Chemical Thinning of Stone Fruits in the Sierra Foothill Region

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Introduction

Chemical thinning in stone fruit has the potential to reduce the cost of hand thinning, however, grower adoption of chemical thinning practices has been slow. Chemical thinning in stone fruit has proven more difficult than in apples and is dependent on specific factors such as variety, climate, timing, etc. This project began field trials to establish baseline data with two commercially available thinning agents, Entry™ and Ralex™, on foothill-grown peaches, plums, and nectarines. The goal is to reduce fruit set, and therefore the cost of hand thinning, to an economically beneficial level, without loss of fruit quality or yield. Specific objectives were:

Objective 1: To evaluate the efficacy of Entry™ at a 3% rate in an equivalent of 100 gal/acre on thinning of peach blossoms on trees grown in El Dorado County.

Objective 2: To evaluate the efficacy of Ralex™, at a rate of 32 g. a.i./acre, on flower density of peaches grown in El Dorado County.

Materials and Methods

Objective 1: Single-tree replicates were randomly selected and flagged prior to bloom and treatment with Entry™. At least four replicates per variety were used, when possible, more replicates were included in the experimental design (see Table 1). Varieties included 'Arctic Rose' nectarine, and 'O'Henry', 'Cal Red', and 'Fairtime' peach. All orchards were located in the "Gold Hill" region of El Dorado County at an elevation of approx. 1800ft. Trees were chosen with at least two buffer trees down the row between treatments and at least one buffer tree across the row to minimize drift from the treated trees to the controls. Eight shoots were flagged, each shoot length was measured and the total number of flowers/shoot was counted on each tree replicate prior to treatment. All varieties were treated on the same date, March 16, and estimated bloom at that time ranged from 80% to 95% for the four varieties.

Variety	# trees treated (replicates)	Est. ave. % bloom at treatment
Arctic Rose	10	80%
O'Henry	6	85%
Cal Red	4	85%
Fairtime	8	95%

Table 1. Number of replicates and estimated percent bloom of each variety treated with Entry™ in 2001. Entry™ was applied to all varieties on March 16.

A 3% stock solution of Entry™ in the equivalent of 100gal/acre was prepared and treatments were applied using a Stihl 400™ mist-blower backpack sprayer equipped with a pressure pump. To assure uniform and accurate application rate between trees, the volume calculated for each tree (based on 100 gal/acre rate and tree spacing of 450 trees/acre) was added to the sprayer tank each time before treating individual trees, the tree was then sprayed until the tank was empty. Wind was from the north at approx. 5-7 mph during application and temperature min/max on that date was 42°F/63°F, as measured using a HOBO data logger located at one of the orchard sites; estimated temperature during application was 55°F.

Treatment effects were evaluated at three stages: 1.) prior to hand thinning, 2.) hand thinning, and 3.) harvest.

1.) On May 8, 7.5 weeks after treatment and prior to hand thinning, the number of fruit on each flagged shoot was recorded. Fruit set was then calculated as (the number of fruit/the number of flowers) for each shoot. The cross-suture diameter of ten randomly chosen fruit from each tree was measured. A visual rating for overall thinning effect was also recorded at this time. Trees were rated by Jim Yeager, who has over ten years experience working in this field, using a scale of 0 (no thinning effect evident) to 5 (severely over thinned).

2.) During hand thinning, we originally proposed to record the amount of time required to hand remove fruit from the trees. This proved difficult to accurately measure for several reasons: more than one worker was thinning each tree, more than one rep. was being thinned at the same time, and workers appeared to speed up or slow down, depending on whether or not they were being visually monitored. Therefore, we decided to count the number of fruit hand thinned instead of the amount of time required to remove those fruit. This was accomplished in two ways: for the 'Arctic Rose' and 'Fairtime', counts of fruit on the ground under each tree were made after the thinning crew had gone through. For the other varieties, workers placed fruit removed directly into picking bags and the total number of fruit removed from each tree was then counted. This was the preferred and more accurate method.

3.) At harvest, fruit size and weight data was taken from the two varieties that appeared to show greatest effects. Cross-suture diameter was measured on ten randomly selected fruit from each tree and the number of fruit in each box and the total weight of that box was recorded. Weight per fruit was then calculated.

Objective 2: To apply the Ralex™, we used the grower's airblast sprayer and applied the top label rate of 48g.ai/acre in the equivalent of 300 gal./acre, based on the grower's recommendation of volume for a similar typical application. The solution of Ralex™ was applied to plots consisting of four trees that were randomly chosen and flagged prior to the application date. At least 2 buffer trees existed between plots down and across the row to prevent drift contamination. We worked with the tractor driver to assure the spray nozzles were turned off and on at each plot without misapplication. Varieties treated included 'Arctic Rose' nectarine, 'O'Henry', and 'Cal Red' peach and 'Kelsey' and 'Friar' plums. Each variety included four replicated four-tree plots in a randomized complete block design except 'Cal Red' which consisted of three replicates. All applications were made on the same date, June 23. This experiment will be evaluated in 2002.

