Welcome to the Jentsch Lab

Research  Our research and extension outreach program is directed by Cornell University's Department of Entomology and located at the Hudson Valley Research Laboratory (now FARM), in Highland, NY. We are a part of the New York State Agricultural Experiment Station in Geneva, NY, with the laboratory building owned by a non-profit cooperative tree fruit grower organization (HVRL Inc).

Partnership  This cooperative partnership with the College of Agriculture and Life Science (CALS), Cornell Cooperative Extension (CCE) and the Eastern New York Commercial Horticultural Program (ENYCHP) providing continuous agricultural Research and Extension to the agricultural community on Tree Fruits and Vegetables in the Hudson Valley since 1923.
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Plant Protection Presentations

Fruit Production IPM Presentations:

2018
The Heirloom Orchard: A Three-Day Series on Estate Orchard Management. Saturday Dec 8th, 15th, 22nd 2018. 5:00-8:00 pm HVRL.

CONNECTICUT POMOLOGICAL SOCIETY. Nov. 27th. Biological Insecticides:What are they and do they really work?

Insecticide Efficacy HVRL IPM Workshop, Highland, NY October 10th, 2018.

Why Grow Heirloom Apple: Discussion

• Understanding the why behind growing apple. Simply not just fruit.
• How orchardists (estate owners) see themselves and how they want to be seen by the world
• **Orchardists** should prioritize the why of fruit growing.
  • Esthetics – View & Vista, Garden & Grounds, Fresh Eating, Storage, Juice, Cider, PYO, For Wildlife
• **Managers** need to understand and prioritize the needs of the why clients have fruit trees
Why Grow Heirloom Apple: Discussion

Cider Tasting: Survey

<table>
<thead>
<tr>
<th>Cider</th>
<th>Location</th>
<th>Style</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bad Seed Cider</td>
<td>Ulster Co. (Highland)</td>
<td>Dry</td>
</tr>
<tr>
<td>Abandoned Orchard</td>
<td>Sullivan Co.</td>
<td>‘Traditional Farm’</td>
</tr>
<tr>
<td>Stella Cidre</td>
<td>Global</td>
<td>Crisp / semi-sweet</td>
</tr>
<tr>
<td>Doc’s Draft</td>
<td>Orange Co. (Warwick, NY)</td>
<td></td>
</tr>
</tbody>
</table>
Why Grow Heirloom Apple: Discussion

Heirloom Apple Variety Tasting: Survey

- Esopous Spitenburg
- Baldwin
- Jonathan
- Northern Spy

- Newer varieties
  - Keepsake
  - Elstar

- Goldrush – Cider / Keeper
- Pink Lady – Firm, attractive color, elongate
Apple Tree Architecture

- Rootstock:
- Tree size management
  - Scion rooted standard (100%)
New England Orchard Revival: Resurrecting the Heirloom Apple
Estate Tree Architecture
• Scion Rooted
• Open Canopy
• ‘Kid Friendly’
• Orchard Floor visibility
Estate Revival
• Re-establishing orchard
• Long Slow Process
• Historically Significant
Estate Revival
• Re-establishing orchard
• Long Slow Process
• Historically Significant
• Wildlife Fruit
• 3-dimensional fruiting
Apple Tree Architecture

- Rootstock:
- Tree size management
  - Scion rooted standard (100%)
  - Semi-dwarf
- Root distribution and depth
- Susceptibility to insect and disease
- Sucker growth, management inputs
- Apple require 1” of water / week

Scion: Tree Characteristics

- Tree height (management requirements)
- Branching (upright, horizontal, drooping)
- Bark characteristics (smooth, flake, burr knots)
Apple rootstocks can have a variety of desirable characteristics including **tree size, crop load**
- Dwarfing and tree branching modifications
- Increased precocity (early fruitfulness)
- Increased productivity, tree spacing for light interception
- Tolerance to apple replant disease (ARD)
Tree size comparisons using different rootstocks based on percent size of standard apple seedling.

Apple rootstocks can have a variety of desirable characteristics including resistance to:

- Crown rot oomycetes (Phytophthora spp.)
- Fire blight bacteria (Erwinia amylovora)
- Woolly apple aphids
General Characteristics of GENEVA® Apple Rootstocks

- **Disease resistance**
  - Fire blight
  - Crown and root rots (Phytophthora)
  - Apple Replant Disease Complex *

- **Pest resistance**
  - Woolly apple aphid*

- **Other characteristics**
  - All are dwarf types that differ within dwarf sizes
  - Cold hardiness*

*Applies to some GENEVA® Apple Rootstocks.

Selected Current Licensees for Geneva Series Grafted Trees

- Cameron Nursery, LLC
- Consorcio Viveros Sacramento
- Copenhaven Farms
- Cummins Nursery, 1408 Trumansburg Rd, Ithaca, NY 14850
- Domaine deCastan, SAS
- Fruit growing Equipment and Service SRI
- Helios Nursery
- Janssen Brothers Nurseries Ltd.
- Kit Johnston Farms
- SAPO Trust
- SNC ELARIS
- Treco, Inc.
- Uni-Viveros
- **Wafler Nursery** 10748 Slaght Road, Wolcott, NY 14590 877-397-0874
- Willamette Nurseries, Inc.
- Willow Drive Nursery, Inc.
## Antiques & Exotics

<table>
<thead>
<tr>
<th>Scion</th>
<th>Category</th>
<th>Rootstock</th>
<th>Size class</th>
<th>Stock</th>
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<tr>
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<td>Apple</td>
<td>G.222</td>
<td>Semi-dwarf</td>
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<td>Arkansas Black</td>
<td>Apple</td>
<td>G.41</td>
<td>Dwarf</td>
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<tr>
<td>Arkansas Black</td>
<td>Apple</td>
<td>G.935</td>
<td>Dwarf</td>
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<td>Ashmead’s Kernel</td>
<td>Apple</td>
<td>G.11</td>
<td>Dwarf</td>
<td>91</td>
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<td>Ashmead’s Kernel</td>
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<td>Ashmead’s Kernel</td>
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<td>71</td>
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<td>Baldwin</td>
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<td>Dwarf</td>
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<td>Black Oxford</td>
<td>Apple</td>
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<td>Blenheim Orange</td>
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<td>Calville Blanc</td>
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<td>21</td>
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<td>Campfield</td>
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<td>G.11</td>
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<td>47</td>
</tr>
<tr>
<td>Eistar</td>
<td>Apple</td>
<td>G.935</td>
<td>Dwarf</td>
<td>3</td>
</tr>
<tr>
<td>Frostbite (MN 447)</td>
<td>Apple</td>
<td>G.210</td>
<td>Semi-dwarf</td>
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<tr>
<td>Frostbite (MN 447)</td>
<td>Apple</td>
<td>P.18</td>
<td>Full-size</td>
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<td>Apple</td>
<td>G.41</td>
<td>Dwarf</td>
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<td>Golden Russet</td>
<td>Apple</td>
<td>B.9</td>
<td>Dwarf</td>
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<td>Apple</td>
<td>G.202</td>
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<tr>
<td>Golden Russet</td>
<td>Apple</td>
<td>MM.111</td>
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<tr>
<td>Grimes Golden</td>
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<tr>
<td>Grimes Golden</td>
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</tr>
<tr>
<td>King David</td>
<td>Apple</td>
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</tr>
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<td>G.41</td>
<td>Dwarf</td>
<td>33</td>
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<tr>
<td>King David</td>
<td>Apple</td>
<td>G.41</td>
<td>Dwarf</td>
<td>7</td>
</tr>
</tbody>
</table>
Baldwin

Baldwin is also known as Woodpecker, Pecker and Butters. It was first discovered as a chance seedling in Wilmington, Massachusetts, USA, 1740. It was the most popular all-purpose dessert apple in the United States until it was killed during harsh winters between 1934-1935 and was replaced by McIntosh. The original tree died in the mid 1800's, but is marked by a monument to the Baldwin apple.

The apple is smaller than McIntosh, medium sized but dense and heavy, with yellow to flushed/striped brick red and bronze. This heirloom is crisp, juicy, with sweet to subacid flavor, aromatic, and firm. It is very hard and thick skinned, good for shipping. Good cider base, and great for pies. The fruit contains 13.64% sugar which ferments to 6% alcohol.

The tree is slow to bear, long-lived, and usually a productive and vigorous tree. Can tend towards biennial or even triennial production. Triploid. Susceptible to apple scab and Baldwin spot, but resistant to Cedar Apple Rust. Ripens in October in upstate New York and will keep till February. Hardy to zone 4.

