Successful Use of Apogee and ReTain in Apple

Philip Schwallier
District Horticulture Agent
Clarksville Horticultural Experiment Station
Apogee

• Prohexadione-calcium
  – Inhibits production of gibberellic acid (GA).
• Locally systemic.
• Apply early (King Bloom Petal Fall)
• Not compatible with hard water, Ca, B.
• Better spray coverage
• Fewer insect/disease problems
Apogee Effect

• Effects on shoot growth
  – Pruning
  – Return Bloom

• Suppresses Fireblight
  – Tree Productivity & Survival

• Other considerations
  – Red Color Improvement???
  – Thinning
### Apogee Rates & Timing

<table>
<thead>
<tr>
<th>Full Seasonal Rate</th>
<th>12 oz/100</th>
<th>48 oz/acre</th>
<th>250 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Must have buffer</td>
<td>Equal amounts of AMS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Must include surfactant</td>
<td>Silwet or Sylgard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; Application:</td>
<td>King Bloom Petal Fall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not compatible with hard water, Ca, B.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
McIntosh Apogee Trial, CHES

UTC

Mostly over in 30 days

Shoot Growth (mm)


Trial 14
NW Mich. Apogee Trial 2008
NW Mich. Apogee Trial 2008

Shoot Growth (inches)

Honeycrisp  Ida Red  Gala

Apogee  Control

50%  50%  20%
Apogee Trial

Apogee
Apogee Trial
Shoot Growth

Typical Growth Control 40%

Full Bloom | June | July

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NW Mich. Apogee Trial 2008

Honeycrisp: 50% increase in shoot growth with Apogee compared to control.
Ida Red: 50% increase in shoot growth with Apogee compared to control.
Gala: 20% increase in shoot growth with Apogee compared to control.

Nikki Rothwell
When to put on the 1st Application?

Start at KBPF
Apogee Trial

1” to 3” growth
Apogee
Seasonal Rate

• 48 oz/acre is full rate.
  – Start by reducing to 2/3 rate = 32 oz/acre
  – Reduce to TRV
    • Example 67% TRV = 21 oz/acre

Need to find your own rate.
Year after year use reduce rates.
### Apogee Split Applications

<table>
<thead>
<tr>
<th>1 Application</th>
<th>Seasonal Rate 21 oz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>1st</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>2nd</td>
<td>*Optional</td>
</tr>
<tr>
<td>3rd</td>
<td></td>
</tr>
<tr>
<td>4th</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>KBPF</th>
<th>May 10</th>
<th>May 24</th>
<th>Jun 14</th>
<th>Jul 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Application</td>
<td>1 2 3 4 5 6 7 8 9</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Apogee Rates & Timing

<table>
<thead>
<tr>
<th>Tree Size</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th *Optional</th>
<th>Seasonal Total</th>
</tr>
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<tbody>
<tr>
<td>Small</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4*</td>
<td>17 oz</td>
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<tr>
<td>&lt;200 TRV</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Medium</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>5*</td>
<td>21 oz</td>
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<tr>
<td>&lt;200 to 300 TRV</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large</td>
<td>7</td>
<td>6</td>
<td>6</td>
<td>6*</td>
<td>25 oz</td>
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<tr>
<td>&gt;300 TRV</td>
<td></td>
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<tr>
<td>Timing</td>
<td>King Bloom PF</td>
<td>2 weeks after KB PF</td>
<td>2 weeks later</td>
<td>2-3 weeks later</td>
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</tr>
</tbody>
</table>
## Apogee Split Applications

<table>
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<tr>
<th>Application</th>
<th>Seasonal Rate 21 oz</th>
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<tr>
<td>1st</td>
<td>+5</td>
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<tr>
<td>2nd</td>
<td>+5</td>
</tr>
<tr>
<td>3rd</td>
<td>+5</td>
</tr>
<tr>
<td>4th</td>
<td>+5</td>
</tr>
</tbody>
</table>

**KBPF**
- May 10
- May 24
- Jun 14
- Jul 5
Gala Apogee Trial, CHES

Apogee 1 spray
21 oz/acre

Apogee Multiple sprays
6+5+5+5

July

Shoot Growth (mm)

