RUTGERS UNIVERSITY
New Jersey Agricultural Experiment Station

This is a section from the

2025/2026 New Jersey Commercial Tree Fruit Production Guide

The recommendations are **NOT** for home gardener use.

The **full guide** can be found on the Rutgers New Jersey Agricultural Experiment Station (NJAES) website at: *https://njaes.rutgers.edu/pubs/publication.php?pid=e002*. The guide is revised biennially.

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PESTICIDE USE DISCLAIMER

THE LABEL IS THE LAW

A pesticide applicator is legally bound by the labeling found on and with the pesticide container in their possession. Before using a pesticide, check and always follow the **labeling distributed with the product at the point of sale for legally enforceable rates and restrictions**.

In addition to the pesticide products listed in this Production Guide, other formulations or brands with the same active ingredient(s) may be commercially available.
ALWAYS CHECK THE LABELING ON THE PRODUCT CONTAINER ITSELF:
a) to ensure a pesticide is labeled for the same use,
b) to ensure the pesticide is labeled for the desired crop,
c) for differences in rates and percent active ingredient, and
d) additional restrictions.

Check the physical product label for the maximum amount of pesticide per application and the maximum number of applications per year.

IMPORTANT: DO NOT RELY ON ELECTRONIC LABELING (unless it is "web labeling" found directly on the product container)**.** *Online pesticide* labels may not be the same as the labeling distributed with the product. Some services include: Proagrica's CDMS *http://www.cdms.net/*; Agworld DBX powered by Greenbook *https://www.greenbook.net*; or Agrian *https://www.agrian.com/labelcenter/results.cfm.*

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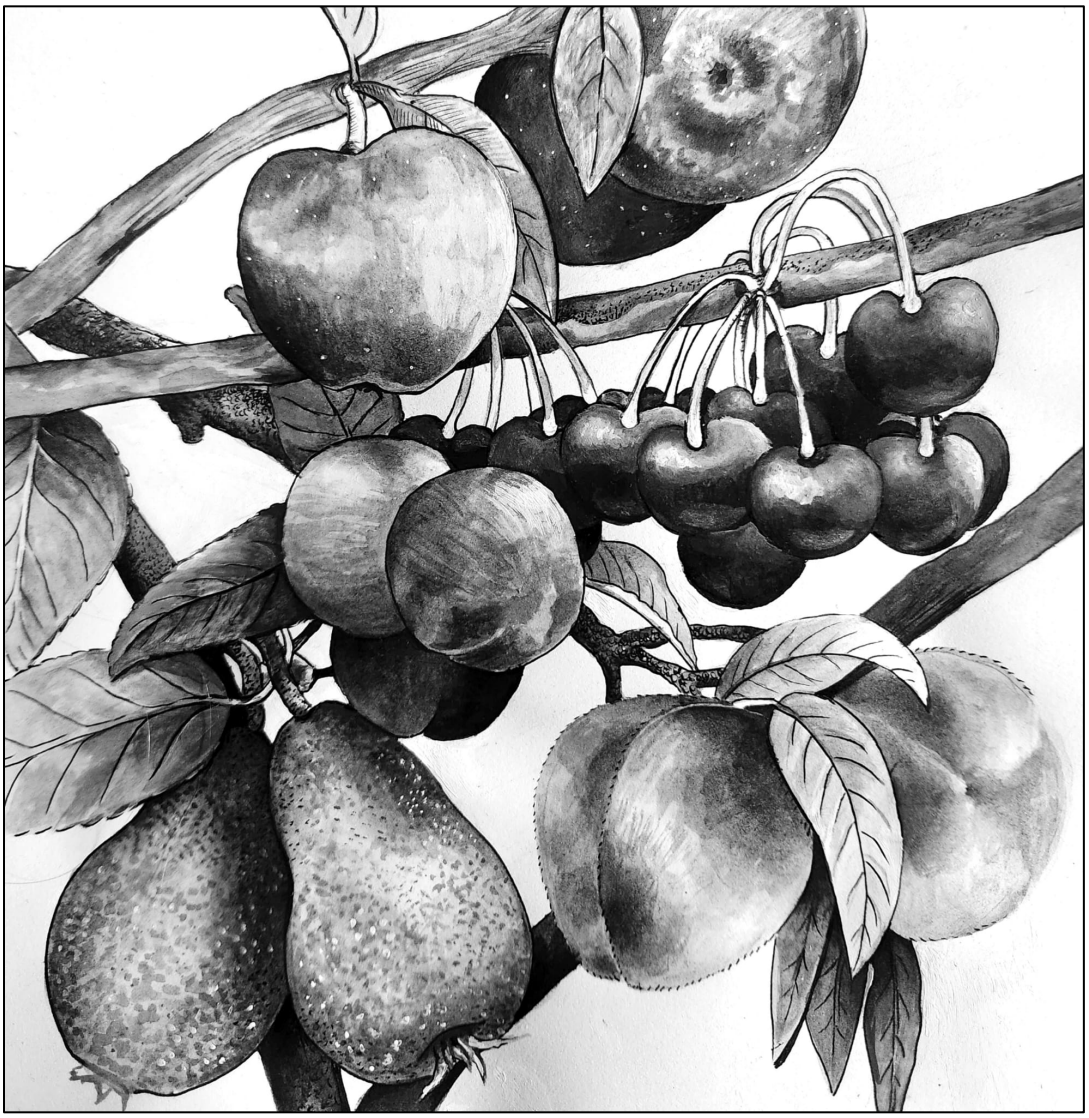
See a detailed regulatory discussion of this and other essential information on Pesticide Safety and the Pesticide Label in Chapter 1. Electronic labeling is discussed in section 1.3.1.

RUTGERS UNIVERSITY
New Jersey Agricultural Experiment Station

E002

2025/2026 New Jersey Commercial Tree Fruit Production Guide



10 APPLES

10.1 Apple Cultivars

Selection of Apple Cultivars Is One of the Most Important Management Decisions for Growers

Growers are encouraged to plant a cultivar test block with several trees of each of the best new apple cultivars to evaluate on their site. Some New Jersey growers have expanded their retail marketing efforts into "Pick-Your-Own" (PYO), and many growers have also expanded into the numerous tailgate marketing opportunities in the New York City Greenmarket system and markets throughout NJ cities. These growers continue to plant newer, higher quality eating apples. Taste and texture continue to be important quality factors in retail apple marketing.

Ordering Apple Trees

There is an extreme nationwide shortage of apple trees, specifically apple rootstocks, primarily because growers have rapidly moved to tall spindle systems at 1000 trees per acre over the past 5 years. There are not enough rootstock nurseries/and stool bed capacity to keep up. Growers should plan to replace 5-10% of their apple acreage on an annual basis.

Growers must order custom budded trees 2-4 years out and pay a deposit per tree up front. Consider thinking of your needs for the next 2-6 years and at least reserve the rootstock you want with your nursery for years 2-6. You can determine the cultivar you wish propagated later.

Cultivars for New Jersey

The **NE-183 Regional Apple Project** identified several outstanding cultivars that perform well in New Jersey. Many New Jersey growers have already adopted these, including Cameo®, Gala Supreme, Ginger Gold®, Goldrush, Honeycrisp™, Suncrisp® (NJ55), Sunrise, and Zestar!™. They have fit into the retail-oriented apple marketing mix that our New Jersey industry has continued to move toward to. For more detailed information on these cultivars, visit the NE-183 website at: *http://virtualorchard.com/ne183/cultivars/cultivars.html*.