G.935 Dwarf rootstock (40% of standard)

<table>
<thead>
<tr>
<th>#1 grade</th>
<th>1/16 grade</th>
<th>9/16 grade</th>
<th>7/16 grade</th>
<th>5/16 grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sold out</td>
<td></td>
<td>Sold out</td>
<td>Sold out</td>
<td>Sold out</td>
</tr>
<tr>
<td>$27.75 each</td>
<td>4 in stock</td>
<td></td>
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## GENEVA® Apple Rootstocks

<table>
<thead>
<tr>
<th>Traits</th>
<th>D1148</th>
<th>D1147</th>
<th>D3610</th>
<th>D3539</th>
<th>D4950</th>
<th>D6280</th>
<th>D3609</th>
<th>D4190</th>
<th>D2737</th>
<th>D4951</th>
<th>D3785</th>
<th>D3540</th>
<th>D5107</th>
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<tbody>
<tr>
<td>Woolly Apple Aphid Resistance</td>
<td>No</td>
<td>No</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>No</td>
<td>No</td>
<td>High</td>
<td>High</td>
<td>No</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Fire Blight Resistance</td>
<td>Resistant</td>
<td>Resistant</td>
<td>Very Resistant</td>
<td>Very Resistant</td>
<td>Very Resistant</td>
<td>Very Resistant</td>
<td>Very Resistant</td>
<td>Very Resistant</td>
<td>Very Resistant</td>
<td>Very Resistant</td>
<td>Very Resistant</td>
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</tr>
<tr>
<td>Replant Disease Complex Resistance</td>
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<td>Partial</td>
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<td>Tolerant</td>
<td>Tolerant</td>
<td>Tolerant</td>
<td>Tolerant</td>
<td>No</td>
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<td></td>
</tr>
<tr>
<td>Crown and Root Rots (Phytophthora)</td>
<td>Tolerant</td>
<td>Tolerant</td>
<td>Tolerant</td>
<td>Tolerant</td>
<td>Tolerant</td>
<td>Tolerant</td>
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<td>Tolerant</td>
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<td></td>
</tr>
<tr>
<td>Cold Hardiness</td>
<td>Yes</td>
<td>Partial: Good Mid-winter, Bad early-cold</td>
<td>Yes</td>
<td>TBD</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Productivity/Yield Efficiency- as good or better than M.9</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Low suckering and burr knots</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Medium</td>
<td>Yes</td>
<td>Medium</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Susceptibility to latent viruses</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

**TBD:** To Be Determined.

(a) Remarks: G.41 has presented weak graft unions with the following scions: Cripps Pink, Scilate, and Honeycrisp. The well feathered trees are prone to breakage in strong winds in the first 2-3 years and additional care needs to be taken to prevent breakage. Breakage risk decreases with time.

**Recommendation:** Use plant materials that have been tested and are "clean" of viruses. Licensing for all varieties is available as exclusive or non-exclusive in selected Domestic and International Territories.

*Chart data valid as of September 20, 2018,* and supplied by Cornell University apple rootstock breeding team members, Gennaro Fazio, PhD., USDA Breeder, Terence Robinson, PhD, Cornell Breeder, and Herb Aldwinckle, PhD., Professor Emeritus.
Esopus Spitzenburg apple

One of the great American apple varieties, thought to be Thomas Jefferson’s favourite. Noted for its spicy flavour, and for its susceptibility to any and every disease afflicting apples.

Origins

- Species: Malus domestica
- Parentage: Unknown
- Originates from: Esopus, New York, United States
- Introduced: Early 1800s
- Orange Pippin Cultivar ID: 1193
- UK National Fruit Collection accession: 1950-033

Identification

- Fruit colour: Red / Orange flush
- Flesh colour: White to Cream, pale yellow
- Flesh colour: White to Greenish to Greenish Yellow
- Flesh colour: Yellow to Very Yellow
- Fruit size: Variable
- Fruit size: Small
- Fruit size: Medium
- Fruit size: Large
- Fruit shape: Round-conical
- Fruit shape: Conical
- Fruit shape: Long-conical
- Fruit shape: Oblong-conical
- Multitude apple group: 7. Flushed / striped, some russetting, sweet
Using

- Uses: Eat fresh
- Uses: Cooking
- Uses: Juice
- Uses: Drying
- Flavour quality: Exceptional
- Flavour quality: Very good
- Flavour style: Honeyed / Scented
- Flavour style: Sweeter
- Flavour style: Aromatic
- Harvest period: Mid-Late season
- Harvest period: Late season
- Use / keeping: 3 months or more Should be stored for at least a month before eating.

Growing

- Cropping: Heavy
- Flowering period: Mid-Late season
- Flowering group: 4
- Fertility: Self-sterile
- Fertility: Diploid
- Vigour: Slightly large
- Bearing regularity: Biennial tendency
- Gardening skill: Some skill needed
- Fruit bearing: Spur-bearer
- General disease resistance: Poor
- Period of origin: 1800 - 1849

Climate

- Climate suitability: Warm climates
- Climate suitability: Temperate climates
- Climate suitability: Tolerates cold winters

Diseases

- Canker: Very susceptible
- Scab: Very susceptible
- Fireblight: Very susceptible
- Cedar apple rust: Some susceptibility

Relationships to other varieties

Offspring of this variety:
- Jonathan

Also known as

- Spitzenburg

References and further reading about this variety

- Apples for the 21st Century
  Author: Manhart
  Listed as Spitzenburg

  Author: Merwin I.A.
Fruit Quarterly

The Fruit Quarterly is printed 4 times a year, in the Spring, Summer, Autumn and Winter and is a joint effort of the New York State Horticultural Society, Cornell University’s New York State Agricultural Experiment Station at Geneva, and the New York State Apple Research and Development Program.

Most Recent Issue

Summer 2018
2 months ago / Issues

1. Update on New Apple Varieties and Clubs
2. Studies on Pollination and Pesticide Use During Orchard Bloom
3. Bacterial Strain Affects Cultivar Response to Fire Blight in Apples
5. Breeding Apple Rootstocks to Match Cultural and Nutrient Requirements of Scion Varieties

Summer 2018 Issue

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Update on New Apple Varieties, Managed Varieties and Clubs

Susan Brown and Kevin Maloney
Horticulture Section, School of Integrative Plant Science, Cornell University, Geneva, NY

Keywords: branding, apple marketing, apple cultivars, exclusive licensing, patents

This is the third in a series of updates on club varieties. Readers are encouraged to review the earlier series for additional information (Brown and Maloney 2009, 2010, 2011). In this article, we are stressing some of the managed or new varieties being tested in New York, or those gaining attention on an international scale.

Apples in the News

Antideam Blush: US plant patent 28,995 was granted in 2017. University of Maryland Professor Chris Walsh and graduate student Julia Harsh were the inventors. This apple is a hybrid of ‘Cripps Pink’ and an unknown advanced selection of McIntosh ‘Wilcox’ (columnar habit) x ‘Galas’. It ripens about the first week of October and seems to tolerate the heat. The narrow canopy may reduce grading needs.

Autumn Glory (‘Haagana’): A cross of Fuji x ‘Golden Delicious’ made in 1976. ‘Autumn Glory’ is bi-color, with a striped red blush over yellow. The fruits are large and slightly ribbed. The flavor is sweet, with some pericarp of cinnamon and cinnamon notes, while others do not perceive these flavors. Autumn Glory is exclusive to Dukes Super Fresh Growers in Washington state. https://www.supersfreshgrowers.com/our-fruits/apples/autumn-glory.

Unfortunately, two samples purchased in Geneva NY on April 17 had internal disorders, yet this was traced back by the company to very young trees and a late harvest. Their customer service was excellent.

Baker’s Delight (MAIA8): A Goldrush ‘Sweet 10’ cross, with a different flavor profile, with some suggesting a flavor similar to cherry or strawberry Doubleapples. This apple tends to set a heavy crop, which may negatively impact its unique flavor profile. Fruits are medium in size and reported to have a tender texture. Fruits are said to hang well on the tree and be good for baking, due to sufficient acidity (Herrick 2017). MAIA8 ripens in early to mid-September — about a week after Honeycrisp. Trees are available fromfsa.org and the home market and commercially from Welfare Nursery (NY) and Early Morning Star Nursery (WA).

Bonita: This scab-resistant variety from the Czech Republic is a hybrid of ‘Topsax’ x ‘Cripps Pink’ (‘Pink Lady’) x ‘Pink Lady’. It is being planted in Italy and represents 10% of new plantings. Bonita has 13% less and 0.76% titratable acidity and it ripens close to Golden delicious.

Braeburn (ANABP 1): The marketing tag-line is “like no other”. Braeburn’s name is derived from ‘Royal Gala’ x ‘Cripps Pink’ (a dwarf ‘Sundowner’). Developed in Maryland, Australia. There are 60 producers in Australia and testing is beginning in Singapore. Braeburn is an unusual, deep burgundy in color and has reduced flesh browning after cutting. It is sweet but with an acid balance. Braeburn is also early ripening, maturing about 2 weeks before ‘Cripps Pink’. Braeburn has a narrow harvest window. The thicker skin is suggested to reduce bruising. https://www.fruitwest.com.au/

Cosmic Crisp (WA 38B): USPP 24,210, 14 in 2014. This hybrid of ‘Honeycrisp’ x ‘Enterprise’ from Washington State University is set to make history in terms of rapid commercialization of an apple variety. 2019 will be the first commercial production in super markets. The production goal of 10 million boxes within the first 5 years includes a massive push of new plantings. WA 38 has excellent storage and quality attributes. A team of researchers is aiding growers with recommendations on best practices for ‘Cosmic Crisp’. All of this is detailed on the website: https://www.cosmiccrisp.com/the-facts. Stay tuned.

