

FINAL PROJECT REPORT**YEAR: 1 of 1****Project Title:** Sprayable 1-MCP for managing apple postharvest quality**PI:** Don C. Elfving
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Email: delfving@wsu.edu**Cooperators:** Eugene M. Kupferman, Horticulturist, WSU-TFREC;
Dwayne Visser, Agricultural Research Technologist III, WSU-TFREC**Other Funding Source: N/A****Total Project Funding: Year 1: 12,000****Budget History:**

Item	2007
Salaries	5,220
Benefits	1,780
Wages	3,590
Benefits	410
Equipment	0
Supplies	200
Travel	800
Miscellaneous	0
Total	12,000

Objectives:

1. Evaluate effects of ethephon applied 4 weeks or 4 and 3 weeks before normal harvest on fruit quality attributes at harvest 2 or 1 week(s) before normal harvest and at normal harvest.
2. Examine effects of postharvest SmartFresh treatment with or without early ethephon on storability and fruit quality attributes for each harvest date after short-term RA and medium-term CA storage.
3. Assess whether combinations of ethephon applied 4 or 3 weeks before normal harvest and SmartFresh postharvest can enable earlier than normal harvest of fruit with comparable quality and storage characteristics to untreated fruit harvested at the normal timing.

Significant findings:

1. Two treatments of ethephon at 150 mg a.i./liter at a weekly interval had less effect on stimulating drop than a single treatment with 300 mg a.i./liter.
2. Both ethephon treatments induced significant drop; a stop-drop treatment of NAA should be used if this program is repeated (combining ReTain and ethephon treatment on 'Cripps Pink' apple stimulates, rather than retards, fruit drop).
3. Over a two-week interval (three harvests), ethephon stimulated fruit C₂H₄ production in proportion to treatment concentration, not number of applications.
4. Ethephon significantly increased C₂H₄ production for the first two harvests and enhanced starch hydrolysis on the second harvest date.
5. After around 90 days of RA storage or 120 or 240 days of CA storage, 'Cripps Pink' apples treated with ethephon and SmartFresh and harvested one to two weeks early showed quality characteristics as good as untreated apples harvested one or two weeks later.
6. Risk of crop loss due to early fall freezes can be reduced by treating a portion of the 'Cripps Pink' crop with ethephon to permit earlier harvest. Such apples must be treated postharvest with SmartFresh to ensure quality maintenance in storage.
7. Careful attention must be paid to the progress of maturity of ethephon-treated 'Cripps Pink' apples. Fruit drop can be accelerated by this treatment.
8. Do not use preharvest ReTain prior to preharvest ethephon on 'Cripps Pink' apples. Preharvest fruit drop has been significantly increased by this combination.

Methods:

One trial was established in a cropping 'Cripps Pink' apple orchard in Wapato. Multiple-tree plots were chosen to allow sufficient fruit for sequential harvests over 3 weeks. A randomized complete block experimental design was used, with preharvest treatments in a one-way treatment arrangement, subdivided into a 3X2 factorial when harvested fruit samples were separated into replicate non-treated or SmartFresh-treated fruit. Harvest evaluations of fruit characteristics were made, to be followed by subsequent evaluations at 90 days of RA storage, as well as 120 and 240 days of CA storage. Experimental harvest in this trial began 2 weeks before normal commercial harvest, to simulate the avoidance of an early freeze event that otherwise might severely damage a large percentage of the crop.

Results and discussion:

Preharvest ethephon did not result in softer fruit flesh at harvest, a common observation that does not indicate how fruit will behave in storage. Starch hydrolysis and C₂H₄ production were the two fruit characteristics most affected at harvest by preharvest ethephon treatment. The lack of accumulating differences in fruit characteristics at the third harvest suggests that the substantial crop loss to drop may have adjusted the population of remaining fruits such that less mature fruit were the only ones left on ethephon-treated trees at commercial harvest. If so, this observation is not of serious concern, since any program in which ethephon would be used preharvest would also automatically schedule

harvest earlier than the normal commercial harvest time in order to retain a larger proportion of the crop in an early fall freeze event. Follow-up evaluations were carried out after 90 days RA and both 120 and 240 days of CA storage. Fruit treated with ethephon 4 weeks before normal harvest, harvested 1 or 2 weeks earlier than normal, treated with postharvest SmartFresh and then stored were comparable or better in fruit quality characteristics after removal from storage and holding for 7 days at room temperature. Postharvest SmartFresh counteracted the tendency of ethephon to stimulate the climacteric, thus enabling the more mature fruit harvested early to maintain its acceptable quality for long periods. Preharvest ethephon or combinations of preharvest ReTain and ethephon have both increased preharvest fruit drop.

Acknowledgments:

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Publications 2008:

Schmidt, T.R., D.C. Elfving, J.R. McFerson and M.D. Whiting. 2008. Gibberellic acid accelerates 'Honeycrisp', but not 'Cameo', apple fruit maturation. **HortTechnology 18:39-44.**

Lenahan, O.M., M.D. Whiting, and D.C. Elfving. 2008. Gibberellic acid is a potential sweet cherry crop load management tool. **Acta Hort. 795:513-516.**

Elfving, D.C. 2008. Bioregulator sprays. p. 75-87. In: T.J. Smith (coord.), **2008 Crop Protection Guide for Tree Fruits in Washington. EB 0419.**

Elfving, D.C. and D.B. Visser. 2008. Bioregulator effects on growth, flowering and cropping in apple trees. **Poster, WA State Horticultural Association Annual Meeting, Yakima, WA.**

Visser, D.B. and D.C. Elfving. 2008. Bioregulators for managing growth, cropping and fruit quality in sweet cherry. **Poster, WA State Horticultural Association Annual Meeting, Yakima, WA.**

Executive Summary:

Preharvest ethephon did not result in softer fruit flesh at harvest, a common observation that does not indicate how fruit will behave in storage. Starch hydrolysis and C₂H₄ production were the two fruit characteristics most affected at harvest by preharvest ethephon treatment. The lack of accumulating differences in fruit characteristics at the third harvest suggests that the substantial crop loss to drop may have adjusted the population of remaining fruits such that less mature fruit were the only ones left on ethephon-treated trees at commercial harvest. If so, this observation is not of serious concern, since any program in which ethephon would be used preharvest would also automatically schedule harvest earlier than the normal commercial harvest time in order to retain a larger proportion of the crop in an early fall freeze event. Follow-up evaluations were carried out after 90 days RA and both 120 and 240 days of CA storage. Fruit treated with ethephon 4 weeks before normal harvest, harvested one or 2 weeks earlier than normal, treated with postharvest SmartFresh and then stored were comparable or better in fruit quality characteristics after removal from storage and holding for 7 days at room temperature. Postharvest SmartFresh counteracted the tendency of ethephon to stimulate the climacteric, thus enabling the more mature fruit harvested early to maintain its acceptable quality for long periods. Preharvest ethephon or combinations of preharvest ReTain and ethephon have both increased preharvest fruit drop.

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