The **Midwest Apple Improvement Association** (MAIA) is a membership based organization where grower members can purchase and grow the group's exclusive cultivars which have been shown to perform well in New Jersey. Varieties include EverCrisp®, Ludacrisp®, Summerset®, Rosalee®, Sweet Zinger®, and SweetMaia®. For more information about these cultivars and how to become a member of this association visit the MAIA website at: *https://maiaapples.com/*.

Descriptions of Cultivars (listed by apple ripening time, early to later)

Pristine®. An early summer, disease-resistant apple that ripens just after Lodi. Pristine is a yellow apple with smooth, glossy skin. Fruit has a high sugar content and excellent storage quality for an early season cultivar. It is scab immune, but susceptible to fire blight.

Sunrise. An early ripening selection from British Columbia, Canada. Sunrise was developed at the Summerland Research Station Apple Breeding Program. Its parents are McIntosh and Golden Delicious X PCF-3-120. It has a unique, highly attractive red/pink color that catches your eye. It ripens around August 5. For fresh market sales only, as it has a short storage life.

Dandee Red®. A new apple with a highly attractive brigh red color that ripens around 8 days before Paulared. It is an early McIntosh type that stores well in its season. It has cropped extremely well at the Rutgers Snyder Research & Extension Farm.

Zestar!™. From the Minnesota breeding program. Zestar! has Honeycrisp-like flavor and texture, but ripens a month earlier, around August 19. This cultivar remains one of the best early season dessert apples at the Rutgers Snyder Research & Extension Farm. It can be prone to drop and should not be held in long-term storage. Many view this apple as a replacement for Paulared.

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Silken. A new apple from British Columbia with very high eating quality; it ripens around Aug 21. It is known for its unique white gold porcelain color with a slight pink blush in some years in Northern New Jersey. Fruit is medium in size with excellent flavor and texture; it has rated extremely high in taste tests at the Rutgers Snyder Research & Extension Farm.

RedFree. An early August disease-resistant apple with tart flavor similar to McIntosh; resistant to apple scab and cedar apple rust, and moderately resistant to fire blight and powdery mildew; good cropper and annual bearer.

Sansa. Sansa ripens around August 30. A Gala X Akane cross developed in Japan, maturing around one week before Gala. It is an excellent dessert apple with good storage quality. It resembles Gala in fruit color and firmness.

Mollie's Delicious. A Rutgers cultivar that is an old-time favorite. It has no Delicious parentage in its heritage. It was named for its flavor, delicious. It is a very large, conically shaped, attractive apple with pinkish red skin over yellow. It has excellent flavor and can be stored for up to 10 weeks.

Early Fuji Cultivars. Ripen 30-35 days before regular Fuji, around September 10-15, and include Rising Sun Fuji, Benishogun Fuji, Auvil Early Fuji, September Wonder Fuji, Daybreak Fuji, and Morning Mist Fuji. These are all true Fuji's with good color, flavor, and other Fuji characteristics.

Gingergold®. Gingergold ripens around August 29. It was discovered as a chance seedling in Virginia. It is a high quality, yellow apple with good finish and crispness for its season. The tree is vigorous and productive. It may develop cork spot. However, apples can be stored for several months if harvested at the correct maturity.

Gala. Gala ripens September 7-10. There are numerous high color strains of this cultivar that work well in New Jersey, *e.g.*, Fulford, Crimpson, and Royal. For Southern New Jersey, Brookfield and Buckeye® are two of the reddest coloring strains. They are too dark for Northern New Jersey if you want a blushed gala.

Honeycrisp™. Honeycrip has outstanding eating quality but needs careful thinning. This cultivar continues to be a consumer favorite. Honeycrisp™ appears to benefit greatly from the use of ReTain®. In Northern New Jersey, it develops good red color 3 out of 5 years, about as frequent as McIntosh. Growers should purchase the newest strains with improved red color. In Southern New Jersey, red color will develop less.

Cortland. Cortland has very white, crisp and tart flesh. It does not brown~~,~~ and has very high eating quality~~, tart~~. Cortland ripens mid-September around a week after McIntosh. Works very well in slender spindle production systems.

Empire. Released from the New York State Agricultural Experiment Station. Very high quality eating apple, must be thinned well for good size. Fruit is creamy, white, and subacid. Spur-type tree that is easy to train.

Liberty. One of the highest quality, disease-resistant cultivars. It should be planted in limited acreage for fresh market. The Liberty tree has many desirable qualities. It is an annual bearer, heavy producer, has compact, spur-type growth, and is easy to train and manage. Fruit quality is very high, with Macoun as one parent. It has white flesh with unique flavor. Spraying with Retain® evens out the non-uniform harvest. Liberty taste and flavor continues to improve in storage, reaching its peak in 4-6 weeks.

Macoun. A New Jersey favorite, well adapted to Northern New Jersey through the Hudson Valley, anywhere you can get good color on McIntosh. It has a striped red skin with a purplish tinge. Very white, juicy flesh that has a unique flavor. Does not store more than 4-6 weeks. Must be thinned heavily to obtain good fruit size. Tree is very upright and is difficult to train.

Jonagold. Large fruit is striped~~,~~ with a red over yellow background. A cross of Golden Delicious X Jonathan, developed at the New York Agricultural Experiment Station. Flesh is firm and juicy with excellent eating quality and full rich flavor.

Cameo®. Originated as a chance seedling in a block of Delicious. Many feel this cultivar has the taste and fruit characteristics of the old fashioned original Delicious. Because of the high quality of the fruit, with creamy white

flesh and excellent flavor, this cultivar has become a favorite of roadside market and PYO orchardists. It is being planted frequently as an alternative to Delicious.

Suncrisp®. A Rutgers release that was tested as NJ55. An outstanding eating apple, ripening October 10-20 (October 25-30 with Retain). This apple always appears at the top of the list in sensory evaluations, and keeps the customers coming back. It is a compact, spur-type tree that is easy to train, but requires early heavy thinning to reduce biennial bearing. It is susceptible to calcium disorders and blister spot and benefits from ReTain®. It can also get surface soft scald in storage.

Golden Delicious. An old-time favorite and a standard for the season in early-October. It originated as a chance seedling of Grimes Golden in West Virginia. It has a mild, sweet flavor and crisp, juicy flesh. Its skin can shrivel in storage.

Fuji. This variety ripens October 15-20. There are numerous high colored strains of this variety available. It is a very vigorous tree with a greater tendency for biennial bearing, and therefore, requires very early chemical thinning and judicious use of PGRs to break this cycle. Sun Fuji, Desert Rose Fuji, and Autumn Rose Fuji are three varieties that have performed well at the Rutgers Snyder Research & Extension Farm.

Stayman. A New Jersey old-time favorite that fell out of favor after the removal of Alar from the market because the fruit can crack. Use of ProVide and ReTain® PGR's have allowed it to make a comeback. It is a late-October, red apple that is hard and has excellent sweet/tart flavor.

Braeburn. A hard, red, fall apple, that ripens in late-October. It retains its firmness and excellent eating texture well into January in cold storage. Flesh is cream colored and firm, with subacid flavor. The newer strains have excellent red color. The tree is spur-type and extremely precocious. Caution must be used not to allow the trees to "runt out" if overcropped. It performs well in the slender spindle growing system. This variety is prone to mite injury.