Crimson Snow (‘AMC28’): “Great feeding” is the marketing tag-line. This chance seedling found in Australia will be managed by Kiwi. Reported to have great coloration, white flesh and fresh low browning after cutting. ‘Crimson Snow’ needs special production techniques to ensure annual bearing. https://www.kiwifruit-network.com/en/cosmic-snow-maia38.

Crunch-a-Bunch (MAIA7): USPP 29,136, granted in 2018. This yellow apple is an open-pollinated ‘Honeycrisp’ seedling, with Goldrush suggested as a potential parent. Trees are prone to oversetting and can become biennial, but the quality is said to be retained with a heavy crop. That statement needs to be confirmed. This apple’s flavor is said to have hints of pineapple and tropical fruits, and the fruits have a light texture. The patent for MAIA7 indicated that it is susceptible to powdery mildew and to soft rot (Penicillium) in storage.

Dazzle (PreA129): The US plant patent application was filed in 2016. The pedigree of PreA129 is ‘NZ Queen’ x ‘Sciried’ (which is a cross of Gala x ‘Splendour’ x ‘Sweetie’ (a hybrid of Royal Gala x ‘Braeburn’). The cross was made in 1997. FruitCult in New Zealand, formed from three of NZ’s largest growers (Mr. Apple, Bosc and Freshman) obtained the worldwide rights to preA129 from Preva. FruitCult is forecasting that 1 billion cartons will be exported from NZ by 2028. Dazzle is a large red and very sweet apple (Figure 1), with about 14.3% Brix and low acidity (0.26-0.32). More information may be found at www.dazzlesapple.com.

Figure 1. Dazzle apple (PreA129) (photo: FruitCult, NZ)

Envy (‘Scilate’): USPP 20,828 in 2008. Tag line: “Nice and beautiful” and also “When you see this it’s really good they call you Envy”. Envy has won US apple’s Apple of the year for several years, and many ask where they can find “Envy” in the US. In searching the literature, ‘Scilate’ is not the easiest apple to grow, with reports of susceptibility to Neonectria, with infected trees sometimes symptoms (Ampelosan et al. 2015). Reports submitted to Enza by researchers also mention rust and shivel (Breen et al. 2008), bitter pit, and internal brown spot. In New York we rated the Enzy as a very susceptible to apple rust. A disease that often on apples is a unitarian pathogen, it was studied extensively (Everett et al. 2017). Van Hooijdonk et al. (2014) suggested specific pruning techniques to maximize fruit quality. https://enzyapples.com/en/about-envy

EverCrisp’ (MAIA13): USPP 26,059, granted in July 2016. This hybrid of Honeycrisp x Fuji, resembles both Fuji and the quality is said to be retained. This apple is a high quality, with excellent shelf life. Comments from the patent and website indicate: rusted extending over stem cavity, with tendency to crack, modest susceptibility to watercore, susceptible to sooty mold, soft rot (Penicillium). First light was reported in Massachusetts with MAIA13 on 59. Fruit is late ripening and tree vigor is low to medium. Ca Myanmar (about 30%) was reported on Red leaf trees in Maryland. There is excellent information on issues to watch for, as well as suggestions for mitigation, on the website. MAIA is partnering with the International Pome Fruit Alliance for global marketing rights.


Wildfire Gala (PPA): This sport is said to ripen 3 weeks earlier than standard ‘Gala’. It is available from EnzaNet. Hobbies Apple

First Kiss (MN 558): The name for MN 25 when grown in Minnesota. More details on this apple are covered in the ‘Rare section, the name used outside of Minnesota. Of course, etc.

Honeycrisp sports

Carmen Honeycrisp: From Cameron Nursery in Washington State, this sport has redder color.

Firestorm Honeycrisp: This sport is reported to color well, even in heat. Tree loss has been reported on 20 Gals (9/15/2017).

Honeycrisp (MNB42): USPP 26,644. This sport originated as a limb mutation in the University of Minnesota’s research block. It is said to allow excellent red coloration in regions not prone to good coloring of ‘Honeycrisp’, with the patent indicating southern NY and Southern Pennsylvania as two such regions.

New Zealand Honeycrisp: For retailers wanting Honeycrisp at the end of the domestic crop, it is said to be superior to other sources (White 2016).

Premier Honeycrisp (BAS 10): This sport received its US plant patent #24,888 in 2011. This sport ripens three weeks before Honeycrisp. Available from Adams County Nurseries.

Royal Red Honeycrisp: (LI-1000): This sport was discovered in Washington State and was granted USPP 22,244 in November 2011. LI-1000 is said to color earlier than the standard Honeycrisp. ‘Royal Red Honeycrisp’ is offered exclusively by Willow Drive Nursery, and sales started in

Site Selection

Soil
• USGS Mapping & Soil Definition
• Water Drainage

Slope
• Air Drainage

Orientation
• Sunlight
• Forest / ornamental deciduous & conifer tree shading
• North / South rows
D - Dystrochrepts dominant

- **D**: Charlton areas
- **Dh**: Muskingum areas
- **DhE**: Lordstown-Mardin areas
- **Dr1**: Hollis areas
- **Dr2**: Lordstown and Oquaga areas
- **Dr3**: Nassau areas
- **Ds**: Charlton, Paxton, and Essex areas, very stony
SOIL SURVEY OF
Ulster County, New York

Nassau series

The Nassau series consists of loamy-skeletal, mixed, mesic Lithic Hapludalfs. These soils are shallow (11) and somewhat excessively drained. They formed in glacial till derived mainly from shale and slate. These soils are on bedrock controlled, glacially modified landforms. The bedrock is folded and tilted at various angles, and bedrock outcrops are common. These soils have a medium textured subsoil. Slope ranges from 3 to 65 percent, but is dominantly 5 to 60 percent.

Nassau soils are closely associated with the moderately deep, well drained to excessively drained Manlius soils and the deep, well drained Bath soils and moderately well drained Madin soils. Nassau soils do not have the angular fragments and flagstones derived mainly from siltstone and sandstone that Arnot soils have. They have a lower base status and more coarse fragments in the solon than Farmington soils that are shallow to limestone bedrock.

Typical pedon of Nassau shaly silt loam, in an area of Bath-Nassau complex, 8 to 25 percent slopes, in the town of New Paltz, 2,300 feet northwest on Jansen Road from its intersection with N.Y. Route 32 and 20 feet north, in an apple orchard:

Ap—0 to 6 inches; brown (10YR 4/3) shaly silt loam; moderate fine granular structure; very friable; many fine roots; 25 percent shale fragments; strongly acid; abrupt smooth boundary.

B21—6 to 10 inches; yellowish brown (10YR 5/4) very shaly silt loam; weak very fine subangular blocky structure; very friable; many fine roots; many fine pores; 35 percent shale fragments; strongly acid; abrupt smooth boundary.

B22—10 to 16 inches; brown (7.5YR 4/4) very shaly silt loam; weak fine and medium subangular blocky structure; friable; many fine roots; many fine pores; 50 percent shale fragments; strongly acid; abrupt irregular boundary.

IIIR—16 inches; dark gray (N 4/0) shale with cleavage planes tipped almost vertically.

The thickness of the solon ranges to a depth of 10 to 20 inches and coincides to the depth to bedrock. Rock fragments are derived mainly from shale and slate. They range from 15 to 50 percent, by volume, in the Ap horizon and from 35 to 70 percent in the B horizon. Reaction, in unfilled areas, is very strongly acid or strongly acid throughout.

The Ap horizon has hue of 7.5YR to 2.5Y, value of 3 to 5, and chroma of 2 or 3. Structure is weak or moderate, medium or fine granular.

The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. The fine earth is silty loam or loam. The B horizon has weak subangular blocky structure, or it is massive. Consistency is friable or very friable. In some profiles, a thin horizon above the bedrock has more than 90 percent loose shale fragments.

