FINAL REPORT

Title: Chemical bloom thinning of sweet cherry to increase fruit size

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Objectives

This project is a collaborative effort involving research in commercial and experimental orchards in Washington and Oregon. The main objectives are to (1) determine the efficacy of chemical bloom thinning agents in reducing crop load and to (2) determine to determine the effect of crop load reduction on fruit size and quality. Trials were conducted in 2001, 2002 and 2003.

Significant findings

- The effect of chemical bloom thinners varied greatly among locations. Treatments that effectively reduced crop load did not consistently increase fruit size.

- The strongest responses to chemical treatments appeared to occur when with high initial crop loads. Crop load reductions have often been excessive, resulting in larger fruit but production of yields too low to be economically attractive.

- Data generated to date indicates that ATS is an effective bloom thinner, but it has not consistently resulted in a significant increase in fruit size.

- It was observed that in some cases, larger fruit was produced without significant chemical bloom thinning, suggesting an alternative mechanism for fruit growth stimulation independent of crop removal. It seems possible that sink strength has been enhanced in these cases, allowing fruit to compete more favorably for resources.

- Fruit firmness and soluble solids content (^{o}Brix) were often increased by the chemical bloom thinners tested.

- More research is needed to clarify the causes of the highly variable responses obtained among years, products and experimental sites and often within experimental sites.

Methods

This project was conducted in grower or experimental orchards in Oregon and Washington. During 2002 and 2003, work focused on testing the following treatments in ‘Bing’ trees:

1. Control trees, not sprayed.
2. Crocker fish oil + lime sulfur 2% (CFO + LS, sprayed at 25% FB and again at 85% FB).
3. Vegetable oil emulsion (VOE; 4% a.i., sprayed at bloom stage 6 and again at 75% FB).
4. Ammonium thiosulfate (ATS; 2% v:v; sprayed at 25% FB and again at 85% FB).

In addition to the above treatments, a combination spray of 2% ATS plus an experimental bioregulator (20 ppm) was tested in The Dalles on 6th leaf 'Bing'/Gisela 5 trees. A single combination spray was applied at ca. full bloom.

One branch per tree was chosen for data collection. Measurements included basal diameter at branching point, total branch length, number of individual flowers, number of green fruit when fruit measured 1 cm diameter, number of harvested fruit per branch and weight of fruit harvested from whole branch. Total yield per tree was recorded and a random sample of 25 fruit was collected from the tagged branch per tree to determine diameter, firmness and average fruit weight.

Results

Prosser, WA ('Bing'/Gisela 5)

All spray treatments significantly reduced crop load compared to controls. Yields of control trees averaged 68 lb/ whereas sprayed trees produced ca. 20 lb/tree. All spray treatments increased average fruit weight from 5.4 g in controls to ca. 7.3 g in sprayed treatments; however, this size increase is insufficient to offer increased profitability. Chemical bloom thinning resulted in ca. 85% 11½-row fruit, whereas controls produced 47%. Average fruit firmness was significantly increased by CFO + LS. ATS and CFO + LS significantly increased total soluble solids to 24^{o} Brix compared to 20^{o} Brix in controls.

Results for 2003 show that ATS and CFO+LS significantly increased fruit size in relation to VOE, while yields were similar for all treatments at ca. 12 kg/tree (Fig. 1). Fruit weights achieved in this trial ranged from 7 to 9 g, with controls producing fruit of statistically equal weight as ATS and CFO+LS. Fruit weights obtained in The Dalles (see below) exceeded 10 g/fruit, suggesting that the experimental microenvironment was more favorable for fruit development.

