Chemical Thinning of Apples Using Ethephon

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Chemical thinning is one of the most difficult practices in the orcharding year. The more tools available to growers, the greater their chance for thinning success. In 2003, we began to work with ethephon as a late-season approach to thinning. Using Ethephon, however, has not been thought to replace earlier thinning treatment but instead to rescue a failed thinning treatment. Results from 2003 and 2004 were published in the Spring issue of *Fruit Notes* in 2005. Both years of study gave consistent results, with between 200 and 300 ppm ethephon resulting in adequate fruit thinning when applied more than one month after bloom (fruit diameter at approximately 1 inch). Treatment in this range also resulted in increased fruit size and greater return bloom. So, Ethephon looks good as a rescue thinner.

The objectives of the work in 2005 included obtaining more experience with ethephon application to McIntosh and test it as a thinner on Macoun.

Materials & Methods

The first study was conducted in 2005 in a block of mature Gatzke McIntosh trees at the University of Massachusetts Cold Spring Orchard Research & Education Center. Forty trees were allocated among eight replications, based on initial fruit set. Within each replication, on June 10, (fruit 0.9 inches in diameter),

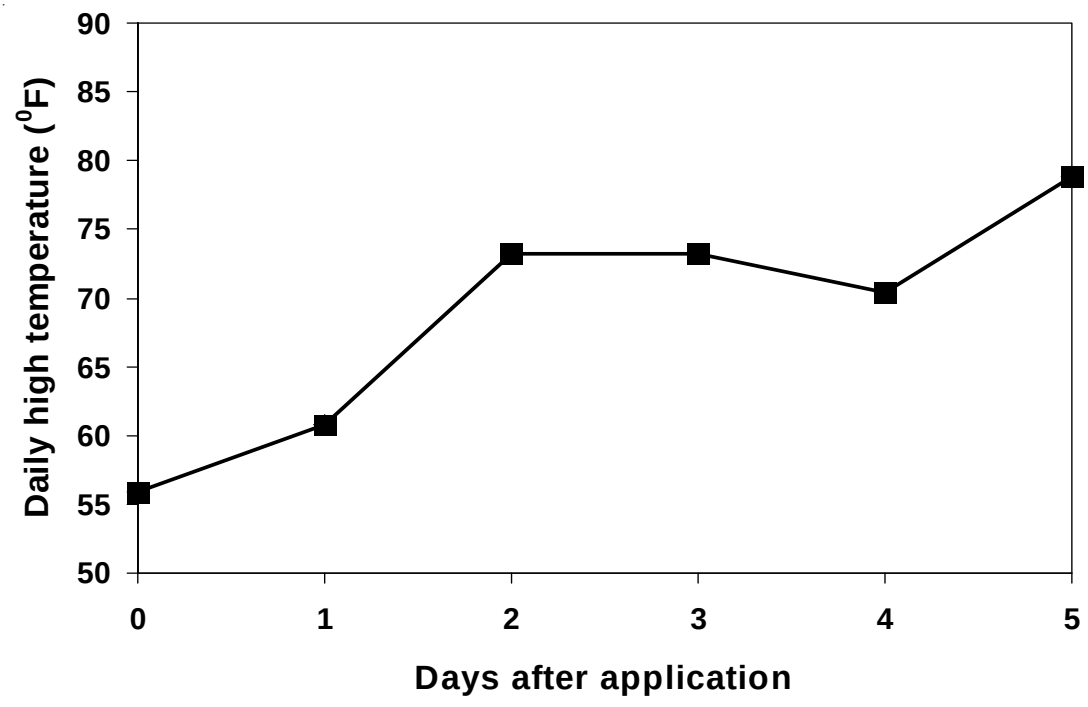

Figure 1. Daily high temperatures the day of ethephon treatment and the five days following treatment. Ethephon was applied on June 10, 2005 (fruit diameter of both McIntosh and Macoun was approximately 0.9 inches).

the five tree were allocated randomly among five thinning treatments (untreated, hand thinned, 200 ppm ethephon, 300 ppm ethephon, 400 ppm ethephon). Ethephon treatments were applied on this date. Daily high temperatures immediately following the day of application are given in Figure 1. Trees in the hand-thinning treatment were thinned on July 13. Thirty-fruit samples were harvested on September 19 and weighed to determine average fruit size. Ten apples were selected at random from this sample for the measurement of flesh firmness (two punctures per fruit with Effegi penetrometer), soluble solids concentration (juice collected from firmness measurements assessed with hand refractometer), and starch pattern (equatorially cut fruit dipped in iodine-potassium iodide solution and compared to Cornell Universal Starch Chart). In late April, 2006, return bloom was counted.

