees

Step 1. Estimate the targeted tonnage from a given block by considering orchard history, age, etc. Let's assume calculate a targeted number of fruit per tree at harvest:

$$(((\text{Dry tons/acre}) \times 2,000 \text{ pounds/ton}) \times \text{Dry count/lb.}) \div \text{Trees per ac} = \text{Target number fruit/tree}$$

$$\left(3 \frac{\text{tons}}{\text{acre}} \times 2,000 \frac{\text{lbs}}{\text{ton}}\right) \times 55 \frac{\text{count}}{\text{lb}} \div 151 \frac{\text{trees}}{\text{ac}} = 2,185 \text{ fruit/tree (target)}$$

Step 2. Determine the actual number of fruits in a sample tree and compare that number to the target of 2,185 fruit (from step 1). Ideally, repeat this procedure on 3 representative trees to ensure accuracy. Place a tarp under the tree and mechanically shake off as much fruit as possible, then hand strip any remaining fruit. Collect all the sound fruit and weigh them (for easy math, let's assume it weighs 100 lbs.). Take a 1-lb subsample of the fruit and count how many sound fruit are in a pound (assume 90 fruit/lb.). Don't count fruit that looks like it wouldn't have stayed on the tree until harvest - these fruits are light green or otherwise look slightly "off" compared to the strong fruit. This year, it may be necessary to separate the fruit from the 1 lb. sample into three categories; 1) bad, 2) good and 3) visibly frost damaged. Then, carefully examine each of the frost damaged fruit to try to decide if it will make a fruit or eventually drop from the tree. It may be a good idea to cut through the middle of each of the frost damaged fruit to see if the flesh or the seed appear damaged. Add the good fruit and the frost damaged fruit that looks good (interior flesh and seed seem OK) together to get a fruit per pound number to use in the equations below. Then use those numbers to determine the total number of fruits per tree:

$$\text{Total tree fruit weight} \times \text{Number of prunes per lb.} = \text{Total number of fruits per tree}$$

$$100\text{lbs} \times 90 \frac{\text{fruit}}{\text{lb}} = 9,000 \text{ fruit/tree (actual)}$$

Step 3. Decide if you need to thin. Subtract the target number of fruit (at harvest) from the number of good fruits on the tree now (reference date). In this example, there is roughly 4 times the number of fruits on the tree than desired to hit the target of 55 dry count/lb. You don't want to simply remove all those extra fruits, because you need to account for natural fruit drop and variability in fruit per tree across the orchard. Estimates of natural fruit drop range from 10% to 50%. Selecting the appropriate drop percentage should account for orchard history, as well as your own risk threshold. Many experienced growers prefer to leave approximately 50% more fruit on the tree after mechanical thinning than they want remaining on the tree at harvest:

$$\text{Target number prunes per tree} \times 1.5 (= 50\% \text{ fruit drop buffer}) = \text{Adjusted number fruit per tree}$$

$$2,185 \times 1.5 = 3,278 \text{ fruit/tree (adjusted target)}$$

Step 4. Calculate how many fruit to remove by subtracting the adjusted target number from the actual number of prunes on the tree:

$$\text{Actual fruit per tree} - \text{Adjusted target fruit per tree} = \text{Number of fruit to remove}$$

$$9,000 \frac{\text{fruit}}{\text{tree}} - 3,278 \frac{\text{fruit}}{\text{tree}} = 5,722 \text{ fruit/tree to remove}$$

Step 5. Shaker thin (if needed). Use harvest machinery (shaker) to remove the approximately 5,700 excess fruits. Shake a tree for one second, and following the steps above, calculate how many fruits were removed. If needed, increase the shaking time until the desired numbers are removed. Typical shaking time is 2 to 4 seconds; avoid shaking for longer than 6 to 7 seconds to prevent unnecessary tree damage. Once you've calibrated your shaking time, go through and thin the block. If you are thinning for more than a week, check fruit per tree and green fruit per pound every few days to make sure that your shake time doesn't need to be adjusted down as fruit grow.

Adela Contreras, with industry support, joins Sacramento Valley UCCE Extension Team as a Staff Research Associate.



Adela Contreras joined UC ANR in 2022 as a Staff Research Associate and serves Sacramento Valley with Katherine Jarvis-Shean and Franz Niederholzer across six counties. Adela is a first-generation college student from Salinas, CA, graduating with a B.S. from UC Davis in 2020. She previously worked on strawberries, tomatoes, fire regime in the boreal forest of Alaska, kernza grain, and walnuts. She plans to pursue a Ph.D. in Agronomy or Soils and Biogeochemistry and inform future grower decisions. She enjoys kayaking, hiking, visiting family, and adventuring with her dog.

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