Granny Smith. Granny Smith can be grown and matured in New Jersey for a high quality, green, tart apple. When mature, it has a red blush on the cheek.

Goldrush. Goldrush ripens around November 7. A later-maturing apple developed by Rutgers, Purdue, and the University of Illinois as part of the Co-op series. It is a unique, high-flavored apple, with a very crisp texture. It reaches its best quality if put into storage until early December where it mellows and sweetens.

10.2 Apple Rootstocks

Rootstocks are a key component in the orchard system. They must be matched with the cultivar, soil type, and planting system that is to be established. The most important traits to consider are growth control, precocity, and resistance to disease, especially fire blight. Rootstocks can also impact fruit size, yield, and cumulative yield over time. The absolute size and performance of a mature tree on a given rootstock is influenced by soil, climate, scion cultivar, and very importantly, by management and care. After eighty years of testing, only full dwarfing rootstocks in high-density plantings can be recommended to ensure an early return on investment. Planting these full dwarfing rootstocks in a supported system is a must.

Research is ongoing to evaluate rootstock performance in New Jersey. We are also identifying rootstocks that are resistant to insects and apple replant disease. The following general characteristics of each rootstock are based on research observations in New Jersey and the NC-140 Rootstock Research Trials located at the Rutgers Snyder Research & Extension Farm in Hunterdon County, New Jersey. For more information, visit the NC-140 website at: *http://www.nc140.org*.

Virus-Free Rootstocks

Only virus-free trees and rootstocks should be planted. Trees indexed and maintained free of known harmful apple viruses may be slightly larger but are healthier and more productive.

Descriptions of Rootstocks (listed by size, largest to smallest)

Denotes rootstocks currently recommended for New Jersey orchards

Malling-Merton 111 (MM.111). Vigorous cultivars on MM.111 produce trees semi-dwarf in size, or 70 to 80 percent the size of those on seedling rootstocks. Thus, cultivars grafted to M.111 will be nearly full seedling size trees at maturity. It is best suited for growers interested in planting orchards at very wide spacing, *i.e.*, hard cider orchards. Spur-type trees on MM.111 are smaller. MM.111 is semi-vigorous, well-anchored, and encourages earlier production than seedling rootstocks. MM.111 is tolerant of drought, high soil temperatures, and collar and root rot. It is also resistant to woolly apple aphids and does not sucker badly if planted with the bud union 2 inches above the soil line. Because of its tolerance to collar rot, it does better than other clonal rootstocks on fine-textured and poorly-drained soils. Spur- and standard-bearing cultivars are recommended on MM.111 rootstock under these soil conditions but will still be large trees.

Malling-Merton 106 (MM.106). MM.106 is not recommended for New Jersey because it is susceptible to tomato ring-spot virus. The virus causes a necrosis and brown line at the bud union which kills Delicious, Jerseymac, and Golden Delicious. MM.106 is also sensitive to collar and root rot. Because of its slow acclimation, early winter low temperatures may injure trees on MM.106.

Malling 7a (M.7a). M.7a is one of the least precocious semi-dwarf rootstocks tested in national rootstock trials. One major downfall of M.7a is that it suckers extensively. Thus it is not recommended for New Jersey growers. M.7a is sensitive to some soil conditions and responds very differently with different scion cultivars. Delicious, Idared, and Rome on M.7a are not well-anchored and are smaller at maturity than well-anchored Golden Delicious or McIntosh trees. M.7a is moderately tolerant of crown and root rot but susceptible to woolly apple aphids.

***Geneva 30 (G.30).** This rootstock is a cross between Robusta 5 and M.9 by the New York State Agricultural Experiment Station, Geneva, NY, and has been widely tested throughout North America. It is resistant to collar rot and fire blight. It is similar in size to M7 and M26, but slightly more precocious, and it has fewer burr knots, and less suckering. It is a well adapted rootstock for weaker scions such as Honeycrisp. This rootstock has been evaluated in two trials at the Rutgers Snyder Research & Extension Farm in Pittstown, New Jersey, and was shown to be one of the highest and most consistent yielding rootstocks for Honeycrisp. This rootstock does require support from a strong trellis system especially with the cultivar Gala. It fell out of favor with the US nursery industry because it is difficult to propagate. However, it is available from a few nurseries.

Geneva 969 (G.969). This is a semi-dwarfing rootstock, similar in size to M.7. It is resistant to fire blight, crown rot, and wooly apple aphid. It also does not produce many suckers or burr knots. Although not a top choice, it should be considered for trial at New Jersey farms on a small scale.

***Geneva 11 (G.11).** This rootstock is the result from a cross of M.26 and Robusta 5 crabapple and was introduced in 1993 by the New York State Agricultural Experiment Station, Geneva, NY. It has been widely tested throughout North America. This is currently one of the recommended rootstocks for high-density, fully dwarfing tall spindle systems in New Jersey. The trees are slightly smaller than M.9. G.11 is moderately resistant to fire blight, and moderately susceptible to woolly apple aphid and crown and root rots. It does require tree support from a trellis system, especially in the early years. It does not produce many burr knots or root suckers.

Geneva 935 (G.935). This rootstock is slightly larger than M.26. It has resistance to fire blight and crown rot, it also has an equal production efficiency to that of M.9. Unfortunately, it is very susceptible to latent viruses, so should only be purchased if it was produced with virus free scion wood. Because of its issues with latent viruses it is not recommended for production in New Jersey.

Malling 26 (M.26). M.26 has fallen out of favor due to its sensitivity to fire blight. It is also susceptible to woolly apple aphids, and is only moderately tolerant to collar and root rot. Trees on M.26 are not drought-tolerant. M.26 acclimates slowly, and like MM.106, is susceptible to low, early winter temperatures but is very hardy during mid- and late winter. Thus it is no longer recommended to be planted in New Jersey. In several rootstock trials at the Rutgers Snyder Research & Extension Farm, G.30 was found to be a similar size at maturity as M.26 but with

improved traits.. These include resistance to collar rot and fire blight, and both higher cumulative yields and greater yield efficiency than M.26.

Ottawa 3 (Ott.3). This rootstock was bred in Canada for its cold hardiness, one parent being M.9. Trees on Ott.3 are about the size as on M.9 EMLA, but smaller than on M.26. It is precocious and resistant to collar rot but susceptible to fire blight and woolly apple aphids. It is one of the best small stocks we have. It has been available for many years, however, it is not popular with the nursery industry because it is difficult to propagate. Thus, most nurseries have not made this rootstock available. It should be grown with all the limitations of M.9, *i.e*., staking, irrigation, and on heavier soils. Ottawa 3 is very susceptible to apple mosaic virus, so only material known to be virus-free should be grown on this rootstock.

Geneva 41 (G.41). This rootstock is the result of a cross between M.27 and Robusta 5 and was introduced by the New York State Agricultural Experiment Station, Geneva, NY. Geneva® 41 is a full dwarf, similar in size to M.9 NAKBT337. However, it has improved yield efficiency over M.9 and produces fewer root suckers. It is highly resistant to fire blight and Phytophthora rot and, in initial tests, it appears to be tolerant of replant disease. It does tend to result in a bitter graft union with some cultivars, thus it is critical that trees are trellised or staked immediately after planting.

Geneva 16 (G.16). This Geneva rootstock is slightly larger than M9, but resistant to fire blight. However, there have been reports from Cornell University that it is sensitive to latent viruses, thus it is not recommended for New Jersey growers. There are several improved rootstocks bred in Geneva, NY that are recommended in lieu of G.16.