The second study in 2005 was in a block of mature Macoun trees at the University of Massachusetts Cold Spring Orchard Research & Education Center. The experimental protocol was identical to that of the McIntosh, except that fruit were harvested on October 3.

Results

McIntosh fruit set was reduced linearly by increasing concentrations of ethephon, but Macoun fruit set was not affected (Figure 2). Only the hand-thinning treatment reduced fruit set to an acceptable level in 2005.

McIntosh firmness was not affected by treatment, but ethephon resulted in a slight reduction in Macoun firmness (Table 1). Hand-thinned Macouns were generally firmer than all other treatments.

The soluble solids concentration in McIntosh fruit

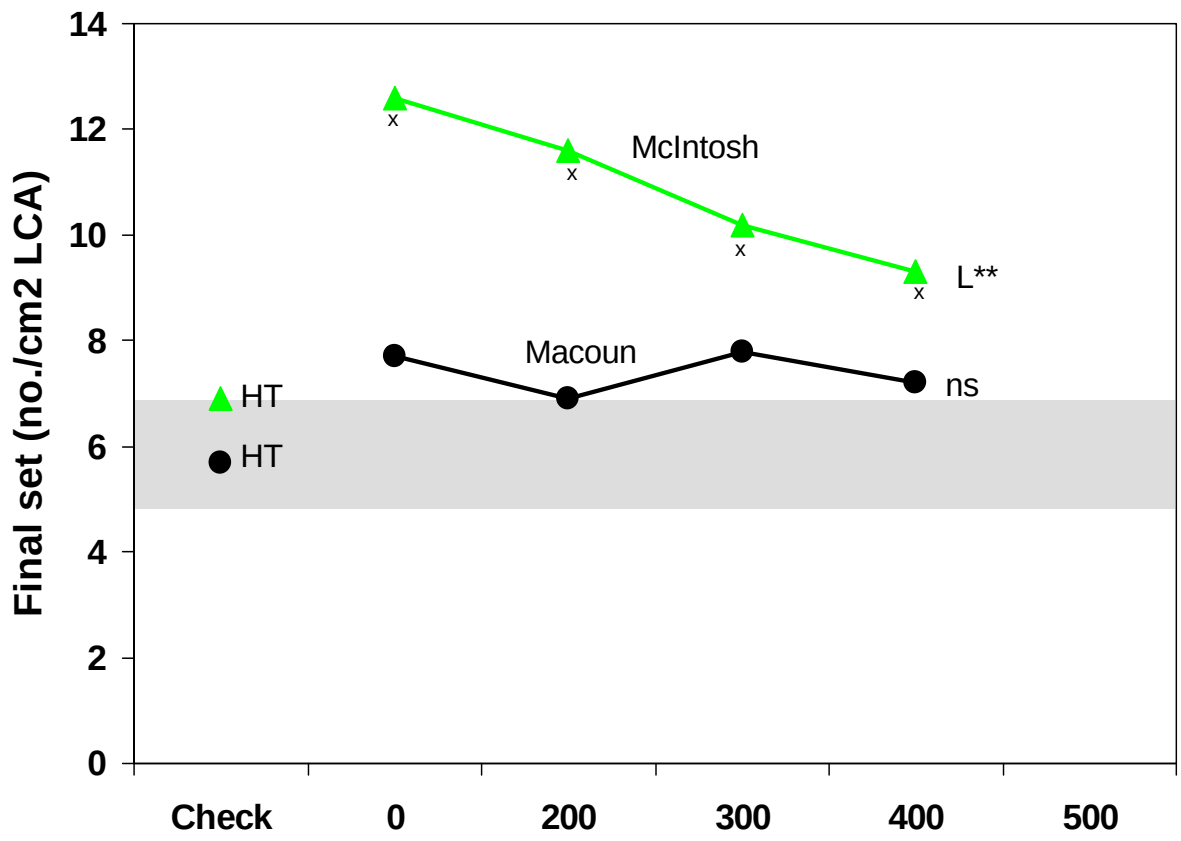

Figure 2. Final fruit set of McIntosh and Macoun in 2005 following ethephon treatments or hand thinning. A nonsignificant difference among ethephon treatments is denoted with "ns." McIntosh fruit set responded in a significant linear manner to increasing concentrations of ethephon. The "x" by a mean tells that it is significantly different from the hand-thinning treatment. The gray bar is the target fruit set.

