Update and Review of the Use of Plant Growth Regulators in the Orchard

Duane W. Greene
University of Massachusetts
Amherst, MA 01003
Update Uses or New PGRs

• Preharvest drop with ReTain +/- NAA
• New formulations of Prohexadione-calcium
• New NAA formulations
• Transforming Cortland
Preharvest Drop

• Shift from wholesale to retain sales is occurring
• This shift has resulted in a need for better and longer control of preharvest drop.
• The weekends in September to mid October are critical to the economic success emphasizing the need to have fruit on the tree during these critical times.
• It is not uncommon to have 50% drop some years
When to Apply ReTain?
Label Suggestions

• 4 weeks prior to start of harvest
  – Maximizes delay in ripening
  – Drop control lost early
• 2 to 3 weeks prior to harvest
  – Minimal effect on ripening
  – Drop control extended late into the season
How Much ReTain Can you Apply?

• The ReTain label states that 333 g of ReTain I bag) per acre can be applied at one time.

• The only label restriction on amount is that you can’t apply more than 333 g/acre per time of application.

• The number of applications is not stated so several applications may be made.
NAA as a Drop Control Compound

- NAA was known to retard fruit drop as early as the 1930s.
- Until the registration of Alar it was the only one available.
- NAA has its limitations:
  - Advance ripening and shorten storage life.
  - NAA is effective for 7 to 14 days.
ReTain Became Dominant

• After 1989 there was a drop control void.
• ReTain filled that void for many years but it is expensive.
• The need for better drop control for a longer time and the desire to reduce costs were the incentives to find improved drop control solutions.
Approaches to Improve Drop Control

- Multiple applications of ReTain
  - Half rates
  - Full rates
- NAA
- Retain plus NAA
  - Many combinations tried
- Tree structure management
6 year Summary of Drop Control

• ReTain timing, number of applications and amount applied.
• ReTain combinations with NAA at different concentrations, number of applications and their time of application.
Cumulative Drop ReTain- 333g/acre

- Control
- 2009
- 2010
- 2011
- 2012
- 2013

Days After Application
ReTain Standard Summary

• Standard is 333g/acre applied 3 weeks before anticipated harvest.
• ReTain restricted drop to under 20% from 32 to 40 days after application.
• After that period of time the rate of drop accelerated.
ReTain Plus NAA 5 Year Average

- ReTain 333g/acre or 333g/acre + 10 ppm NAA with 333g/acre ReTain resulted in near identical drop control.
- ReTain + NAA resulted in increased drop control in only one year.
- There were a few negative fruit effects when NAA was included with ReTain.
NAA Fruit Effects

• 10 ppm NAA did not affect most fruit quality parameters as long as at least ½ rate of ReTain was used.
• Late in the season and also in storage a small percent of fruit (1-3%) cracked even when used with ReTain
• If too much NAA is used then fruit was induced to ripen early.
• The addition of NAA has questionable benefit for improving drop control.
ReTain Summary

• The more ReTain you apply the better and longer the drop control.
• Two full rates of ReTain have controlled drop into early October.
• The earlier you apply ReTain the more delay in ripening you will see.
• The later you apply ReTain the longer into the season drop will be controlled.
• It require 10-14 days for ReTain to slow drop.
• Multiple applications are best.
Kudos- Prohexadione-Ca Formulation

• Fine Agrochemicals has introduced a new formulation of Prohexadione-Ca that is supposed to be the same as Apogee.

• This formulation was evaluated with Apogee last year to determine if the two products perform similarly.
Prohexadione-Ca Evaluation

- Mature Cortland/M.7 trees were selected for this experiment.
- Three treatments
- 3 oz/100 gal applied TRV dilute
- Times of application: 5-17, 6-6, 6-25 and 7-23
Days after Petal Fall

Days after Petal Fall

Terminal Growth (CM)

Control
Apogee
Kudos

Days after Petal Fall

Terminal Growth (CM)
Influence of Kudos on Terminal Growth and Fruit Set of Fuji

• There is no information in the literature related to how long Pro-Ca remains active in tree before additional sprays are required.
• It is known that Pro-Ca can increase fruit set but no rate studies have been done on apple to quantify this.
• This project was done in an attempt to obtain more information on these.
Effect of Pro-Ca on Strawberry

• Pro-Ca can inhibit runner formation
• This is critical for the Hill System to be useful
• Strawberries were planted on July and Pro-Ca applied at 83 ppm on July 18
• One or 2 repeat applications were made at 3 week intervals depending on treatment.
Effect of Pro-Ca on Strawberry

