

GIBBERELLIN TO IMPROVE FRUIT QUALITY AND FIRMNESS AT HARVEST IN 'SUTTER' PRUNE.

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PROBLEM AND SIGNIFICANCE

'Sutter' prune fruit is reported to slab and bleed during drying, requiring time-consuming tray scrapping and other problems including sticky storage bins. Increasing firmness at harvest may alter the performance of this new variety during drying and subsequent processing.

Gibberellin (GA₃) is registered in California as ProGibb 40 (Valent) for use in stone fruit "to increase fruit firmness and improve fruit quality". Published work by Southwick reported that GA₃ significantly increased 'French' prune fruit firmness when applied at 31 or 61 ppm in high spray volume (200 gallons per acre) when fruit reached 13-16% sugar. Unfortunately, the ProGibb 40 label limits use to 16-32 grams/acre. Using spray volume of 200 gallons of water per acre (gpa), labeled rates equal 8-16 ppm GA₃ in the spray tank -- 50% or less of the concentrations used in the Southwick study. Field demonstrations of GA₃ applied to mature 'French' prune using 24 grams/acre in 200 gpa (13 ppm) with a non-ionic surfactant at 0.25% one month before harvest (12% sugar in the fruit at application timing) increased average fruit pressure by 0.5 pounds compared with untreated fruit. Lower spray volumes and subsequent increase in spray GA₃ concentration closer to the levels in the original Southwick research may further increase fruit firmness when applied to 'Sutter' prunes.

OBJECTIVES

Apply ProGibb 40 to mature, commercial 'Sutter' prune trees just ahead of harvest when fruit is between 12-16% sugar. Determine if average fruit pressure is higher for treated fruit at harvest compared with unsprayed fruit.

Dry subsamples of treated and untreated fruit at commercial harvest for later evaluation. Visually assess dried fruit to observe any apparent differences in fruit quality (eg slabbing) between treatments.

PROCEDURES

On July 31, twelve mature 'Sutter' prunes were selected for similar tree canopy size and tree health in a commercial planting in Sutter County. Trees were classified into two blocks of six trees each. "Strong" trees showed healthy shoot growth, no dieback and no leaf yellowing. "Weak" trees showed limited or irregular shoot growth throughout the canopy with some dieback and leaf yellowing. A total of twelve fruit per tree were sampled. Three fruit were selected from each quadrant of each tree; one from the outer canopy, one from mid-way to the trunk and one from the interior of the canopy. Fruit pressure was determined by use of a 5/16th inch fruit pressure gauge after a thin piece of skin was removed from each cheek. Pressures from

each side of the fruit were averaged to generate a single pressure value for each fruit and then those data were averaged to produce a pressure value for each tree. Soluble solids were determined by refractometer after blending half of each fruit – without the pit— into one homogeneous sample for each tree.

On August 4, ProGibb 40 was applied to eight of the twelve trees at two rates – 21 ppm (“low GA” = 16 grams a.i./acre) or 42 ppm (“high GA”= 32 grams a.i./acre). Four trees – two “strong trees” and two “weak trees”—were treated with each of the GA rates. Spray material was applied with a motorized back pack sprayer at spray volumes equivalent to 50 gallons per acre. A modified seed oil adjuvant was included at 0.25% -- one quart per 100 gallons.

Fruit pressure and sugar levels were measured, as described above, on August 13 and August 19. On August 19, in addition to the 12 fruit sampled from ground level, an additional 12 fruit were sampled from the 9-12 foot zone of each tree. Fruit were harvested on August 23. Sub-samples of fruit – roughly 2-4 pounds of fresh fruit per sample -- were dried in commercial tunnels.

RESULTS AND DISCUSSION

There was no significant difference in fruit pressures or sugars on July 31 (Table 1 and Table 2). Individual fruit pressures were normally distributed (Figure 1).

Fruit pressure of untreated trees were significantly less than prunes treated with low GA rate (21 ppm) on August 13, but not on August 19 (Table 1). The higher rate of GA (42 ppm) did not show significantly different pressures compared with the untreated controls at any time. Application of GA₃ at just under 16% sugar (Aug 4 in 2010) did not eliminate soft fruit on August 19 – just prior to harvest – compared with untreated controls (Figure 2). Visual assessment of fruit after commercial drying showed no treatment differences. Sugar levels were not different between the three treatments on any of the sampling dates (Table 2), although the weaker trees did have a significantly lower sugar level than the strong trees (data not presented).