United States Department of Agriculture
Soil Conservation Service
in cooperation with
Cornell University Agricultural Experiment Station
Site Selection

Soil
- USGS Mapping & Soil Definition
- Water Drainage

Slope
- Air Drainage

Orientation
- Sunlight:
  - Full all day sun, south slope ideal

- Forest / ornamental deciduous & conifer tree shading
  - Wildlife management
    - Deer Fencing
    - Grey Squirrel
    - Woodchuck
    - Birds

- North / South rows for best light penetration

- Maintain tree height to limit shading
Managing the Hudson Valley Insect Pest Complex Using Homeowner Toolbox

Insect Pest Biology & Management
<table>
<thead>
<tr>
<th>Plum Curculio</th>
<th>Lepidopteran Complex</th>
<th>Scale Complex</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>*American Plum Borer</td>
<td>*San Jose Scale</td>
</tr>
<tr>
<td>Apple Maggot</td>
<td>*Apple Blotch Leafminer</td>
<td>*Oystershell Scale</td>
</tr>
<tr>
<td></td>
<td>*Codling Moth</td>
<td>*Pernicola White Scale</td>
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<tr>
<td>European Apple Sawfly</td>
<td>*Cutworms</td>
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<td></td>
<td>*Dogwood Borer</td>
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<tr>
<td>Comstock Mealybug</td>
<td>*European Corn Borer</td>
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<td>*Green Fruitworm</td>
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<td><strong>Plant Bug Complex</strong></td>
<td>*Lesser Appleworm</td>
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<tr>
<td>*Tarnished Plant Bug</td>
<td>*Obliquebanded Leafroller</td>
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<td>*Oriental Fruit Moth</td>
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<td>*Variegated Leafroller</td>
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Cornell University

Hudson Valley Research Laboratory
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* indicates a species or pest.
SEASONAL ACTIVITY OF 3 MAJOR PESTS OF APPLES IN THE HUDSON VALLEY OF NEW YORK STATE

H. Reissig


H. Reissig
Plum Curculio

- Adult overwinter in woodland, stone walls
- Adults emerge after 2-3d @ 70ºF
- Migrate into orchard from bloom to 2C
- Adults cut and lay eggs in fruitlet
- Can cause up to 100% fruit injury & drop

- Management: pre-bloom – 2C
  - 2-3 appl. of pyrethroid, carbaryl
  - End applications at 308 DD 50ºF
Apple Maggot

- Overwinters as pupa in the soil
- Adults emerge in June in moist soil

- Adults feed for 7-10 d prior to mating and egg laying into fruit
- Individual eggs are lain within fruit
- Developing larva feed on the interior flesh of the apple causing oxidized trails (‘Trail Worm’)

- Management: Carbaryl & Pyrethroid
Obliquebanded Leafroller

- Overwinter as a late instar larva that causes injury to fruit through bloom to 1C
- Adults emerge in June, mate and begin egg laying
- Larva emerge 350 DD base 43F after first adult sustained flight (biofix)
- Management: Bt at bloom, low rate multiple applications
Codling Moth, *Cydia pomonella*

- Overwinters as pupa under tree bark
- Adults emerge during late bloom
- Eggs are lain on foliage and fruit
- Larva evacuate fruit skin as they burrow
- Then feed directly on seeds in carpels

- Management: Granulosis virus plus mating disruption at first hatch
  - Use NEWA modeling to obtain timing of CM hatch

Hudson Valley Research Laboratory
Codling Moth Larvae Bioassay (UTC susceptible ‘Benzon’ Colony)
NYSAES, Highland NY 2009

Warrior @ 0.16 fl. oz. /A

Percent Mortality (After 24hrs.)

Cold

Warm

Temperature

1 Bioassay conducted on 1st instar codling moth larva topically treated with 1µL droplet of lamda-cyhalothrin at 0.0005 µg A.I. / 1000 mL or 0.0005 ppm [3% of the labeled field rate] placed in temperature controlled chambers over 24 hours.

( df = 3, F-value = 8.648, P-value = 0.0001).
San Jose Scale

- Overwinter as adult on bark
- Adults produce live young
- Crawlers emerge at 2C
- Damage fruit & bark cambium

Management: pre-bloom
- 1% Horticultural oil
Rosy Apple Aphid

- Overwinter as eggs
- Adults produce live young
- Begin feeding on foliage and developing fruit clusters
- Damage fruit post bloom
- Management @ Pink
  - Pyrethroids
Green Aphid Complex

- Overwinter as eggs
- Adults produce live young
- Begin feeding on foliage and developing fruit clusters during spring & summer
- Produce blackened leaves

Management
- Pink
  - Pyrethroids
- PF and summer
  - Azadirect

Phase Dates:

- GT: 21 March
- TC: 21 April
- P: 27 April
- Bloom: 1 May
- PF: 14 May
- 1C: 28 May
- 2C: 10 June
- 3C: 25 June
- 4C: 5 July
- 5C: 15 July
- 6C: 1 Aug
- 7C: 15 Aug
- 8C: 1 Sept
**European Red Mite**

- Overwinter as egg
- Motiles emerge pre-bloom
- Adults after bloom cause foliar injury
- High populations with increasing temperatures >80°F & drought
- Reduced fruit size, color, Lf. bronzing

- Management Pink, Petal Fall, 1-2C:
  - Horticultural Oil @ 1%
  - Avermectin plus 0.25% oil

<table>
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<tr>
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</tbody>
</table>
Tarnished Plant Bug

- Nymphs / adults cause fruit injury beginning at tight cluster with 2d above 75°F
- Pre-bloom – 15mm fruit size
- Scout: yellow sticky cards, flowers
- Feeding and oviposition in fruit
- Management: Pre-bloom, @ Petal Fall, 1C:
  - Pyrethroids
Dogwood Borer

- Overwinter as larva beneath bark
- Adults emerge at 2C
- Girdles bark cambium
- Adults lay eggs in bark scales

- Management: pre-bloom
  - Multiple appl. of neonicotinoid or Spinosad (Spintor)
Mullein Plant Bug *Campylomomma verbasci* (Meyer)
Apple Brown Bug *Atractotomus mali* (Meyer)

- Sporadic orchard pests on both pear and apple. Both species occur simultaneously; collectively called “mirid bugs”.
- Pre-bloom, they are considered beneficial, feeding on mite and aphid species.
- Management: Pyrethroid at Pink

<table>
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</tr>
</tbody>
</table>
Green Stink Bug  *Acrosternum hilare* (Say).
Brown Stink Bug  *Euschistus servus* (Say)

- Sporadic orchard pests on both pear and apple. Most often occurs on Hudson Valley fruit late in the season during dry periods or drought.

- Management: Pyrethroid upon scouting for adults.
Stink Bug Injury To Pear

Typically To Shoulder Of Fruit

Depressions With Corking Up To The Skin Surface
Brown Marmorated Stink Bug, 
*Halyomorpha halys* Stål

- Overwinter as adults
- 1-2 generations / year
- Eggs lain late May
- Nymphs and adults feeds on leaves, branches and through skin of fruit
- Causes dimpling, corking

Management: pyrethroids
Eggs: Average 28/cluster; light green to white

1st instar: black & red; cluster near eggs

2nd instar: striped antennae

3rd instar: striped antennae and legs

4th instar: thoracic spur striped antennae & legs

5th instar: wing pads striped antennae & legs

BMSB Adults: red eyes, 4 cream colored dots on shoulders; banding on legs and antenna, smooth blunt shoulders. Banded abdomen; 14 -17 mm in length.
**Homeowner Insecticides Available Locally In Stores or Internet Based Suppliers (Amazon and Direct Distributors.**

<table>
<thead>
<tr>
<th>IPM Commercial</th>
<th>Biologicals</th>
<th>Barrier Films</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Organophosphates</td>
<td>• Bt’s (Bacterial)</td>
<td>• Horticultural Oil</td>
</tr>
<tr>
<td>• Carbamates</td>
<td>• Fungi (Beauvaria)</td>
<td>• Kaolin Clay</td>
</tr>
<tr>
<td>• Pyrethroids</td>
<td>• Virus (CM Granulosis)</td>
<td></td>
</tr>
<tr>
<td>• Spinosad</td>
<td>• IGR (Insect Growth Regulators)</td>
<td></td>
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<tr>
<td>• Neonicotinoids</td>
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</tbody>
</table>
Malathion: Bonide
Broad Spectrum
Organophosphate insecticide