Results

Fruit set on trees treated with Entry™ was reduced relative to the controls in all varieties except 'Arctic Rose', ($p \leq 0.05$); however, set was only reduced by 11-16% (graph 1). Fruit set reduction was greatest in 'Cal Red', in that variety, some phytotoxicity occurred (complete burning of small shoots) which may have contributed to the reduced set. These treated trees did not appear otherwise "setback" from this damage.

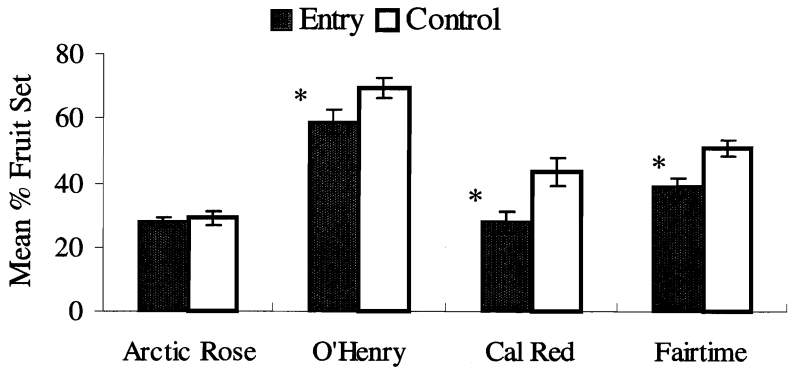

Figure 1. Mean percent fruit set in trees treated with Entry™ at 3% compared to untreated controls. Bars indicate standard error. * indicates a significant difference ($p < 0.05$).

Although fruit set was reduced in several varieties, the number of fruit removed during hand thinning, as accounted for by our methods, was only significantly reduced in the 'O'Henry'. We are not quite sure why this is the case, however, it is possible that two of the 'Cal Red' trees had fruit removed prior to our measurements, as noted by the field worker who did the hand-thinning for us. Also, the number of fruit from the 'Fairtime' variety is small for both the control and Entry™ treated trees due to the young age of the trees. We believe our method of obtaining this data improved with the workers thinning directly into the picking bag, and will use this method to obtain future data.

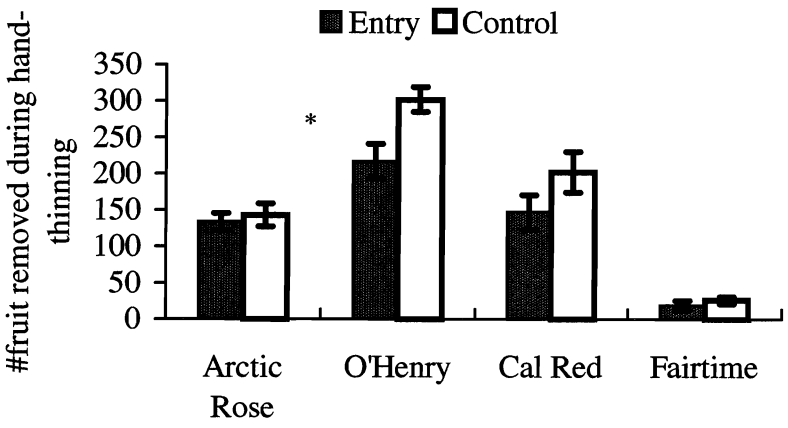

Figure 2. The number of fruit removed during hand thinning in Entry™ treated and untreated (control) trees. Bars indicate standard errors. * indicates a significant difference ($p<0.05$).

Visual rating results gave evaluations similar to calculated percent fruit set for most varieties (Table 2). The mean rating for the 'Cal Red' and 'O'Henry' Entry™-treated trees was higher than the control, indicating greater chemical thinning effect; while the ratings for the 'Fairtime' and 'Arctic Rose' was about the same between treated and controls. Although these results are qualitative, they provide additional information for overall tree thinning effects.

Variety	Entry-treated	Untreated controls
Arctic Rose	1.8	1.7
O'Henry	2.1	1.1
Cal Red	3.0	1.0
Fairtime	3.6	3.4

Table 2. Mean rating from visual assessment of thinning effects.
Trees were rated using the following scale: 0 = no thinning effect, considerable hand thinning needed; 1 = slight thinning effect, about 10% thinned; 2 = moderate thinning effect, about 20-30% thinned; 3 = "perfect", only minimal hand thinning needed; 4 = slightly over thinned; 5 = severely over thinned.

Fruit diameter at hand thinning was mostly the same among varieties, with only a small difference in the 'O'Henry'. Mean fruit size in the 'O'Henry' trees that received Entry™ was 31.3 mm compared to 30 mm for the untreated controls. Likewise, at harvest, the mean diameter of the 'O'Henry' fruit from the Entry™ treated trees was 77.5 mm, compared to 75.2 mm in the controls. Mean fruit weight was not different at harvest for either the 'O'Henry' or 'Cal Red' variety.