

MANAGING HEAT AT BLOOM IN 'FRENCH' PRUNE, 2017

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PROBLEM AND ITS SIGNIFICANCE

Excessive heat or extended wet, cool weather at bloom is linked to significantly reduced prune production in key California growing regions in five of the last fourteen years (2004, 2005, 2007, 2014, and 2016). Total grower economic losses in Sutter and Yuba Counties – with 40% of the prune acres in the state -- were in the range of \$240 million for 2004, 2005, and 2007, based on county ag commissioners' data. Overall economic damage to the regional economy was probably 1.5x that loss -- \$360 million. As the probability of heat in March appears to be increasing (Rick Snyder, retired UCCE microclimate specialist, personal communication), California prune growers must develop management strategies to mitigate heat damage at bloom to remain economically viable, while remaining aware of crop risk due to unusually cool bloom weather,

Recent research results show that temperatures $>75^{\circ}\text{F}$ begin to negatively affect pollen tube growth rate and viability, but research has not identified temperature thresholds for actual crop damage.

OBJECTIVES

- Determine bloom-time temperature thresholds above and below which crop damage occurs.

PROCEDURES

Sutter, Glenn and Tehama Counties:

Bloom timing and temperature were monitored along most of the length of the major fruit growing regions of the Sacramento Valley, home to 85% of the bearing acres in California. In Tehama County, bloom timing and temperature/relative humidity were observed in three orchards; one in Red Bluff, one in south Red Bluff and one in South Los Molinos. In Glenn County, bloom and temperatures/relative humidity were tracked in one orchard east of Orland. In Sutter County, bloom and temperature/relative humidity were tracked in an orchard 10 miles south of Yuba City.

Temperature and relative humidity sensors were placed in between trees down the tree row at 6-8' above the orchard floor within the study orchard. Sensors were not placed in tree canopies. Temperatures and relative humidity in each block were continually recorded during bloom at all sites. Average hourly temperatures are reported, not maximum temperature for the day.

Bloom progression was measured by counting open flowers on two short branches (roughly 100 flowers, each) at approximately 6' height around 3 trees in each orchard. Initial set was measured in May.

RESULTS AND DISCUSSION

Weather during the 2017 prune bloom in the Sacramento Valley was warm and some rain fell. Very similar temperatures were recorded in Glenn, Tehama and Sutter Counties for the same time period. Fruit set ranged from 24-38%, a level that probably required thinning to avoid excessive production of small fruit.

CONCLUSIONS

Excellent fruit set occurred following a wet bloom period with full bloom temperatures between 66-72°F (Table 1). These conditions support the general model for crop success at bloom (Figure 2), based on data and experience from the last fourteen years.

Financial value of this research: Prune crop loss in the Sacramento Valley in 2016 was at best estimate, at least 1.5 dry tons/acre across 90% of the acres in the region (37,000 acres using 2015 crop report data). At \$2000/dried ton, that loss = \$111M in farm gate value before the multiplier effect on local economies. This research, developing information to allow growers to more accurately predict crop risk at bloom, will help growers use management tools to minimize damage from unseasonable weather at bloom.

Table 1. Average prune fruit set and full bloom dates for individual orchards plus maximum orchard temperatures (hourly average of measurements taken every 5 minutes) during bloom in Sutter, Glenn and Tehama Counties, 2017. Maximum orchard temperatures on the day of full bloom in each orchard appear in BOLD font. Days with measurable rain have blue background.

County	Site	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24	% Fruit Set
Tehama	Red Bluff	70	69	77	69	67	66	68	58	62	55	24
Tehama	S. Red Bluff	68	71	78	67	68	66	69	60	63	54	26
Tehama	Los Molinos	69	69	77	69	69	66	68	59	63	55	38
Glenn	Road S	68	71	77	68	68	65	69	58	63	54	38
Sutter	South of Hwy 113	71	75	80	72	73	67	70	63	65	54	28

Figure 1. Average, hourly temperatures (deg F) and bloom progression, Glenn County. 2017. The blue line tracks temperatures over the bloom period; red squares show % bloom progression.