<table>
<thead>
<tr>
<th>Crop</th>
<th>Insects</th>
<th>When to Apply</th>
<th>Amount/Gal. Water</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apples</td>
<td>Woolly apple aphid, bud moth, Forbes scale, green apple aphid, rosy apple aphid, mealybug, codling moth, plum curculio, red banded leaf roller, tent caterpillar</td>
<td>Start to spray early in season. Make up to 2 applications per year - at least 7 days apart. Do not spray during blossom period. Do not apply within 1 day of harvest.</td>
<td>1/2 to 1 1/2 fl. oz. to cover 1,000 to 3,500 sq. ft.</td>
<td>Do not exceed 1 1/2 fl. oz./1000 sq. ft. per single application. May cause injury to Cortland and McIntosh varieties.</td>
</tr>
<tr>
<td>Apricots</td>
<td>codling moth, orange tortrix, terrapin scale, soft brown scale, aphids</td>
<td>Start to spray early in season. Make up to 2 applications per year – at least 7 days apart. Do not spray during blossom period. Do not apply within 6 days of harvest.</td>
<td>1/2 to 1 1/2 fl. oz. to cover 1,000 to 3,500 sq. ft.</td>
<td>Do not exceed 1 1/2 fl. oz./1000 sq. ft. per single application.</td>
</tr>
<tr>
<td>Cherries</td>
<td>black cherry aphid, fruit tree roller, cherry fruit fly, bud moth, mealy plum aphid</td>
<td>Start to spray early in season. Make up to 4 applications per year – at least 3 days apart. Do not spray during blossom period. Do not apply within 3 days of harvest.</td>
<td>1/2 to 2 fl. oz. to cover 1,000 to 3,500 sq. ft.</td>
<td>Do not exceed 2 fl. oz./1000 sq. ft. per single application.</td>
</tr>
<tr>
<td>Peaches</td>
<td>oriental fruit moth, plum curculio, green peach, black cherry, black peach, rusty plum aphids, Japanese beetle, terrapin, cottony peach scales</td>
<td>Start to spray early in season. Make up to 3 applications per year – at least 11 days apart. Do not spray during blossom period. Do not apply within 7 days of harvest.</td>
<td>1 to 3 fl. oz. to cover 1,000 to 3,500 sq. ft.</td>
<td>Do not exceed 3 fl. oz./1000 sq. ft. per single application.</td>
</tr>
</tbody>
</table>
Carbaryl: 22.5% (Lowes/ Home Depo)

- Insecticide & Apple Crop Load Reduction*
- Pink (P) Plum Curculio, Leafroller
- Petal Fall (PF) Plum Curculio, Leafroller
  - 2 appl. At 10d intervals (1\textsuperscript{st} & 2\textsuperscript{nd} Cover)

* May overthin some varieties including Cortland
Imidacloprid: Translaminar / Systemic Soil Drench

SOIL DRENCH TO APPLE, PEAR, PEACH, PLUM, CHERRY AND PECAN TREES Cont.
For best results, use this product as part of a preventative treatment program before insect damage occurs. Use one soil drench treatment per year during early spring to early fall. This product can be applied anytime except when the ground is saturated or frozen. These conditions will make movement of the product down into the root zone difficult. When applying this product during dry periods, generously water the tree or shrub the night before treatment.

RESTRICTIONS:
• Do not apply pre-bloom or during bloom or when bees are foraging.
• Do not apply to soil that is frozen or waterlogged.
• For apple, pear, peach, plum and cherry - A. Allow twenty-one (21) days between the final application and harvest. B. Do not apply more than 3 gallons of this product per acre per year.
• For pecans - A. Allow seven (7) days between the final application and harvest. B. Do not apply more than 3.2 gallons of this product per acre per year.

Trees that are already heavily infested may not survive due to the existing pest damage and the resulting stress.

Determining Amount of This Product to Use
Measure the circumference (distance around the tree trunk) in inches at chest height or at 4.5 feet from the soil using a flexible tape. Or, measure the diameter of the tree trunk in inches at chest height or at 4.5 feet from the soil.

Mix 1 oz. of this product per inch of circumference of the tree trunk to one (1) gallon of water. Refer to the mixing chart for the amounts of this product needed.

How to Apply
Apply the solution to the root zone as a band around the base of the tree. Apply one (1) gallon of solution in a circular band from the base of the tree outward for two (2) feet. For trees with trunk diameters more than 16 inches at chest height, apply two (2) gallons of solution in a circular band from the base of the tree outward for three to four (3-4) feet.
Imidacloprid: Translaminar / Systemic Soil Drench

ACTIVE INGREDIENT:
Imidacloprid ................. 1.47%
OTHER INGREDIENTS ... 98.53%
TOTAL ................. 100.00%

EPA Est. No. 4-NY-1  EPA Reg. No. 53883-205-4

Pests Controlled

Adelgids
Aphids
Armored scales (suppression)
Black Vine Weevil Larvae
Borers: Roundheaded Borers (incl. Eucalyptus Longhorned Borers and Asian Longhorned Beetles)
Flatheaded Borers (incl.)

Bronze Birch, Alder Borers, and Emerald Ash Borers
Japanese Beetles (adult)
Lacebugs
Erl Leaf Beetles
Viburnum Leaf Beetles
Leafhoppers
Leafminers
Mealybugs

Pine Tip Moth Larvae
Psyllids
Royal Palm Bugs
Sawfly Larvae
Soft Scale (suppression)
Thrips (suppression)
White grub larvae
Whiteflies
**Permethrin:**
Pyrethroid Broad Spectrum

### ACTIVE INGREDIENT:
Permethrin (Cas No. 52645-53-1) ... 2.50%

### OTHER INGREDIENTS: 
... 97.50%

### TOTAL: 
100.00%

EPA Est. No. 4-NY-1   EPA Reg. No. 4-408

#### FRUIT & NUT TREES

<table>
<thead>
<tr>
<th>Pests:</th>
<th>How to use:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almonds, Pecans</td>
<td></td>
</tr>
<tr>
<td>Navel orangeworms, Peach twig borers</td>
<td>Do not make more than 2 applications during hull split and 5 applications per season. Can be applied up to 7 days prior to harvest.</td>
</tr>
<tr>
<td>Apples</td>
<td></td>
</tr>
<tr>
<td>Green fruitworms, Aphids, Leafrollers (Oblique-banded, Redbanded), Plum curculio, Rosy apple aphids, Spotted tentiform leafminers, Tamished plant bugs, White apple leafhoppers, Japanese Beetles</td>
<td>Repeat as required to maintain control. Do not make more than 3 applications. Do not apply after petal fall.</td>
</tr>
<tr>
<td>Peaches</td>
<td></td>
</tr>
<tr>
<td>Borers (Lesser peachtree, Peach twig), Green fruitworms, Plum curculio, Oriental fruit moths, Tamished plant bugs</td>
<td>Do not apply within 7 days of harvest. Do not make more than 8 applications per season.</td>
</tr>
<tr>
<td>Pears (dormant through delayed dormant)</td>
<td></td>
</tr>
<tr>
<td>Pear psylla</td>
<td>Apply during the dormant through delayed dormant growth period only. Do not make more than 2 applications per season.</td>
</tr>
<tr>
<td>Pears (summer)</td>
<td></td>
</tr>
<tr>
<td>Codling Moths, Green fruitworms, Pear psylla, Aphids</td>
<td>Do not make more than 3 applications per season. Can be applied up to 14 days prior to harvest.</td>
</tr>
</tbody>
</table>
Lowes/ Home Depo
Zeta-cypermethrin: 0.35%
14 DTH

Pest Complex:

$49.97 / gallon
# Spectracide Malathion Insect Spray Concentrate

## Lowes/ Home Depo

**Malathion: 50 %**

- Peaches only:
  - Make up to 3 applications per year
  - 11 days apart.
  - Do not apply within 7 days of harvest.

**Pest Complex:**

- Aphids
- Red Spider Mites
- Mealybugs
- Thrips
- Scale

**ACTIVE INGREDIENTS**

- Malathion 50%
- Other Ingredients* 50%

**Total:** 100.00%

*Contains Xylene range aromatic solvent.
Spinosad: Lepidopteran Insecticide

**Kills bagworms, borers, beetles, caterpillars, codling moth, gypsy moth, loopers, leaf miners, spider mites, tent caterpillars, thrips**

**ACTIVE INGREDIENT:**
- Spinosad (a mixture of spinosyn A and spinosad D) . . 0.5%

**OTHER INGREDIENTS:** ........................................ 99.5%

**TOTAL: .......................................................... 100.0%

Contains 0.04 lb of active ingredient per gallon.
EPA Reg. No. 4-471  EPA Est. No. 4-NY-1

<table>
<thead>
<tr>
<th>Crops</th>
<th>Pests Controlled</th>
<th>Maximum Number of Applications per Calendar Year</th>
<th>Minimum Days to Wait Before Reapplying</th>
<th>Minimum Days to Wait from Last Application to Harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td>apple and other pome fruits including: crabapples, mayhaw, pears, and quince</td>
<td>codling moth, European grapevine, moth, leafminers, leafrollers, light brown apple moth, oriental fruit moth, thrips, tufted apple budmoth</td>
<td>6</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>asparagus (post-harvest to protect ferns)</td>
<td>asparagus beetles</td>
<td>3</td>
<td>7</td>
<td>60</td>
</tr>
<tr>
<td>bulb vegetables including: dry bulb onion, garlic,</td>
<td>armyworms, dipteran leafminers, European corn borer, flea beetle,</td>
<td>5</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>
Bacillus thuringiensis: kurstaki Lepidopteran Larvae

**ACTIVE INGREDIENT:**  
*Bacillus thuringiensis subspecies kurstaki* strain SA-12solids, spores and Lepidopteran active toxins (At least 6 million viable spores per mg.)* 15.0%  
**OTHER INGREDIENTS** .............. 85.0%  
**TOTAL** ................................ 100.0%  