Soft fruit may be a key factor in reduction of ‘Sutter’ fruit quality at drying. It is possible that an earlier application, timed closer to 12-13% sugars, provide improved results and eliminate the soft fruit closer to harvest. The impact of GA₃ applied at just under 16% sugars appears to be limited to fruit at the 3-4 pound range and higher on Aug 19.

When applying GA₃ in commercial orchards, use of low spray volume – 50 gpa – is effective and could be more economically advantageous to growers compared to high volumes – 200 gpa -- used in earlier work.

Table 1. The affect of GA₃ – applied as PriGibb 40 – on ‘Sutter’ prune fruit pressures prior to harvest. ProGibb was applied on August 4 with a spray volume of 50 gallons/acre and a modified seed oil spray adjuvant at a rate of 0.25% (1 quart/100 gallons of water). Within each column, data followed by the same letter have a 95% chance of being the same value.

Treatments	July 31	Aug 13	Aug19 low fruit	Aug 19 high fruit
Untreated Control	7.9 a	5.0 a	4.1 a	4.5 a
Low GA (21 ppm)	7.5 a	5.8 b	4.6 a	4.6 a
High GA (42 ppm)	7.4 a	5.3 ab	4.4 a	4.5 a

Table 2. The affect of GA₃ – applied as PriGibb 40 – on ‘Sutter’ prune fruit pressures prior to harvest. ProGibb was applied on August 4 with a spray volume of 50 gallons/acre and a modified seed oil spray adjuvant at a rate of 0.25% (1 quart/100 gallons of water). Within each column, data followed by the same letter have a 95% chance of being the same value.

Treatments	July 31	Aug 13	Aug19
Untreated Control	15.2 a	17.5 a	19.7a
Low GA (21 ppm)	15.9 a	19.7 a	21.6 a
High GA (42 ppm)	15.2 a	19.4 a	21.0 a

Figure 1. Pressure distribution of ‘Sutter’ prune fruit on July 31. Fruit from 12 trees --12 fruit per tree.

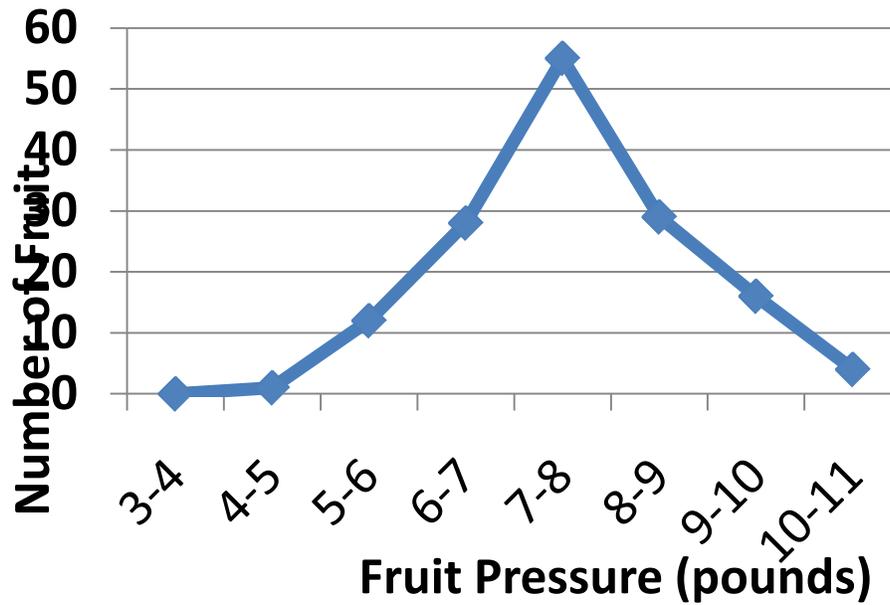


Figure 2. Pressure distribution of ‘Sutter’ prune fruit on August 19, 2010 following GA3 application at 21 ppm (“low GA” = 16 grams a.i./acre) or 42 ppm (“high GA”= 32 grams a.i./acre) on August 4. Spray volume = 50 gallons/acre.