Malling 9 (M.9). This is historically the best-known and most widely planted apple rootstock in high-density apple plantings in the U.S., Europe, and other apple growing regions around the world. **However, M.9 and all of its clones listed below have fallen out of favor due to their susceptibility to fire blight and Rapid Apple Decline.** For more information on Rapid Apple Decline see the Pennsylvania Fact Sheet at:
https://extension.psu.edu/apple-disease-rapid-apple-decline

While M.9 may be more vigorous on deep, well-drained, loamy soils than on sandy loam or shallow soils, the roots are very brittle and trees of M.9 are poorly anchored. All clones of M.9 need support in the form of stakes or trellis. Trees on M.9 are early bearing and very efficient. Spur cultivars and less vigorous cultivars on M.9 are smaller and can be very dwarfed. M.9 is not drought-tolerant but is very responsive to irrigation. It is susceptible to woolly apple aphids, it can develop burr knots, and it suckers freely. All M.9 clones are considered highly sensitive to fire blight.

Clones of M.9 (note: partial list, for reference only, as M.9 clones are no longer recommended)
M.9 NAKB 337. This is one of the most widely propagated clones of M.9. It is a good rootstock but very susceptible to fire blight. In the 1994 NC-140 trial, NAKB 337 proved to be one of the smaller of the M.9 clones. It had one of the highest yield efficiencies, but only average fruit size.

M.9 EMLA. A virus-free clone of the original M.9. M.9 EMLA is the oldest and most widely tested of all M.9 clones in the U.S. This clone is very sensitive to fire blight. It is one of the weaker growing strains of M.9 with a size comparable to NAKB 337.

M.9 RN.29. Nicolai 29 is a Belgian clone of M.9 that has performed very well in Europe. Although its testing is still limited in North America, it has performed well in many national rootstock trials. In the 1994 NC-140 trial at the Rutgers Snyder Research & Extension Farm, RN.29 was one of the largest of the M.9 clones under evaluation. Its size is comparable to that of M.26. Its 4-year cumulative yield has also been higher than any of the other clones, and its fruit size is outstanding.

M.9 Fleuren 56. F.56 is a virus-free Dutch clone and one of the least vigorous clones of M.9 under test in North America, though testing in the U.S. has been very limited. It has performed well in the New Jersey NC-140 trial, with the highest cumulative yield efficiency of all the M.9 clones. Fruit size has suffered with trees on this rootstock. Rootstock performance appears to increase as the tree gets older.

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M.9 Pajam 1 (Lancep). The authenticity of the Pajam series clones, as to their M.9 progeny, is in question. But, as of now, both Pajam series stocks are treated and evaluated as M.9 clones. Pajam 1 produces a larger tree than most other M.9 clones. Although the tree is larger, it is highly productive and produces large fruit.

M.9 Pajam 2 (Cepiland). Another clone of M.9 originating in France. Pajam 2 produces a tree with more vigor than Pajam 1. Nationally, Pajam 2 has proven superior to M.9 EMLA and NAKB 337 in nearly 100 test trials.

***Budagovsky 9 (B.9 or Bud.9).** This is one of our recommended rootstocks for high-density, dwarfing systems on tall spindle trees. This rootstock was bred at the Budagovsky breeding program in Russia. This program has been actively pursuing new rootstocks that are tolerant of low minimum winter temperatures. Many of their selections have found their way onto the marketplace in Russia and Europe, and are now entering North American markets.

Trees grown on this rootstock are slightly smaller than M.9 EMLA. The leaves are a distinctive red, which make it a good identifying trait. It appears resistant to collar rot and is very cold hardy, more so than M.9. B.9 has shown field tolerance to fire blight and has been shown to impart resistance to bitterpit in sensitive cultivars such as Honeycrisp.

B.9 has performed very well in New Jersey, although the trees need to be supported by stakes or trellis. It is a well suited rootstock for use in a slender spindle production system. B.9 also fits very well into single stake culture for "Pick-Your-Own" plantings. Note, however, that the in-row tree spacing must be matched to the soil type and cultivar as B.9 is very precocious. It must not be allowed to crop until the tree has filled its space. Also, when combined with a precocious cultivar like Honeycrisp, it can be extremely dwarfing and trees can "runt out" if planted too far apart and/or are allowed to crop too soon. Trees will not recover from this situation.

Tree Spacing for Rootstock Recommendations in New Jersey

- Nearly all new orchards should be planted with dwarfing rootstocks in high density tall spindle systems.
- Planting dwarfing rootstocks helps to ensure early yields and returns on orchard investments.
- Proper tree spacing (trees per acre) is critical in maximizing the benefits of dwarfing rootstocks.

Tree Spacing Considerations

- Consider planting a minimum of approximately 1,200 trees/A (Table 10.1).
  Ideal spacng for this density is 12 ft by 3 ft.
- For high-density plantings of approximately 1,200 or more trees/A, use B.9, G.11, or G.30.
  Match the rootstock to the vigor of the scion and the soil, *i.e.*, B.9 or G.11 for the strongest cultivars such as Fuji, Jonagold, or Ludacrisp
- **Note**: This tree spacing requires an adequate support system and a trickle or drip irrigation system installed at planting. If possible a soil moisture monitoring system should also be installed.
- To determine tree spacing, you must take into account the scion vigor, rootstock vigor, soil type, irrigation, and the ultimate height trees will be allowed to attain. One way to do this is by following the online calculator developed by the University of Massachusetts and Michigan State University:
  https://ag.umass.edu/fruit/fact-sheets/apple-scionrootstock-selection-planning.

Table 10.1 Some Examples of Tree Spacing

Note: Tree Height should equal Row Width

Density (trees/A)	1815	1452	1210	1117	1037	990	908	778	662	580	519	389	262
Between row spacing (ft)	12	12	12	13	14	11	12	14	14	15	14	14	16
In row spacing (ft)	2	2.5	3	3	3	4	4	4	5	5	6	8	10

10.3 Specific Issues for Apple Orchard Nutrition

Calcium-Related Disorders

Calcium-related disorders result in significant economic losses. Two of the most prevalent disorders are cork spot and bitter pit. These disorders appear to be specifically related to low levels of calcium and are sometimes coupled with high levels of nitrogen, potassium and/or magnesium in the fruit flesh. Cork spot, characterized by spherical dead areas in the flesh, is an orchard disorder, while bitter pit is primarily a storage disorder and usually attacks the skin and adjacent cells. However, symptoms vary according to area, cultivar, and environmental conditions, making this distinction less than clear-cut.

Management of these disorders involves improving soil conditions, encouraging uniform annual cropping and moderate tree vigor. Foliar sprays of calcium chloride or equivalent calcium products have been used effectively to manage calcium disorders in New Jersey. For long-term maintenance and prevention of calcium disorders, maintaining an optimum soil pH of 6.5 with regular applications of high calcium limestone, applied according to soil test results, is essential.