EPA Est. No. 4-NY-1  
EPA Reg. No. 4-226

### VEGETABLES, FRUITS & NUTS

<table>
<thead>
<tr>
<th>Crop</th>
<th>Pest</th>
<th>Rate (tsp./gal. water)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almonds</td>
<td>redhumped caterpillar, tent caterpillar</td>
<td>2 - 4</td>
</tr>
<tr>
<td>Apples, Pears</td>
<td>redbanded leafroller, tufted apple</td>
<td>2 - 4</td>
</tr>
<tr>
<td>Apply when eggs or newly hatched larvae first appear</td>
<td>budmoth, variegated leafroller, tent caterpillar, fruit tree leafroller, gypsy moth</td>
<td></td>
</tr>
<tr>
<td>Broccoli, Brussels Sprouts, Cabbage, Cauliflower, Collards, Kale, Mustard Greens, Turnip Greens</td>
<td>cabbage looper</td>
<td>2 - 4</td>
</tr>
<tr>
<td>Beans, Beets, Carrots, Celery, Chard, Chinese Cabbage, Endive, Escarole, Garlic, Kohlrabi, Lentils, Lettuce, Onions, Parsley, Radishes, Spinach, Squash</td>
<td>cabbage looper</td>
<td>2 - 4</td>
</tr>
<tr>
<td>Sprouts</td>
<td>imported cabbage worm, green cloverworm</td>
<td>1 - 3</td>
</tr>
<tr>
<td>Turnip Greens</td>
<td>diamondback moth</td>
<td>1 - 2</td>
</tr>
</tbody>
</table>
# Commercial & Private License Availability of Insecticides Through Direct Distributors

**Crop Protective Services (CPS), Helena,**

<table>
<thead>
<tr>
<th>IPM Commercial / Class</th>
<th>Biologicals</th>
<th>Barrier Films</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Organophosphates (1B)</td>
<td>- Bt’s (Bacterial - 11)</td>
<td>- Horticultural Oil</td>
</tr>
<tr>
<td>- Carbamates (1A)</td>
<td>- Fungi (Beauvaria)</td>
<td>- Kaolin Clay</td>
</tr>
<tr>
<td>- Pyrethroids (3A)</td>
<td>- Virus (CM Granulosis)</td>
<td></td>
</tr>
<tr>
<td>- Neonicotinoids (4A)</td>
<td>- IGR (Insect Growth Regulators - 7)</td>
<td></td>
</tr>
<tr>
<td>- Spinosad (5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Other groups (6-28)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SEASONAL ACTIVITY OF 3 MAJOR PESTS OF APPLES IN THE HUDSON VALLEY OF NEW YORK STATE

H. Reissig
NEWA Apple Insect Models

Select a pest:
Codling Moth

State:
New York

Weather station:
Highland HVL 2

Accumulation End Date:
12/15/2018

Calculate
NEWA Apple Insect Models

Select a pest: Codling Moth
State: New York
Weather station: Highland HVL 2
Accumulation End Date: 12/15/2018

Map Results More info
NEWA Apple Insect Models

Select a pest:
Codling Moth

State:
New York

Weather station:
Highland HVL 2

Accumulation End Date:
06/01/2018

First Trap Catch: 5/24/2018

First Trap Catch date above is estimated based on degree day accumulations or user input. Enter the actual date for blocks of interest and the model will calculate the protection period after first trap catch more accurately.

Accumulated degree days (base 50°F) first trap catch through 6/1/2018: 185 (10 days missing)

<table>
<thead>
<tr>
<th>Date</th>
<th>Past</th>
<th>Past</th>
<th>Current</th>
<th>5-Day Forecast</th>
<th>Forecast Details</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>May 30</td>
<td>May 31</td>
<td>Jun 1</td>
<td>Jun 2</td>
<td>Jun 3</td>
</tr>
<tr>
<td>Daily Degree Days (Base 50BE)</td>
<td>23</td>
<td>16</td>
<td>26</td>
<td>24</td>
<td>13</td>
</tr>
<tr>
<td>Accumulation since January 1</td>
<td>542</td>
<td>558</td>
<td>584</td>
<td>607</td>
<td>620</td>
</tr>
</tbody>
</table>

Show Degree Day Graph

Pest stage: Moths flying & first eggs laid

The pest stage above is estimated. Select the actual stage and the model will recalculate recommendations.

<table>
<thead>
<tr>
<th>Pest Status</th>
<th>Pest Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>First eggs are laid at about 50 DD and the first eggs usually hatch after about 220 DD.</td>
<td>Apply insecticides that need to be present before egg laying at about 50-75 DD. Apply insecticides that target early egg laying period at 100-200 DD.</td>
</tr>
</tbody>
</table>

Disclaimer: These are theoretical predictions and forecasts. The theoretical models predicting pest development or disease risk use the weather data collected (or forecasted) from the weather station location. These results should not be substituted for actual observations of plant growth stage, pest development, or disease risk.
Carbamate Insecticides (IRAC 1A)
Organophosphate Insecticides (IRAC 1B)
Neonicotinoid Insecticides (IRAC 4)
Pyrethroid Insecticides (IRAC 3)
Spinosad Insecticides (IRAC)
# Carbamate Insecticides (IRAC 1A)

<table>
<thead>
<tr>
<th>Trade Name (Active Ingredient)</th>
<th>IRAC‡</th>
<th>AM</th>
<th>Aph</th>
<th>EAS</th>
<th>Int</th>
<th>GFW</th>
<th>LH</th>
<th>OBLR</th>
<th>PC</th>
<th>PP</th>
<th>RAA</th>
<th>RBLR</th>
<th>SJS</th>
<th>STLM</th>
<th>TPB</th>
<th>WAA</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Lannate (methomyl)</td>
<td>1A</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2-3</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Sevin (carbaryl)</td>
<td>1A</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>*†Vydate (oxamyl)</td>
<td>1A</td>
<td>0</td>
<td>2</td>
<td>-</td>
<td>0</td>
<td>-</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

### Key to control ratings:

- Unknown, unlabeled, or does not apply
- 0 = not effective
- 1 = poor
- 2 = fair
- 3 = good

* Restricted-use pesticide.
† Not for use in Nassau and Suffolk Counties.
‡ = Potentially acceptable in certified organic programs.
† = IRAC (Insecticide Resistance Action Committee) Mode of Action Classification Group: Arthropod pest populations are more likely to exhibit cross-resistance to materials within the same group.
# Organophosphate Insecticides (IRAC 1B)

<table>
<thead>
<tr>
<th>Trade Name (Active Ingredient)</th>
<th>IRAC†</th>
<th>AM</th>
<th>Aph</th>
<th>EAS</th>
<th>Int</th>
<th>GFW</th>
<th>LH</th>
<th>OBLR</th>
<th>PC</th>
<th>PPs</th>
<th>RAA</th>
<th>RBLR</th>
<th>SJS</th>
<th>STLM</th>
<th>TPB</th>
<th>WAA</th>
</tr>
</thead>
<tbody>
<tr>
<td>*diazinon</td>
<td>1B</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>*dimethoate</td>
<td>1B</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>*Imidan (phosmet)</td>
<td>1B</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Lorsban (chlorpyrifos)</td>
<td>1B</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Malathion</td>
<td>1B</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
</tbody>
</table>

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# Neonicotinoid Insecticides (IRAC 4)

## Ratings for the Control of

<table>
<thead>
<tr>
<th>Trade Name (Active Ingredient)</th>
<th>IRAC‡</th>
<th>AM</th>
<th>Aph</th>
<th>EAS</th>
<th>Int</th>
<th>GFW</th>
<th>LH</th>
<th>OBLR</th>
<th>PC</th>
<th>PPs</th>
<th>RAA</th>
<th>RBLR</th>
<th>SJS</th>
<th>STLM</th>
<th>TPB</th>
<th>WAA</th>
</tr>
</thead>
<tbody>
<tr>
<td>*†Actara (thiamethoxam)</td>
<td>4A</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*Admire Pro (imidacloprid)</td>
<td>4A</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assail (acetamiprid)</td>
<td>4A</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>*†Voliam Flexi (thiamethoxam/ chlorantraniliprole)</td>
<td>4A/28</td>
<td>-</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>*†Agri-Flex (abamectin/thiamethoxam)</td>
<td>6/4A</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

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IRAC (Insecticide Resistance Action Committee) Mode of Action Classification Group: Arthropod pest populations are more likely to exhibit cross-resistance to materials within the same group.
## Pyrethroid Insecticides (IRAC 3)