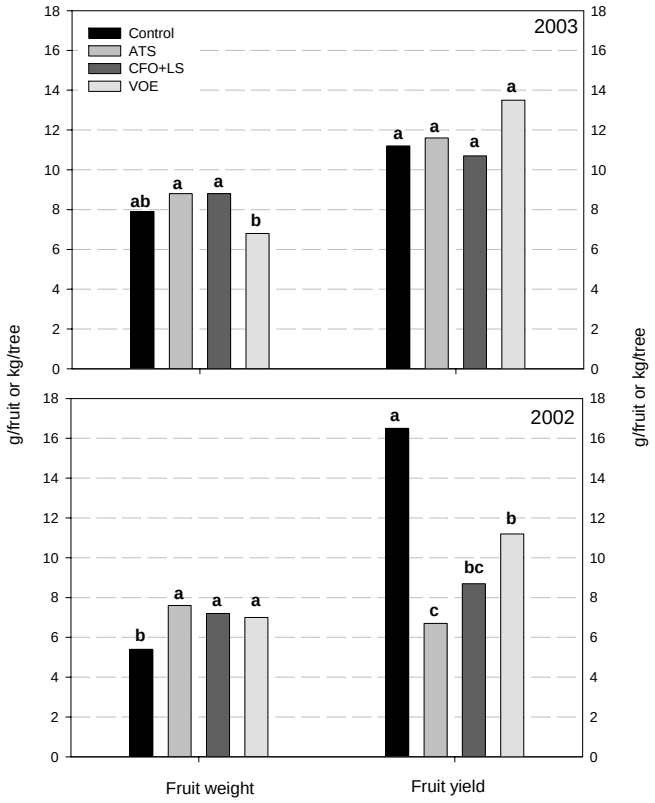

Figure 1. Effect of blossom thinner on individual fruit weight (g) and tree yield (kg) from 8- and 9-year-old 'Bing'/Gisela 5 sweet cherry trees in Prosser, WA. Bars with different letters are statistically different within year and parameter ($P<0.05$, $n = 8$). Data from M. Whiting.

Wenatchee, WA ('Bing'/Gisela 5)
Average yield for control trees was 50 lb/tree, compared to 36 lb/tree to 45 lb/tree for the spray treatments. Significant increases in average fruit weight were obtained with all treatments. Average fruit weight for controls was 6.6 g compared to >8.0 g for VOE and ATS, and 8.9 g for CFO+LS.

Yakima, WA ('Bing'/Gisela 6)
Chemical bloom thinning treatments showed no significant effects on fruit set, crop load reduction or fruit size. Average fruit size for all treatments at this site ranged from 8.6 g to 9.7 g

The Dalles, OR ('Bing'/Gisela 5)
Average tree yields for all treatments were ca. 40 lb/tree. Fruit set of controls was 52%, vs. 39% to 42% fruit set for sprayed trees. Compared to Prosser, average fruit weight in The Dalles was large for all treatments (10.0 g to 10.8 g), including controls (10.4 g), corresponding to an average row size of 9½ in all cases. Fruit firmness ranged from 314 g/mm in controls to > 323 g/mm for the chemical spray treatments.

In a separate trial, it was observed that the 2% ATS/bioregulator combination spray produced a large proportion of fruit exceeding 10 g without significantly reducing tree yields. This response suggests the possibility that the competitive ability of young sweet cherry fruit can be stimulated at this early stage, when they are still ovaries in development.

Hood River, OR ('Lapins'/Gisela 11)

Tree responses were very variable, resulting in no significant effects on fruit set, crop load reduction or fruit size. Fruit set varied from 27% to 30%, with average yields ranging from 28 lb/tree (ATS) to 46 lb/tree (control and LS). Average fruit weight ranged from 12.0 g to 13.4 g (30.3 to 31.6 mm diameter).

Future work

Crop load management via bloom thinning offers great potential as a management tool to increase grower profitability. However, consistent and predictable increase of sweet cherry fruit size by chemical bloom thinning still eludes us. It is suggested that tree and environmental conditions be monitored more closely in future work to help explain the highly variable responses observed to date. Generating fruit growth curves during each trial would also be very helpful. Periodic assessment of tree stress level is necessary to determine whether a lack of response is due to product or tree condition. For example, a practical determination of tree water status involves measuring leaf or stem water potential with a portable pressure bomb. Focusing future work on more detailed tree, fruit and environmental monitoring with very few treatments (only control vs. ATS, for example, may be sufficient to begin) and with more replication would increase our ability to interpret results of experimental chemical bloom thinning treatments.

Budget

Title: Chemical bloom thinning to increase fruit size in sweet cherry.
PI: Roberto Núñez-Elisea
Duration: 3 years
Project total (3 yrs): $17,000

Item	Year 1 (2001)	Year 2 (2002)	**Year 3 (2003)**
Salaries - FRA	$4,000	$4,398	**4090**
OPE (51.58 %)		$352	**2110**
Supplies		$500	**300**
Travel to orchards		$750	**500**
Total	$4,000	$6,000	**7,000**