Calcium chloride foliar sprays

Foliar sprays can be effective in managing calcium disorders if begun at first cover. Calcium chloride tree sprays have been shown to be some of the most cost-effective, quickest cultural practices for reducing low-calcium physiological disorders in apples. Current recommendations are to apply 4.0 to 14.0 lb/A per season of actual calcium, in six to eight cover sprays. Application rates should begin at 2.0 to 2.75 lb of calcium chloride/100 gal and can be increased on a sliding scale in each cover spray up to 3.0 to 5.0 lb/100 gal late in the season. The scab-resistant cultivar Enterprise benefits from the higher application rates of calcium chloride. The cultivar Honeycrisp is also particularly susceptible to calcium disorders and benefits from the full 14.0 lb/A per season.

Calcium, in the form of calcium chloride, is recommended because of its proven efficacy and lower cost. Many other calcium products are available, but in general, they supply a much lower rate of calcium than is needed to correct the deficiency. The PennState Extension factsheet ”Orchard Nutrition - Calcium Rate Calculator for Individual Product Comparisons” has an excellent tool to calculate the amount of calcium in individual products (*https://extension.psu.edu/orchard-nutrition-calcium-rate-calculator-for-individual-product-comparisons*).

It is important to note that $CaCl_2$ increases the pH of the spray solution, so 2/3 ounce of vinegar (5%) should be added per pound of $CaCl_2$. The addition of a surfactant may reduce the potential for leaf injury and increase uptake. There are no restrictions on the gallons of water/A needed. Sprays with as little as 20.0 gal of water/A have been effective. Tree row volume calculations should be used to determine the volume of water/A on each block. See the section 2.1, Sprayer Calibration and the Tree Row Volume Method.

Warnings: Do not premix calcium chloride with Solubor (Boron) before adding to the tank. At the rates recommended, calcium chloride and/or Solubor may be mixed with spray oil (Superior 70 Sec.), with Wettable Powder (WP) or with Emulsifiable Concentrate (EC) formulations of the more common fruit pesticides. Compatibility of other calcium materials is uncertain.

Some leaf injury may occur from calcium chloride sprays following wet, cool springs or hot, dry summers. When injury is noticed, cut the calcium chloride rate in half in the next spray, or delete until one half inch of rain has fallen.

The following factsheet from PennState Extension provides further information on calcium disorders in apples. Apple Fruit Disorders - Calcium Deficiency: *https://extension.psu.edu/apple-fruit-disorders-calcium-deficiency*.

Dip before Storage

Calcium chloride can be included in the postharvest scald dip solution. One combination that has been used successfully contains 50.0 lb of calcium chloride (food grade) in 500 gal of water plus diphenylamine (DPA) for scald (No Scald DPA EC 283). Calcium in the dip solution provides protection against bitter pit developing in storage, and generally improves the condition of the fruit in storage. More information on scald can be found in section 6.2.4, Postharvest Apple Diseases and Disorders.

Foliar Nutrient Sprays on Apple

Foliar applications of nutrient sprays should be applied as dilute sprays - 1X for maximum effect. Prebloom applications of boron and zinc enhance cropping by increasing retention of flower buds that would otherwise abscise during early bud development. The most obvious use of these treatments (N, B, Zn) would be on apple blocks where cropping is expected to be light. There is potential to increase fruit size as long as aggressive thinning practices are followed.

Nitrogen (N)

Applied as urea, foliar nitrogen is beneficial to apples for improving fruit set and increasing size on cultivars that are low in nitrogen, as indicated by leaf tissue analysis. Use 2.0-3.0 lb of urea/100 gal of water at pink bud, full bloom, and/or at petal fall, to improve fruit set and tree vigor. Use 5.0 lb/100 gal in cover sprays after petal fall only on nitrogen-deficient trees. Foliar nitrogen is not a replacement for ground applied nitrogen, but rather aids fruit set and fruit sizing.

Boron (B)

Solubor sprays of 1.0 lb in 100 gal of water, applied at full bloom and at 1 week after full bloom, may reduce cork spot in apple flesh if boron is deficient. Boron aids calcium movement into fruit. Adequate boron is essential; excessive boron hastens apple maturity and increases fruit drop. Both soil and leaf analyses are essential in determining the need for boron. Apply no more than two sprays/season.

Note: Boron may be added to cover sprays. Do not premix Solubor with calcium chloride. Do not apply boron with oil or when trees are wet with oil, as an increased uptake of boron may result in boron toxicity.

Zinc (Zn)

Use EBDC fungicides containing zinc. If zinc level is low, as indicated by leaf tissue sample, apply zinc chelate (EDTA) at 1.0 qt liquid formulation/100 gal dilute equivalent at tight cluster to pink. Avoid applications after bloom until harvest is complete to prevent russeting and fruit finish damage. Additional applications can be made after harvest to the foliage and the soil. Apply 3.2 lb actual zinc, as zinc sulfate/A, while the leaves are still green and active. Caution is advised with the zinc chelate formulations. There are different standards of quality in the chelation process and not all zinc products are chelated to the same standard. Soil applications may be used to correct long-term deficiencies, especially if soil tests low in zinc. Broadcast soil applications of Zn at 6.4-12.8 lb/A of actual zinc.

Manganese (Mn)

Manganese deficiency is most often observed on well-drained soils with a slightly acid to alkaline pH. However, soils abnormally high in organic matter may exhibit the deficiency within a slightly to moderately acid pH range. Manganese deficiency in tree fruits is generally characterized by interveinal chlorosis, which begins near the leaf margins and extends toward the mid-rib, and finally only the veins remain green. The deficiency symptoms are most prominent in the older portions of the current season‘s growth. One or more foliar applications of manganese, as manganese sulfate ($MnSO4$), will usually correct the deficiency in tree fruits. Apply at the rate of 1.0 lb of Mn/100 gal of water/A/application. Manganese chelates used according to manufacturer’s recommendations may also be effective in correcting manganese deficiencies in tree fruits.

Manganese toxicity, commonly referred to as ‘measles‘, is a physiological disorder brought on by excessive uptake of manganese. The bark on fruit shoots and laterals appears pitted. It is very common in Delicious strains but is seen in other cultivars as well. Manganese toxicity is usually associated with very low soil pH in the subsoil and/or topsoil. It is vital that the pH range be adjusted to 6.5 in both layers of soil prior to orchard establishment to prevent this condition.

10.4 Apple Pollination

All apple cultivars grown require cross-pollination to set a good commercial crop of fruit. Cultivars vary in degree of self-fruitfulness. For example, Rome Beauty is considered one of the most self-fruitful cultivars, whereas Delicious is one of the least self-fruitful. Regardless of the degree of self-fruitfulness, mixtures of compatible cultivars to provide cross-pollination should be used in every planting.

The following five conditions are necessary to obtain satisfactory cross-pollination:

1. Cultivars must bloom together or the blooming periods must overlap.
2. The pollinizer must have viable pollen.
3. Cultivars must be planted close together in the orchard. A recommended practice is to have a cultivar no farther than two rows from a pollinizer. Another practice is to have every third tree in every third row a pollinizer.
4. Bees and other pollinators must be active in the orchard at the time of bloom.
5. Weeds, such as dandelion, mustard, and wild radish, should not be present in large quantity since they attract bees when they are in bloom.

Certain cultivars have a tendency toward biennial bearing when proper crop thinning has not been successful. During an "off year", the pollinizer has a dramatically reduced number of flowers and therefore, reduced pollen availability. The adjacent cultivar, although it bears annually, may lose a crop because of the lack of cross-pollination. This is not so serious where one cultivar is rather self-fruitful, but the problem of crop loss must be considered with all other factors affecting pollination and fruit set.