<table>
<thead>
<tr>
<th>Trade Name (Active Ingredient)</th>
<th>IRAC‡</th>
<th>AM</th>
<th>Aph</th>
<th>EAS</th>
<th>Int</th>
<th>GFW</th>
<th>LH</th>
<th>OBLR</th>
<th>PC</th>
<th>PPs</th>
<th>RAA</th>
<th>RBLR</th>
<th>SJS</th>
<th>STLM</th>
<th>TPB</th>
<th>WAA</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Pounce (permethrin)</td>
<td>3A</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>3</td>
<td>3</td>
<td>2-3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>*Asana XL (esfenvalerate)</td>
<td>3A</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2-3</td>
<td>3</td>
<td>3</td>
<td>2-3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>*Danitol (fenpropatrin)</td>
<td>3A</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2-3</td>
<td>3</td>
<td>3</td>
<td>2-3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td><strong>Endigo (thiamethoxam/lambdacyhalothrin)</strong></td>
<td>3A/4A</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2-3</td>
<td>3</td>
<td>3</td>
<td>2-3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>-</td>
</tr>
</tbody>
</table>

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§ = Potentially acceptable in certified organic programs  
‡ = IRAC (Insecticide Resistance Action Committee) Mode of Action Classification Group: Arthropod pest populations are more likely to exhibit cross-resistance to materials within the same group.
## Spinosad Insecticides

<table>
<thead>
<tr>
<th>Trade Name (Active Ingredient)</th>
<th>IRAC‡</th>
<th>AM</th>
<th>Aph</th>
<th>EAS</th>
<th>Int</th>
<th>GFW</th>
<th>LH</th>
<th>OBLR</th>
<th>PC</th>
<th>PP$_s$</th>
<th>RAA</th>
<th>RBLR</th>
<th>SJS</th>
<th>STLM</th>
<th>TPB</th>
<th>WAA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delegate (spinetoram)</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>-</td>
<td>3</td>
<td>3</td>
<td>-</td>
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<td>3</td>
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<td>3</td>
<td>-</td>
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<tr>
<td>§Entrust (spinosad)</td>
<td>5</td>
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<td>-</td>
<td>2</td>
<td>3</td>
<td>0</td>
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</tbody>
</table>

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0 = not effective
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## Other Insecticide Grouping

<table>
<thead>
<tr>
<th>Trade Name (Active Ingredient)</th>
<th>IRAC‡</th>
<th>AM</th>
<th>Aph</th>
<th>EAS</th>
<th>Int</th>
<th>GFW</th>
<th>LH</th>
<th>OBLR</th>
<th>PC</th>
<th>PPs</th>
<th>RAA</th>
<th>RBLR</th>
<th>SJS</th>
<th>STLM</th>
<th>TPB</th>
<th>WAA</th>
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</thead>
<tbody>
<tr>
<td>*†Altacor (chlorantraniliprole)</td>
<td>28</td>
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<tr>
<td>Avaunt (indoxacarb)</td>
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<tr>
<td>§Aza-Direct, §Neemix</td>
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<td>-</td>
<td>3</td>
<td>-</td>
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<tr>
<td>§B.t, (§Agree, §Biobit, §Deliver, §Dipel, §Javelin)</td>
<td>11A</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>2</td>
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<tr>
<td>Beleaf (flonicamid)</td>
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<tr>
<td>*†Centaur (buprofezin)</td>
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<tr>
<td>Esteem (pyriproxyfen)</td>
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<tr>
<td>*†Exirel (cyantraniliprole)</td>
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</tbody>
</table>

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### Other Insecticide Grouping

#### Ratings for the Control of

<table>
<thead>
<tr>
<th>Trade Name (Active Ingredient)</th>
<th>IRAC‡</th>
<th>AM</th>
<th>Aph</th>
<th>EAS</th>
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<th>GFW</th>
<th>LH</th>
<th>OBLR</th>
<th>PC</th>
<th>PPs</th>
<th>RAA</th>
<th>RBLR</th>
<th>SJS</th>
<th>STLM</th>
<th>TPB</th>
<th>WAA</th>
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<tbody>
<tr>
<td>*†Mintect Pro (cyantraniliprole/abamectin)</td>
<td>28/6</td>
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<tr>
<td>Movento (spirotetramat)</td>
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<tr>
<td>†Nexter (pyridaben)</td>
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<tr>
<td>*Proclaim (emamectin benzoate)</td>
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</tr>
<tr>
<td>*Rimon (novaluron)</td>
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<td>3</td>
<td>2</td>
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</tr>
<tr>
<td>§Surround (kaolin)</td>
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<td>-</td>
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<td>2</td>
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<td>2</td>
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<td>-</td>
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<td>0</td>
<td>0</td>
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<td>-</td>
</tr>
<tr>
<td>*†Voliam Flexi (thiamethoxam/chlorantraniliprole)</td>
<td>4A/28</td>
<td>-</td>
<td>3</td>
<td>3</td>
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<td>3</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>*†Voliam Xpress/†Besiege (chlordantraniliprole/lambdacyhalothrin)</td>
<td>3A/28</td>
<td>3</td>
<td>2</td>
<td>3</td>
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<td>3</td>
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<td>-</td>
</tr>
</tbody>
</table>

**Key to control ratings:**
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3 = good
Commercial & Private License Availability of Insecticides Through Direct Distributors
Crop Protective Services (CPS), Helena,

<table>
<thead>
<tr>
<th>Organic/ Class</th>
<th>Biologicals</th>
<th>Barrier Films</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Pyganic (3)</td>
<td>• Bt’s (Bacterial - 11)</td>
<td>• Horticultural Oil</td>
</tr>
<tr>
<td>• Spinosad (5)</td>
<td>• Fungi (Beauvaria)</td>
<td>• Kaolin Clay</td>
</tr>
<tr>
<td>• Other groups (6-28)</td>
<td>• Virus (CM Granulosis)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• IGR (Insect Growth Regulators - 7)</td>
<td></td>
</tr>
</tbody>
</table>

Organic Fungicide Program

• **Cedar-Apple Rust**
  [Bloom to 2\textsuperscript{nd} cover] Regalia + JMS Stylet-Oil

• **Apple scab**
  [silver tip through midsummer] - copper
  [silver tip & green tip]; sulfur
  [tight cluster to midsummer] *Bacillus sp*, potassium bicarbonate, and peroxides

• **Powdery mildew**
  [tight cluster to midsummer]
  sulfur, potassium bicarbonate, peroxides, and white mineral oil
## Table 1. Control of quince rust on Golden Delicious.

<table>
<thead>
<tr>
<th>Treatment and rate/ 100 gal dilute</th>
<th>Timing</th>
<th>% fruit infected</th>
<th>% control</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Non-treated control</td>
<td>---</td>
<td>36 d</td>
<td>---</td>
</tr>
<tr>
<td>1 Manzate Pro-Stick 75DF 12 oz</td>
<td>2 May</td>
<td>20 c</td>
<td>44</td>
</tr>
<tr>
<td>2 Rally 40WSP 0.6 oz</td>
<td>2 May</td>
<td>3 a</td>
<td>92</td>
</tr>
<tr>
<td>3 Topguard 1.04SC 1 fl oz</td>
<td>2 May</td>
<td>6 b</td>
<td>83</td>
</tr>
<tr>
<td>4 Inspire Super 2.82EW 1.5 fl oz</td>
<td>2 May</td>
<td>7 b</td>
<td>81</td>
</tr>
<tr>
<td>5 Regalia Biofungicide 5% 4 qt + JMS Stylet-Oil 1 gal</td>
<td>2 May</td>
<td>4 ab</td>
<td>89</td>
</tr>
<tr>
<td>6 Rally 40WSP 1.25 oz</td>
<td>5 May</td>
<td>5 ab</td>
<td>86</td>
</tr>
<tr>
<td>7 Rally 40WSP 0.6 oz</td>
<td>5 May</td>
<td>5 ab</td>
<td>86</td>
</tr>
<tr>
<td>8 Topguard 1.04SC 1 fl oz</td>
<td>5 May</td>
<td>7 b</td>
<td>81</td>
</tr>
<tr>
<td>9 Regalia Biofungicide 5% 4 qt + JMS Stylet-Oil 1 gal</td>
<td>5 May</td>
<td>2 ab</td>
<td>94</td>
</tr>
</tbody>
</table>

Mean separation by Waller-Duncan K-ratio t-test (p=0.05). Counts of 100 fruit per rep 3 Jun.