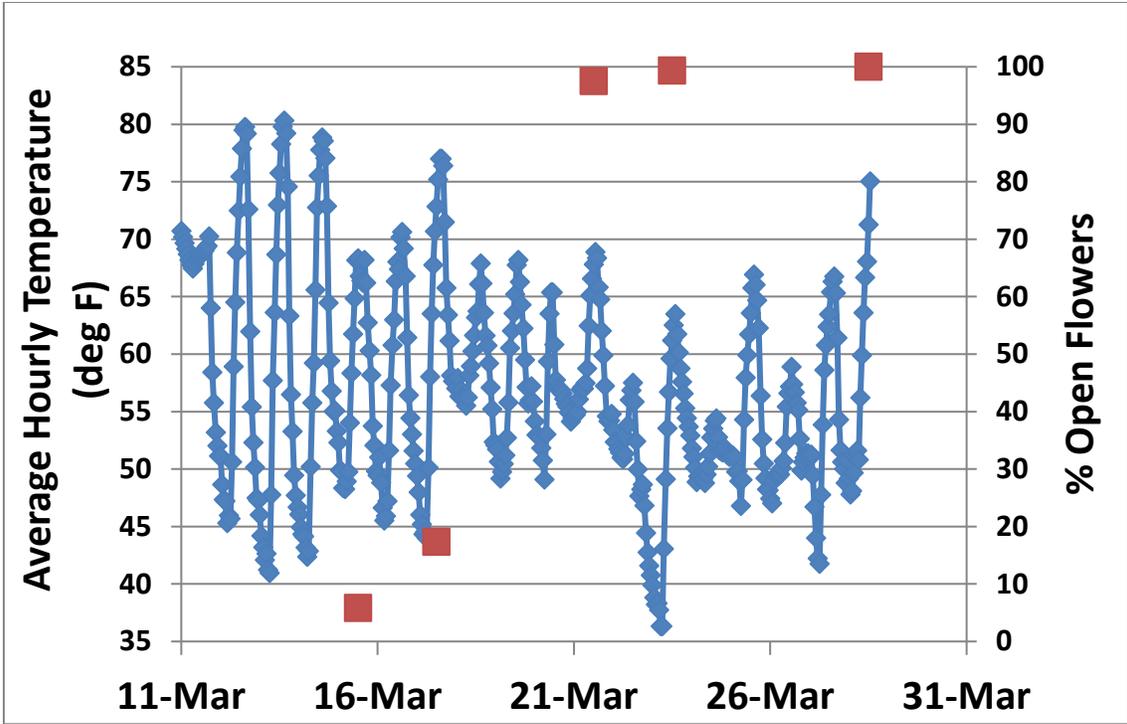
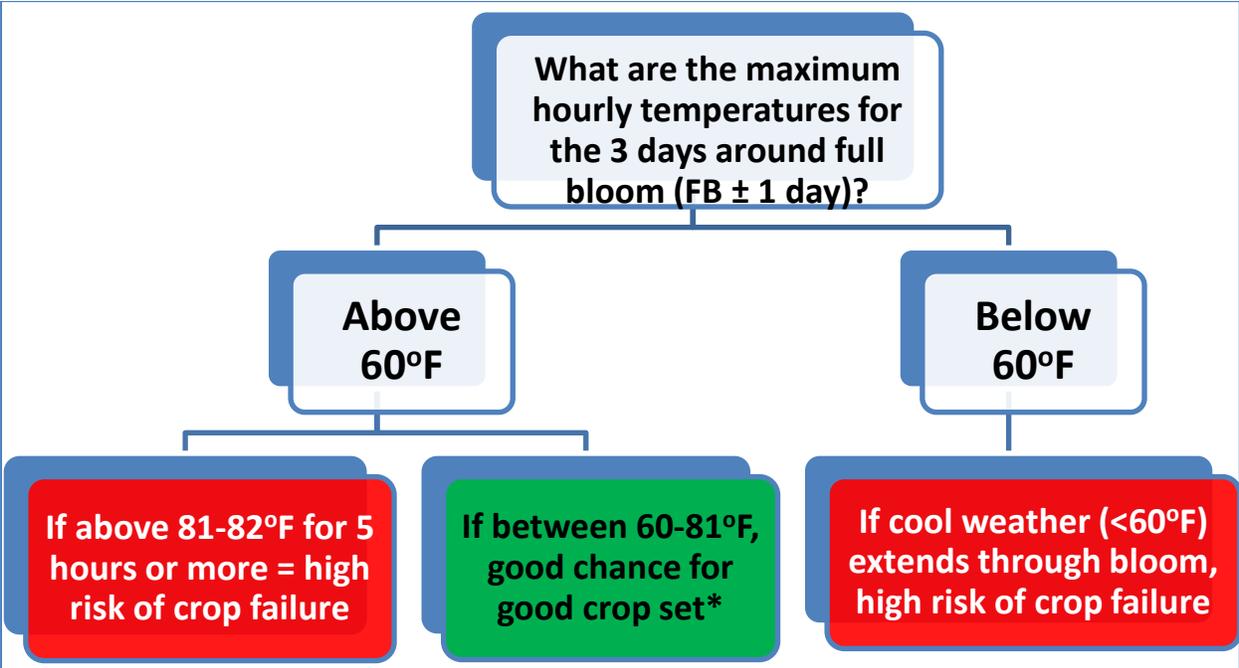


Figure 2. Beta bloom weather model for estimating prune fruit crop set.



*If weather at bloom is dry and windy, crop set will be lower and thinning may not be needed. If temperatures are between 60-80°F, with rain or dew/fog occurring during bloom, thinning should be needed to deliver large crop of good sized fruit.