• Pro-Ca can inhibit runner formation
• This is critical for the Hill System to be useful
• Strawberries were planted on July and Pro-Ca applied at 83 ppm on July 18
• One or 2 repeat applications were made at 3 week intervals depending on treatment.
Concentration of Kudos on Fruit Set and Growth of Fuji Apples

- Mature Fuji/M. used
- Treatments applied at TRV dilute
- Rates: 3 oz, 6 oz, 9 oz and 12 oz /100 gal only once at petal fall on May 20
Date Measured

Terminal growth (cm)

- Control
- Pro-Ca 3
- Pro-Ca 6
- Pro-Ca 9
- Pro-Ca 12

Date Measured
Effect of Kudos on Terminal Growth

• It required more than a week to measure growth reduction from treatments.
• Clearly the 3 oz rate stood out as being less effective than the other treatments.
• There was no evidence of regrowth which was unexpected.
Date Set Taken: 5-28 6-6 6-16 7-25

Fruit per cm LCSA

Control, Pro-Ca 3, Pro-Ca 6, Pro-Ca 9, Pro-Ca 12

Date Set Taken
Effect of Kudos on Fruit Set

• Fruit set was initially increased by all rates of Kudos.
• There was a marginal increase in set on treated trees.
• At the end of June drop set, there was no statistical difference among treatments although set differences appeared to be commercially significant.
• This warrants further evaluation.
Comparing NAA Formulations

- There are formulations of NAA that are or may be soon available for use in the orchard.
- Are they comparable products?
- Thinning trials were conducted in two years to compared efficacy.
- All three products were evaluated in 2014
NAA Formulations Trial

- Mature Macoun/M.9 trees were used.
- Treatments were applied with an airblast sprayer at a TRV dilute rate of 125 gal/acre.
- Carbaryl at 1 qt/100 gal applied to all trees except the Control at petal fall.
- All NAA treatments were applied on 28 May when fruit size averaged 9.9 mm.
Comparison of thinning efficacy of NAA formulations on Macoun/M.9.

<table>
<thead>
<tr>
<th>Treatment (ppm)</th>
<th>Fruit/cm LCSA</th>
<th>Fruit set (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>12.0 a</td>
<td>69 a</td>
</tr>
<tr>
<td>Carbaryl 1qt/100 gal</td>
<td>13.4 a</td>
<td>77 a</td>
</tr>
<tr>
<td>FAL 840 5</td>
<td>9.2 bc</td>
<td>54 b</td>
</tr>
<tr>
<td>FAL 840 10</td>
<td>8.3 c</td>
<td>51 b</td>
</tr>
<tr>
<td>PoMaxa 5</td>
<td>11.5 ab</td>
<td>65 ab</td>
</tr>
<tr>
<td>PoMaxa 10</td>
<td>8.8 bc</td>
<td>52 b</td>
</tr>
<tr>
<td>Fruitone L 5</td>
<td>11.1 ab</td>
<td>66 ab</td>
</tr>
<tr>
<td>Fruitone L 10</td>
<td>8.2 c</td>
<td>51 b</td>
</tr>
</tbody>
</table>

Significance Formulation

NS
Improving Cortland

- Historically Cortland has been an important apple in New England.
- In the 1970s and 1980s harvest was often delayed until McIntosh were harvested.
- Too frequently apples were over mature at harvest, thus storage and taste were compromised.
- There are tools available to transform this apple into a very desirable variety.
Apogee Use on Cortland

- Cortland is a tip bearing apple resulting in drooping branches that results in shading.
- Apogee application can cause it look like a spur-type tree, especially if used for several years in a row.
- Apply 4-6 oz/100 gal as early as possible.
- Follow this with a second application 2.5 to 3 weeks later.
- A 3rd application may be appropriate.
ReTain Use on Cortland

• Cortland responds very well to ReTain.
• Apply when you make your application on McIntosh.
• Two applications of 333g/acre have worked well but you may wish to use a lesser amount
• Ripening is retarded, firmness is increased and red color will improve since these can be harvested later.
• I strongly suggest that you try this on a few trees.
Summary

• A number of suggestions have been made for effective use of Plant Growth Regulators in your orchard.

• These are expensive products but I feel strongly that their use will be beneficial and profitable.
Washington Grower Quote

“Don’t tell me how much is costs. Just tell me how much money I am going to make.”

He is a wealthy man!