Table 1. Effects of ethephon treatment on fruit firmness, soluble solids, and starch index value in 2005.

Treatment	Flesh firmness (lbs)		Soluble solids concentration (%)		Starch index value	
	McIntosh	Macoun	McIntosh	Macoun	McIntosh	Macoun
0 ppm ethephon	15.3	14.9[x]	11.3[x]	11.9	5.6	3.7
200 ppm ethephon	15.4	14.4[x]	11.7	11.9	5.8	3.4
300 ppm ethephon	15.1	14.3[x]	11.4[x]	12.0	5.8	3.6
400 ppm ethephon	15.4	14.4[x]	11.7	12.1	5.6	3.6
Hand thinned	15.8	15.9	11.9	12.4	4.1	3.8
Significance[z]	ns	L**	L*	ns	ns	ns

[z]L denotes a significant linear relationship between ethephon concentration and the parameter measured. Nonsignificant differences among treatments are denoted with an "ns."

[x]These means are significantly different than that of the hand-thinning treatment.

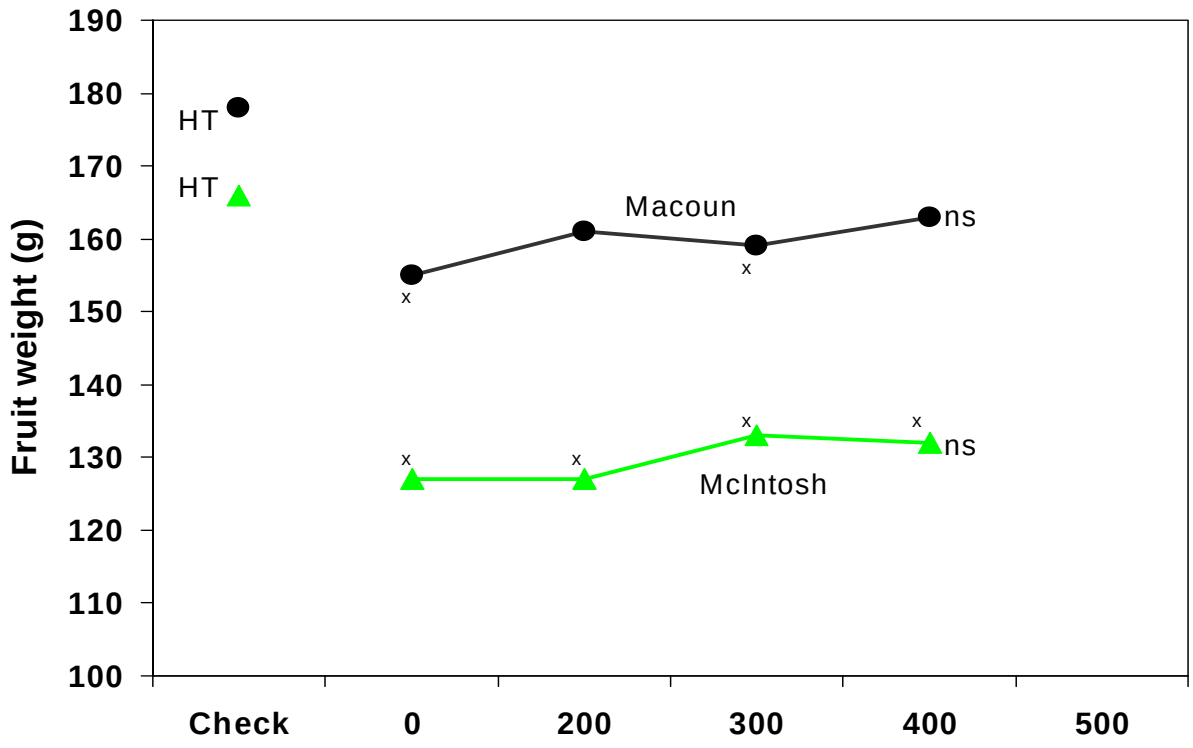

Figure 3. Fruit weight of McIntosh and Macoun in 2005 following ethephon treatments or hand thinning. A nonsignificant difference among ethephon treatments is denoted with "ns." The "x" by a mean tells that it is significantly different from the hand-thinning treatment.