35%

UTC
Apogee
Apogee Multiple


Trial 14
Apogee Trial
Regrowth Fuji
# Apogee Rates & Timing

**oz/Acre**

<table>
<thead>
<tr>
<th>Tree Size</th>
<th>1&lt;sup&gt;st&lt;/sup&gt;</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt;</th>
<th>3&lt;sup&gt;rd&lt;/sup&gt;</th>
<th>4&lt;sup&gt;th&lt;/sup&gt; *Optional</th>
<th>Seasonal Total</th>
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<tbody>
<tr>
<td><strong>Medium</strong>&lt;br&gt; &lt;200 to 300 TRV</td>
<td>6</td>
<td>5</td>
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<td>12</td>
<td></td>
<td>9</td>
<td></td>
<td>21 oz</td>
</tr>
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<td><strong>Timing</strong></td>
<td>King Bloom PF</td>
<td></td>
<td>3 weeks later</td>
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Apogee

- Apogee increases fruitset but not consistently
- Because of higher cropload, fruit size may be smaller
- Increase thinning.
- Cropload vs rate needed
Super Spindle
Apogee Super Spindle 2004
Percent Fruit Set / Cluster

Apogee

Sacramento Valley

Percent

Mac
Cortland
Gala

UTC
Apogee

Trial Apogee
Apogee Super Spindle Fruit #’s
2003-2005

Trial Apogee
Apogee

- Nit vs rate needed
- Vigor vs rate needed
- Vigor or low cropload or high N will need additional Apogee

- Effect on Red Color
  - Inconsistent, no effect.
Honeymcrisp Trial 2003
Harvest
Apogee
UTC
Apogee
Conclusions

• Fireblight Suppression
• Will suppress FB canker growth and FB infections on shoots
• Key factor is apply early and high rates (get the shoots under control early)
Fireblight Shoot Blight
Super Spindle 2007
Fire Blight Tree Death

Exp 25

Apogee
UTC
Exp 25
Super Spindle 2007
Fire Blight Tree Death

Apogee
UTC
Fireblight & Apogee Trial 2008
Canker Growth

Canker Length | % Young Wood Infected | % Branch Infected
---|---|---
| | | Apogee | UTC | Strep+Mycoshield

Philip Schwallier
Super Spindle 2004
Cortland With Fireblight
Fire Blight Strikes
Super Spindle

Exp 25

<table>
<thead>
<tr>
<th></th>
<th>McIntosh</th>
<th>Cortland</th>
<th>Gala</th>
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<tr>
<td>UTC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apogee</td>
<td>10</td>
<td>5</td>
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</table>

Apogee Evaluation Report
2007.ppt
Apogee & Fireblight

<table>
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<tr>
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KBPF
May 10  May 24  Jun 14  Jul 5

3 weeks to measure effect
Apogee and Return Bloom
Gingergold Growth Habit
Apogee Trial

Apogee
UTC
Apogee Super Spindle 03-05
Pruning Cuts

Costs $133/acre

Costs $78/acre

Trial Apogee
Apogee Fruit Nutrition
2002 Gala Apogee Trial
Fruit Calcium

% Fruit Nutrition

UTC Apogee Apogee Multiple Calcium

Trial Apogee
Honeycrisp Calcium Trial 2005

Bitterpit

UTC | Calcium | Apogee
--- | --- | ---
20 | 2 | 12

% Sample 4
<table>
<thead>
<tr>
<th>Factors</th>
<th>Recommended Apogee Rate Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy Pruning (Vigor)</td>
<td>Add 1 oz/acre/spray</td>
</tr>
<tr>
<td>Nitrogen Fertilizer</td>
<td>Move Apogee Season Program to the Next Higher Level</td>
</tr>
<tr>
<td>Low Cropload</td>
<td></td>
</tr>
<tr>
<td>Questionable Coverage</td>
<td></td>
</tr>
<tr>
<td>Fireblight Concerns</td>
<td></td>
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<tr>
<td>Varieties</td>
<td>See Variety Guide</td>
</tr>
</tbody>
</table>
# Variety Consideration