Flower/Fruit Growth and Development

Pollination and fertilization are separate events that are necessary for the development of a fruit. Pollination is the deposition of pollen on the stigma of the apple flower. After the pollen is deposited, it germinates, and the pollen tube develops and elongates. When the pollen tube reaches the ovary, fertilization occurs. The time it takes for the pollen tube to reach the ovary is quite variable and dependent on temperature and pollen vigor as well as genetic factors. The average duration of cell division in the apple fruit is 30 days after fertilization. Growth of the fruit that occurs after this time is primarily due to cell enlargement. Dependent upon the seasons (*i.e.*, weather), the period of cell division in the apple can take longer than 30 days.

There are many fungicides and insecticides that exhibit plant growth regulator (PGR) activity, such as thinning of fruit. Most of these types of pesticides clearly state on their labels that these compounds should not be sprayed until 30 days after full bloom, or potential thinning of fruit may result. If the season is slow or prolonged by weather, then there must be some added precautions that growers must take into consideration. If bloom is delayed and/or prolonged, CAUTION should be advised with the use of any chemical that has potential plant growth regulator activity. When in doubt, growers should contact their area Fruit Extension Agent. This could prevent some potentially catastrophic problems (*i.e.*, overthinning). See section 10.5, Use of Plant Growth Regulators in Apple Orchards.

Honeybees for Orchard Pollination

Beekeeper Relations

Never use insecticides during bloom. Give beekeepers at least 48 hours notice when you need bees moved in or out (at least 24 hours notice before spraying is required by law in several cases, see "New Jersey Beekeeper Notification Regulations" in section 1.6.3, Protect Non-Target Organisms. Keep beekeeper telephone numbers handy and warn them if there is danger of spraying. A written grower-beekeeper contract may protect both parties. Such a contract should include hive-quality guarantees, delivery and removal dates, rental fees, and protection to the beekeeper against colony damage. For the most up to date information regarding laws affecting pesticide applications and beekeeper notification, contact your County Agricultural Extension Agent or the DEP.

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Renters of bees should know that a certificate of inspection must accompany all bees coming into the state. The certificate must indicate that the accompanying bees are free from contagious bee diseases. The certificate must also show the colonies are free of acarine mites. Bee inspection officers are also given the right of entry to inspect any hives, combs or other beekeeping equipment. Copies of bee laws may be obtained from your County Agricultural Extension Agent.

Bee Colonies.

Honeybee colonies should be provided for pollination in almost all orchards where cultivars requiring cross-pollination are grown. Strong hives may furnish 20 times as many field bees as weak hives when conditions are cool, wet, or windy. Bee colonies are usually substandard for pollination unless they have at least 800 square inches of brood (eggs, larvae, and pupae) and enough adult bees to care for this brood, regardless of the weather. One to two strong colonies of bees/A are recommended for apple pollination. Due to poor pollination weather, early blooming cultivars require more bees than later blooming cultivars. Mature orchards, with a maximum number of flowers/A, require more bees than young orchards. Small orchards, where wild bees are common, require fewer honeybees than large orchards. Inadequate pollination causes misshapen fruit or dropping of immature fruit.

Hive Placement

For best results, delay hive placement in orchards until there is about 10 percent bloom. This tends to orient bee activity to the target bloom rather than to competing plants such as dandelions. Competing bloom in the orchard should be eliminated. This helps reduce bee foraging on non-crop hosts and reduces the adverse effects that some pesticides have on bee health. Groups of 6 to 10 hives can be placed at 200 to 300 yard intervals throughout the orchard. For peak efficiency, they should be set about 100 yards inside the orchard edge in full sunlight. Hive entrances should be facing south or southeast to take advantage of sunshine on cool days. The hives should sit on boxes or at least have weeds removed from in front of the entrances. Wind protection is desirable. There should be a plentiful pesticide-free source of water within one-fourth mile of the bees; eliminate all water contaminated with insecticides.

Pollinizers

Trees providing sufficient compatible pollen for the main crop trees are necessary. The minimum planting arrangement of pollinizers is every third tree in every third row. Every other tree in every other row would be more ideal. Where pollinizers have not been planted, a remedial practice is to graft a pollinizer branch in each producing tree. Care must be taken not to prune out the pollinizer branch during regular pruning operations. Annual blooming at the same time as the producing tree is important in the selection of the pollinizer cultivar. Large bouquets of pollinizer branches in drums of water near each tree can be used when no other source of pollen is available. The nearer the pollen source to the cropping trees, the better the distribution of pollen to all blossoms by bees.

10.5 Use of Plant Growth Regulators in Apple Orchards

10.5.1 Apple Crop Load Management and Precision Thinning

Optimizing crop load greatly impacts and enhances crop value. Using **Plant Growth Regulators** (PGR's) for chemical fruit thinning is done to obtain the optimal crop load per tree, return bloom (annual bearing), and larger fruit size. However, many factors must be considered prior to the application of PGR's for fruit thinning, including:

- **Frost Damage:**
  Frost damage can result in a reduced fruit set.

- **Sunlight prior to application:**
  Sunny weather tends to lead to a lower thinning response. Cloudy weather during this time tends to lead to a greater thinning response. Thinners applied just before, during, or after a three-day cloudy period, especially when temperatures are above 65°F, will likely increase the thinning response.

- **Weather after Application:**
  Weather in the 5 days after application is a major factor affecting thinning response. Cool weather tends to lead to less of a thinning response, while hot weather or a warming trend leads to a greater thinning response.

When applied during poor drying conditions, thinners will generally have increased activity. Dew or light rain following treatment may redistribute the chemical and cause additional uptake and a larger thinning response. The effects of light intensity, moisture and temperature on thinning response are complex.

It is **STRONGLY** suggested that growers use the **Cornell Apple Carbohydrate Thinning Model,** available at *https://www.newa.cornell.edu/apple-carbohydrate-thinning,* to estimate the thinning response based upon weather patterns each year. Note: The carbohydrate balance and supply in the tree at any given time will affect the activity that results from any thinning sprays that are applied. This balance has been found to correlate well with a tree's sensitivity to chemical thinners, and has been modeled to guide growers in the use and timing of thinning materials. These models should be used as a real time guide during the thinning period.

The Cornell Apple Carbohydrate Thinning Model derives data from local weather stations, thus growers who obtain their own on farm weather station can have more tailored guidance during the thinning period.

- **Pollination:** Poor pollination (fewer than 5 seeds per fruit) can lead to a greater thinning response.

- **Fruit Set:** Heavier fruit sets tend to be harder to thin while lighter fruit sets tend to be easier to thin.

- **Fruit Size at Time of Application**
  Plant growth regulators should be applied from petal fall through 20 mm fruit size. Beyond 20 mm fruit size, the efficacy of plant growth regulators decreases significantly.

No single thinning program is applicable to all orchards because of the many variables. Past experience combined with detailed records of materials, rates, crop performance, crop management practices, yield, and weather conditions is your best guide. It is essential to understand which thinning materials are available, how they work, and the different windows of opportunity available for their application. Knowing the cultivar response to these different materials will greatly increase the success of your thinning program.

In general, early applications of high rates thin aggressively. Moderate and mild thinning occurs at lower rates and/or at later timings. Rates of individual thinners and/or combinations should be based on past grower experience with individual cultivars in each fruit block.