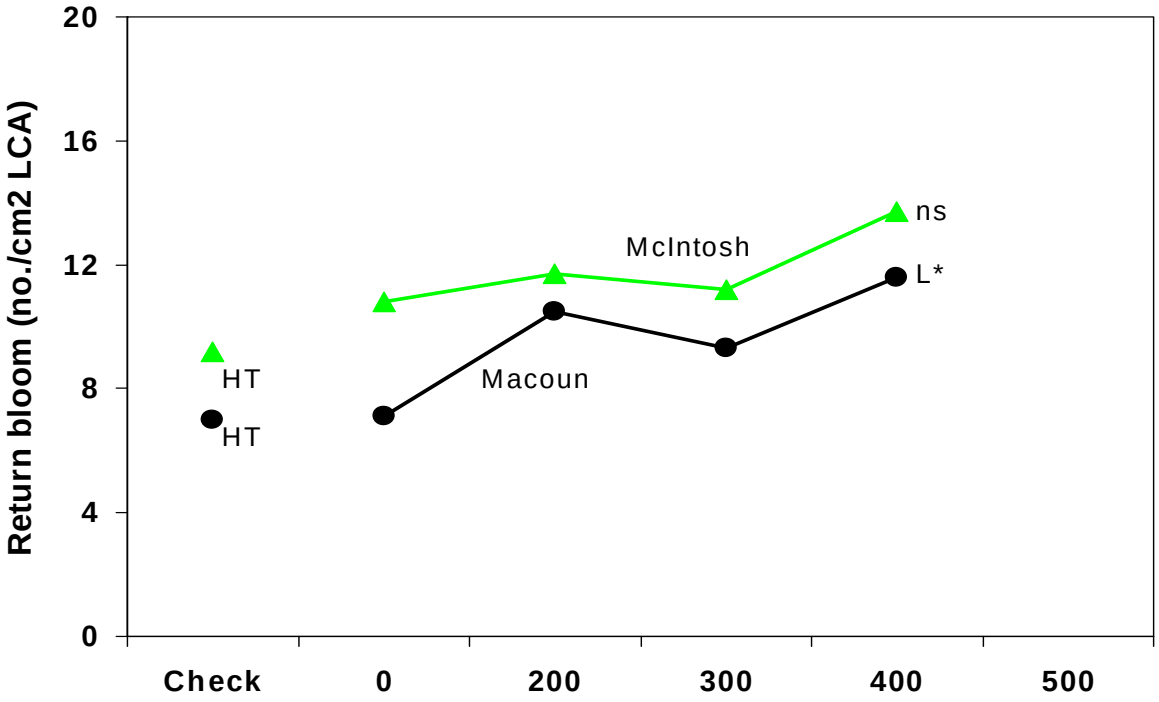

Figure 4. Return bloom of McIntosh and Macoun in 2006 following ethephon treatments or hand thinning in June 2005. A nonsignificant difference among ethephon treatments is denoted with "ns." Macoun return bloom responded in a significant linear manner to increasing concentrations of ethephon.

was increased somewhat by ethephon, but it had no impact on the soluble solids in Macoun fruit (Table 1). Starch index was not affected significantly by any treatment in 2005 (Table 1).

Fruit size was generally unaffected by ethephon treatment, and fruit from the hand-thinning treatment generally were larger than those from the other treatments (Figure 3).

Macoun return bloom in 2006 was increased linearly by increasing concentrations of ethephon applied in June, 2005 (Figure 4).

Conclusions & Future Research

In 2003 and 2004, very similar thinning benefits occurred from ethephon, with optimal concentrations between 200 and 300 ppm (0.67-1 pint/100 gal). Unfortunately, the effects of ethephon in 2005 were disappointing, to say the least. Even the highest concentration (400 ppm, 1.3 pints/100 gal.) did not give adequate thinning. We suppose that the lack of response relates to the cool temperature at the time of thinning and the following day (Figure 1). Future research will repeat previous work to gain more experience and attempt to determine if temperature is a significant factor controlling the tree's response to ethephon.

Acknowledgments

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