## Table 2. Control of quince rust on Red Delicious.

<table>
<thead>
<tr>
<th>Treatment and rate/ 100 gal dilute</th>
<th>Timing</th>
<th>% fruit infected</th>
<th>% control</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Non-treated control</td>
<td>---</td>
<td>35 b</td>
<td>---</td>
</tr>
<tr>
<td>1 Regalia Biofungicide 5% 4 qt + JMS Stylet-Oil 1 gal</td>
<td>16 May</td>
<td>16 a</td>
<td>54</td>
</tr>
<tr>
<td>2 Inspire Super 2.82EW 1.5 fl oz</td>
<td>16 May</td>
<td>14 a</td>
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</tr>
<tr>
<td>3 Topguard 1.04SC 1 fl oz</td>
<td>16 May</td>
<td>10 a</td>
<td>71</td>
</tr>
<tr>
<td>4 Rally 40WSP 0.6 oz</td>
<td>16 May</td>
<td>13 a</td>
<td>63</td>
</tr>
<tr>
<td>5 Rally 40WSP 1.25 oz</td>
<td>16 May</td>
<td>15 a</td>
<td>57</td>
</tr>
</tbody>
</table>

Mean separation by Waller-Duncan K-ratio t-test (p=0.05). Counts of 50 fruit per rep 3 Jul.
Organic Fungicide Program

- **Fire blight**
  - [pink to terminal budset] copper
  - [pink to petal fall] *B. subtilis, B. amyloliquefaciens*
  - [pink to terminal budset] *B. mycoides, Reynoutria sachalinensis*

- **FLyspeck and Sooty Blotch -**
  - [petal fall to harvest] *B. subtilis, B. amyloliquefaciens*
  - [petal fall to harvest] coppers
Organic Insecticide Program

**Barrier Films**
- Horticultural Oil
- Kaolin Clay

**Biologicals**
- Bt’s (Bacterial)
- Fungi (Beauvaria)
- Virus (CM Granulosis)
- IGR (Insect Growth Regulators)
Organic Insecticide Program

- **Obliquebanded leafroller**
  [bloom, summer cover sprays] - *Bacillus thuringiensis/B.t.*

- **Internal-feeding Lepidoptera** (codling moth, oriental fruit moth, lesser appleworm)
  [petal fall + summer cover sprays] - mating disruption; spinosad, B.t.; granulosis virus *Chromobacterium subtsugae*

- **Plum curculio**
  [petal fall, 1st cover] - kaolin clay; pyrethrin; entomopathogenic nematodes

- **Aphids, leafhoppers**
  [midsummer] - azadirachtin; insecticidal soap

- **San Jose scale**
  [midsummer] - pyrethrin; *Burkholderia*

- **Apple maggot**
  [mid-July through August] - spinosad; pyrethrin

- **Mites**
  [tight cluster] - highly refined mineral oil
Plum Curculio

- Adult overwinter in woodland, stone walls
- Adults emerge after 2-3d @ 70°F
- Migrate into orchard from bloom to 2C
- Adults cut and lay eggs in fruitlet
- Can cause up to 100% fruit injury & drop

- Management: pre-bloom – 2C
  - 2-3 appl. of pyrethroid, carbaryl
  - End applications at 308 DD 50°F
**Apple Maggot**

- Overwinters as pupa in the soil
- Adults emerge in June in moist soil
- Adults feed for 7-10 d prior to mating and egg laying into fruit
- Individual eggs are lain within fruit
- Developing larva feed on the interior flesh of the apple causing oxidized trails (‘Trail Worm’)

**Management:** Carbaryl & Pyrethroid

<table>
<thead>
<tr>
<th></th>
<th>GT</th>
<th>TC</th>
<th>P</th>
<th>Bloom</th>
<th>PF</th>
<th>1C</th>
<th>2C</th>
<th>3C</th>
<th>4C</th>
<th>5C</th>
<th>6C</th>
<th>7C</th>
<th>8C</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>21 March</td>
<td>21 April</td>
<td>27 April</td>
<td>1 May</td>
<td>14 May</td>
<td>28 May</td>
<td>10 June</td>
<td>25 June</td>
<td>5 July</td>
<td>15 July</td>
<td>1 Aug.</td>
<td>15 Aug.</td>
<td>1 Sept.</td>
</tr>
</tbody>
</table>

---
Obliquebanded Leafroller

- Overwinter as a late instar larva that causes injury to fruit through bloom to 1C
- Adults emerge in June, mate and begin egg laying
- Larva emerge 350 DD base 43F after first adult sustained flight (biofix)
- Management: Bt at bloom, low rate multiple applications
Codling Moth, *Cydia pomonella*

- Overwinters as pupa under tree bark
- Adults emerge during late bloom
- Eggs are lain on foliage and fruit
- Larva evacuate fruit skin as they burrow
- Then feed directly on seeds in carpels

- Management: Granulosis virus plus mating disruption at first hatch
  - Use NEWA modeling to obtain timing of CM hatch
Codling Moth Larvae Bioassay (UTC susceptible ‘Benzon’ Colony)
NYSAES, Highland NY 2009

Warrior @ 0.16 fl. oz. /A

Percent Mortality (After 24hrs.)

1 Bioassay conducted on 1st instar codling moth larva topically treated with 1µL droplet of lambda-cyhalothrin at 0.0005 µg A.I./ 1000 mL or 0.0005 ppm [3% of the labeled field rate] placed in temperature controlled chambers over 24 hours. (df = 3, F-value = 8.648, P-value = 0.0001).
San Jose Scale

- Overwinter as adult on bark
- Adults produce live young
- Crawlers emerge at 2C
- Damage fruit & bark cambium

- Management: pre-bloom
  - 1% Horticultural oil

<table>
<thead>
<tr>
<th>GT</th>
<th>TC</th>
<th>P</th>
<th>Bloom</th>
<th>PF</th>
<th>1C</th>
<th>2C</th>
<th>3C</th>
<th>4C</th>
<th>5C</th>
<th>6C</th>
<th>7C</th>
<th>8C</th>
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<tbody>
<tr>
<td>21 March</td>
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<td>1 May</td>
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<td>28 May</td>
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<td>25 June</td>
<td>5 July</td>
<td>15 July</td>
<td>1 Aug.</td>
<td>15 Aug.</td>
<td>1 Sept.</td>
</tr>
</tbody>
</table>
Rosy Apple Aphid

- Overwinter as eggs
- Adults produce live young
- Begin feeding on foliage and developing fruit clusters
- Damage fruit post bloom
- Management @ Pink
  - Pyrethroids
Green Aphid Complex

- Overwinter as eggs
- Adults produce live young
- Begin feeding on foliage and developing fruit clusters during spring & summer
- Produce blackened leaves

Management @ Pink
- Pyrethroids
- Management @ PF and summer
  - Azadirect
European Red Mite

- Overwinter as egg
- Motiles emerge pre-bloom
- Adults after bloom cause foliar injury
- High populations with increasing temperatures >80°F & drought
- Reduced fruit size, color, Lf. bronzing

- Management Pink, Petal Fall, 1-2C:
  - Horticultural Oil @ 1%
  - Avermectin plus 0.25% oil
Tarnished Plant Bug

- Nymphs / adults cause fruit injury beginning at tight cluster with 2d above 75°F
- Pre-bloom – 15mm fruit size
- Scout: yellow sticky cards, flowers
- Feeding and oviposition in fruit
- Management: Pre-bloom, @ Petal Fall, 1C:
  - Pyrethroids
Dogwood Borer

- Overwinter as larva beneath bark
- Adults emerge at 2C
- Girdles bark cambium
- Adults lay eggs in bark scales

- Management: pre-bloom
  - Multiple appl. of neonicotinoid or Spinosad (Spintor)
Mullein Plant Bug *Campylomma verbasci* (Meyer)
Apple Brown Bug *Atractotomus mali* (Meyer)

- Sporadic orchard pests on both pear and apple. Both species occur simultaneously; collectively called “mirid bugs”.
- Pre-bloom, they are considered beneficial, feeding on mite and aphid species.
- Management: Pyrethroid at Pink

![Graph showing bloom and management periods](image-url)

<table>
<thead>
<tr>
<th>GT</th>
<th>TC</th>
<th>P</th>
<th>Bloom</th>
<th>PF</th>
<th>1C</th>
<th>2C</th>
<th>3C</th>
<th>4C</th>
<th>5C</th>
<th>6C</th>
<th>7C</th>
<th>8C</th>
</tr>
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<tbody>
<tr>
<td>21 March</td>
<td>21 April</td>
<td>27 April</td>
<td>1 May</td>
<td>14 May</td>
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<td>5 July</td>
<td>15 July</td>
<td>1 Aug.</td>
<td>15 Aug.</td>
<td>1 Sept.</td>
</tr>
</tbody>
</table>
Green Stink Bug *Acrosternum hilare* (Say).
Brown Stink Bug *Euschistus servus* (Say)

- Sporadic orchard pests on both pear and apple. Most often occurs on Hudson Valley fruit late in the season during dry periods or drought.

- Management: Pyrethroid upon scouting for adults.
Stink Bug Injury To Apple
Typically To Shoulder Of Fruit

Depressions With Corking Up To The Skin Surface
Brown Marmorated Stink Bug, *Halyomorpha halys* Stål

- Overwinter as adults
- 1-2 generations / year
- Eggs lain late May
- Nymphs and adults feeds on leaves, branches and through skin of fruit
- Causes dimpling, corking
- Management: pyrethroids