Another tool that growers can use to predict fruit set is the **Fruit Growth Rate Model** developed by Michigan State University and the University of Massachusetts. Instructions on how to use this model can be found at: *https://ag.umass.edu/fruit/fact-sheets/hrt-recipe-predicting-fruit-set-using-fruitlet-growth-rate-model***.**

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Chemical Choice

Prior to applying plant growth regulators, it is critical to take into consideration the tree row volume. Details on sprayer calibration in relation to chemical concentration and tree row volume can be found in the factsheet "Spray Mixing Instructions Considering Tree Row Volume – TRV," developed collaboratively between Cornell University and Rutgers University and available at: *https://rvpadmin.cce.cornell.edu/uploads/doc_569.pdf*

Auxins

Auxins are our oldest and most reliable thinners. They are available in two main formulations: 1-Napthaleneacetic Acid Sodium Salt (NAA), and Napthaleneacetamide (NAD), which are sold under a number of different trade names/formulations. **NAA** can be applied from bloom to 13 mm fruit size at rates of 5 to 10 ppm in at least 100 gal/A. **NAD** is a mild form of NAA and is used from bloom to petal fall and early fruit set (8-13 mm) only. It is very effective on summer cultivars such as Paulared, Jerseymac, Macintosh cultivars and Macoun.

Caution: Do not use **NAA** or **NAD** on any trees that are to be treated with 6-Ba PGR materials, including Maxcel, Promalin, or ProVide in the same year, or pygmy fruits may result. Do not apply **NAA** at concentrations greater than 5 ppm or after petal fall on Delicious or Fuji cultivars, to avoid pygmy fruits. Do not apply **NAD** to Delicious or Fuji cultivars, as pygmy fruits may result.

Cytokinins

The primary cytokinin used for apple thinning is 6-Benzyladenine (6-BA), which is sold under a number of different trade names/formulations with label rates ranging from 10 ppm to 200 ppm depending on use, timing, and combinations. The best results for thinning are attained at the 8-13 mm stage (10 mm is optimal), and at temperatures between 70-80°F, followed by a warming trend for the 3 days following application. If temperatures are forecast to remain in the 80's or higher following application, reduce the rate of 6BA materials. Do not apply 6-BA if the temperature is to be 85°F or higher at application or 3 days following application. For most uses, rates should not exceed 100 ppm. Use **Caution** when combining with carbaryl, since this creates a synergistic effect. For later thinning (15-20 mm), a combination with carbaryl will increase efficacy. **Caution**: The combination of MaxCel™ and Sevin on the cultivar Gala can over-thin.

Carbaryl

Carbaryl is a carbamate insecticide that is a standard thinner for apples. Only the formulation of Sevin XLR-Plus or Sevin 4F should be used to thin apples. Sevin is a mild thinner, and is labeled at 0.5 pt – 6 pt per acre tree row volume. For most cultivars, it is best used in combination with other thinners (NAA or 6-Ba). Sevin alone is adequate for easy to thin cultivars such as Cortland, Braeburn, and Granny Smith when used at petal fall and/or at 8-12 mm.

Oxamyl

Oxamyl is a carbamate insecticide that works in the same manner as Sevin. (**DO NOT USE CARBARYL IN COMBINATION WITH OXAMYL**). Oxamyl, like Sevin, is a mild thinner and should be used in combination with another thinner (NAA or 6-Ba) for best results if only one application is being made. At 1.0-2.0 pt/100 gal, it should be applied tree row volume dilute between petal fall and 15 mm fruit size. Up to two applications can be made/season. Oxamyl may be less toxic to mite predators than carbaryl.

ACC

ACC (1-Aminocyclopropane-1-carboxylic acid) is a precursor to ethylene that stimulates ethylene production. It is an effective thinner for both apples and stone fruit. The best thinning results in apples have been observed when it is applied to 20 mm sized fruitlets at a rate of 200-400 ppm with a non ionic surfactant (rate of 0.05%). It is most effective during slow drying conditions with good spray coverage.

Ethephon

A plant growth regulator marketed in various formulations. The effects of Ethephon depend on the application rate and the temperature at both the time of application and for several days following application. The rate depends on both the timing of the application and the cultivar. It is labeled on apple for thinning at 1.5 to 6.0 pt/A and works better as a late rescue treatment for thinning in the 20 mm window. It should not be used on Macoun as a rescue treatment, as it has over-thinned. The ethephon label lists rates as per acre and not per 100 gal. However, it is assumed to be a high volume spray.

Windows of Application for Thinning Apples

In general, earlier thinning will result in larger fruit size at a comparable crop load. Use of multiple thinning treatments **(Nibble Approach)** may improve thinning results in difficult to thin blocks in addition to enhancing return bloom.

Bloom Thinning Window

Bloom thinning is recommended in apple production because the earlier fruit are thinned, the larger the fruit will size. Early thinning also allows for additional applications with other materials at petal fall or later if necessary. Effective thinners to use at bloom include ATS, NAA, and NAA (Table10.2).

Petal Fall Window (PF(6 mm) up to 8 mm size)

Thinners to use at this time: NAA, NAD, 6Ba, Carbaryl, and Oxamyl (Table 10.2). Each of the aforementioned thinners can be used alone on some varieties, or combinations of 6Ba with NAD or NAA can be used. If fruit is not adequately thinned at petal-fall, then additional applications may be required.

Fruit Set Window (8 mm to up to 13 mm)

This is the traditional time for chemically thinning apples. However, if using the nibble approach this would be the second or third spray. All labeled thinning materials are effective at this time, including NAA (*i.e.*, Fruitone, PoMaxa, Refine), 6 Ba (*i.e.*, Maxcel, RiteWay, Exilis) and the carbamates (*i.e.*, Vydate or Sevin) (Table 10.2). Combination treatments with a carbamate + either NAA or 6-Ba have generally been more effective than single materials. The carbamates are synergistic with NAA or 6-Ba. Target applications for the air temperatures to be on a warming trend, or remaining in the 70's for 2-3 days following application.

Late Fruit Set Window (15-20 mm)

Historically, all labeled materials are much less effective at this time, including NAA, 6-BA, and carbamates. Higher rates and combinations of more than one material must be used to achieve a thinning response (Table 10.2). For example a combination of 6Ba at 100-125 ppm, plus 2 pints of carbamate plus spray oil at 1 pint per 100 gallons.

Accede is a new product that has been shown to be effective at this timing window at a rate of 23-46 fl oz per acre or 200-400 ppm (100 gal/acre).

Rescue Thinning (17-27 mm)

At this size the only material that will thin is Ethephon or Ethephon combined with Carbaryl. Please refer to Table 10.3.

Note: Rescue thinning with Ethephon can over-thin, especially if the temperature is above 80°F. Note also that the rate used is variety dependent. Make sure to review the label.

See Tables 10.2 and 10.3 on page 238

Table 10.2 Summary of Apple Thinning Timing and Materials

All PGR chemical thinning applications should be applied on a per acre basis calculated via TRV irrespective of the water volume applied. Tree Row Volume Gallonage (TRV) = (Tree Height X Tree Width X 43,560 X 0.7)/(Between Row Spacing X 1,000). See section 2.1, Sprayer Calibration and the Tree Row Volume Method.