<table>
<thead>
<tr>
<th>Sensitivity to Apogee</th>
<th>Variety</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Sensitive</td>
<td>Gingergold, Gala, Cortland, Rome, Paulared</td>
<td>Consider reducing rates of later sprays (spray 3 and 4).</td>
</tr>
<tr>
<td>Sensitive</td>
<td>Golden Delicious, Fuji, Spartan, N. Spy, Jonamac</td>
<td></td>
</tr>
<tr>
<td>Less Sensitive</td>
<td>Jonathan, Idared, McIntosh, Empire*, Golden Supreme, Jonagold</td>
<td>Consider using additional 1 oz/acre/spray.</td>
</tr>
<tr>
<td>Special</td>
<td>Red Delicious, Spur Mac</td>
<td>Spur type, Use 4+3+2 for medium size trees.</td>
</tr>
</tbody>
</table>

* Not recommended on Empire, Stayman.
Apogee
Conclusions

- Reduces shoot growth
- Significantly reduces pruning
- Suppresses FB.
- Apogee increases return bloom and fruit set (some varieties).
- Varieties differences
- Some fruit Ca benefits
- Increase thinning
Timing Apogee Applications

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<th>3rd</th>
<th>4th</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Seasonal Application</td>
<td>Split Application</td>
<td>Optional</td>
<td></td>
</tr>
</tbody>
</table>

KBPF

*May 10 *May 24 *Jun 7 *Jun 21

*These dates are typical timing dates for the Grand Rapids, Michigan area.
ReTain

- Delays harvest
- Stops Drop
- Improves Shelf Life
ReTain

- Maturity and Harvest Management
- Impact on Fruit Size
- Impact on Color
- Reduces Watercore, Greasiness, Cracking
- May Increase Fruit Size?
- Gala, Jonagold, Very Sensitive
- Honeycrisp, Moderately Sensitive
ReTain

• Apply 4 weeks before anticipated harvest.
• Gala delayed 14 to 21 days
• Jonagold delayed 10 to 14 days
• Honeycrisp delayed 7 to 10 days
• Most other varieties delayed 7 days
Gala UTC
1st Week, September

Gala, 50 g ReTain
1st Week, September
Gala 50 g ReTain
3rd Week, September
ReTain Harvest

Normal Harvest

ReTain Treated
ReTain Harvest

Normal Harvest

Aligned Harvest Dates

ReTain Treated
Jonagold ReTain Trials

% Red Color

Some minor impact

UTC
ReTain

Aligning Center Harvest
Jonagold ReTain Trials

Starch Index

Some minor impact

UTC
ReTain

Aligning Center Harvest

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Jonagold ReTain Trials
Internal Ethylene

Marked reduction in ethylene

UTC
ReTain

Aligning Center Harvest

% > 2 ppm

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Jonagold ReTain Trials

Fruit Weight

Some fruit size reduction

Aligning Center Harvest

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Gala ReTain Trial
Average Fruit Weight

Comparison of average fruit weight for different treatments:
- **Check**
- **ReTain**

The diagram shows a marked increase in average fruit weight for the ReTain treatment compared to the Check treatment.
ReTain Stops Drop
Retain Reduces Cracks

Reduces Greasiness

Reduced Watercore
Honeycrisp Trial 2003 @ CHES

Sound Fruit

% Sound Fruit

UTC

ReTain

Apogee

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ReTain Harvest

Normal Harvest

4 WBH

Full Rate ReTain

1/2 Rate

1/3 Rate
Red Del Example

Normal Harvest

Treat 1/3 with Full Rate
Treat 1/3 with Half Rate

Full Rate ReTain

1/2 Rate
ReTain

- Harvest management tool
- Quality improvement
ReTain

- Delays harvest
- Stops Drop
- Reduces Watercore, Greasiness, Cracks
- Improves Shelf Life
- May Increase Fruit Size??
- Color Development??
- Gala, Jonagold, Very Sensitive
- Honeycrisp, Moderately Sensitive

Philip Schwallier
Thanks to:
CHES staff
Michigan Apple Research Committee
Michigan State Horticulture Society
Valent BioSciences
AmVac
BASF
Grower Cooperators