Spray Timing	Chemical Name	Trade Name	Rate per 100 gal dilute TRV
Bloom	Ammonium Thiosulfate[3] (2 applications may be necessary)	ATS (foliar nutrient)	2 gal or 2% solution, do not concentrate
	Naphthaleneacetic Acid-Sodium (NAA)	Fruitone®-N, Fruitone®-L, PoMaxa®, Refine™ 3.5 WSG, Refine® 3.5L	3-4 oz (8-10 ppm)
	Naphthaleneacetamide[2] (NAD)	Amid-Thin W	6.4-8 oz (40-50 ppm)
Petal Fall[1,2] and up to 8 mm Fruit Size	Naphthaleneacetamide[2] (NAD)	Amid-Thin® W	4-8 oz (25-50 ppm)
	Naphthaleneacetic Acid-Sodium[2] (NAA)	Fruitone®-N, Fruitone®-L, PoMaxa®, Refine™ 3.5 WSG, Refine® 3.5L	2-4 oz (5-10 ppm)
	Carbaryl	Sevin® XLR Plus, Sevin® 4F	0.5-6 pt
	Oxamyl	Vydate L	1-2 pt
	6-Benzyladenine (6-BA)	MaxCel®, RiteWay®	48-200 oz (75-100 ppm)
		Exilis® Plus, Exilis® 9.5 SC	See label (75-150 ppm)
Fruit Set 8-13 mm Fruit Size	Naphthaleneacetic Acid-Sodium (NAA)	Fruitone®-N, Fruitone®-L, PoMaxa®, Refine™ 3.5 WSG, Refine® 3.5L	2-4 oz (5-10 ppm)
	Carbaryl	Sevin® XLR Plus	1-2 pt
	Oxamyl	Vydate L	2 pt
	6-Benzyladenine (6-BA)	MaxCel®, RiteWay®	See label (75-150 ppm)
		Exilis® Plus, Exilis® 9.5 SC	See label (75-125 ppm)
Late Fruit Set 15-20 mm Fruit Size	[6-Benzyladenine (6-BA)]+ [Carbaryl]/[Oxamyl]+ Oil	[MaxCel®, RiteWay®, Exilis® Plus, Exilis® 9.5 SC], [Sevin® XLR Plus], [Vydate L]	6Ba (100-125 ppm) + Carbaryl/Oxamyl (1-2 pt) + 1 pt Oil
	1-aminocyclopropane-1-carboxylic acid (ACC)	Accede	23-46 fl oz (200-400 ppm)
Rescue Thinning 17-27 mm Fruit Size	Ethephon	See recommendation for different varieties in Table 10.3.	

[1]From petal fall stage onward there are many combinations of thinners that are optimal for specific cultivars, contact your local county agent and/or crop consultant for recommendations. [2]Do not use Naphthaleneacetamide or Naphthaleneacetic Acid-sodium or combine with 6-BA on Red Delicious or Fuji from petal fall or later pygmy or misshapen fruit may occur, see cautions on label. [3] **Ammonium Thiosulfate is phytotoxic and can over-thin** under certain slow drying weather conditions, and at high rates.

Table 10.3 Recommendations for Rescue Thinning with Ethephon

Recommendations for Rescue Thinning with Ethephon (Concentration and Amount/A Dilute TRV)
Fruit 17-27 mm diameter (0.7-1.1 inch)

Treat when temperatures are 70-80°F (day of treatment + 2 days). Do not treat when below 70°F or above 80°F (day of treatment + 2 days). ***Cautions:*** Ethephon can defruit trees, particularly with high temperatures. Response may be less than ideal, particularly with low temperatures. ***Benefits:*** Reduced or eliminated hand thinning. Enhanced fruit size. Increased return bloom - 30-50%.

Varietal recommendations based on Massachusetts research and observations (per 100 gal dilute spray, with 0.5 lb carbaryl a.i. and a surfactant)	McIntosh and Macoun	200-300 ppm (0.7 - 1 pt)
Varietal recommendations based on Mid-Atlantic research and observations (per 100 gal dilute spray, with 0.5 lb carbaryl a.i. and a surfactant)	Spur-type Delicious	300-375 ppm (1-1.25 pt)
	Fuji	300-375 ppm (1-1.25 pt)
	Golden Delicious	120 ppm (0.4 pt)
	Rome Beauty	120 ppm (0.4 pt)
	Gala	225 ppm (0.75 pt)
	Cameo	225 ppm (0.75 pt)
	Enterprise	150 ppm (0.5 pt)
	Goldrush	225 ppm (0.75 pt)
	Jonagold	150-225 ppm (0.5-0.75 pt)
	August varieties	120 ppm (0.4 pt)

10.5.2 Other Uses For Plant Growth Regulators in Apple

Growth Control and Fire blight Suppression

Apogee®

Apogee® is a growth control product with the added benefit of reducing the tree's susceptibility to shoot fire blight. Apogee® is a unique production management tool that will suppress vegetative growth by blocking gibberellin synthesis, the plant hormones that stimulate vegetative growth. Blocks that have a light crop and apple cultivars that are particularly sensitive to fire blight are good candidates for Apogee®.

In NJ, 3 to 5 applications of 3.0-4.0 oz/100 gal or 9-12 oz/A at 10 to 17 days apart will be needed for full season growth control; using the lower rates will not interfere with chemical thinning. Multiple applications of the lower rate have worked best with minimal interference with fruit set. The rate and number of applications should be determined by evaluating tree vigor. Refer to the Apogee® label for details on application rates, vigor ratings, and safety precautions. Optimum timing for the first application is 1-3" of new shoot growth (roughly bloom to petal fall). The active ingredient in Apogee® is calcium based, and therefore, hard water should be buffered for Apogee® applications. Other calcium products (*i.e.*, calcium chloride, calcium nitrate) should also be avoided when applying Apogee®. If you know that your water contains high levels of calcium carbonate, a water-conditioning agent should be added to the tank-mix to help "soften" the water. The only labeled conditioner is high quality spray grade Ammonium Sulfate (AMS). **Note**: Apogee® needs an eight-hour rain free period following application.

Defruiting Young Apple Trees

Young trees (2-3 years old) may set a heavy crop of fruit. If this occurs it is critical to completely defruit the trees to ensure adequate vegetative growth and high yields in the future. The following is recommended as a de-fruiting spray: a mixture of 2.0 lb Sevin XLR-Plus + 150 ppm [MaxCel™ or Exilis] (6-BA) + 1 pt Soluble Oil per 100 gal. Apply between petal fall and 14 days after bloom (6-12 mm) to remove most fruit. Any remaining fruit should be removed by mid-June for the greatest efficacy.

Fruit Elongation and Fruit Size Enhancement

Promalin®/Perlan®

Promalin®/Perlan® (a.i.: 6-Benzyladenine or 6-BA and Gibberillins A_4A_7) is a growth regulator that has been used to increase the length thereby improving the shape of Delicious fruit. Fruit thinning may occur if the material is misused.

- Apply 1.0 pt/100 gal at king bloom petal fall.
- Over-application, or application when temperatures exceed 85°F, may result in excessive fruit thinning.
- Apply while king blossoms are open.
- Adding surfactants increases the effects on fruit shape and fruit thinning.
- To determine if there was any effect on fruit shape or thinning, be sure to leave a few trees untreated for comparison.

MaxCel™/exilis® 9.5 SC

In addition to its use as a fruit thinner, MaxCel™/exilis® 9.5 SC (a.i.: 6-Benzyladenine or 6-BA) can be used for fruit size enhancement. Applied at petal fall of king bloom and repeated 2-4 times, it has been shown to result in increased fruit size of hard-to-size cultivars like Gala and Empire.

- Rate: apply 10-50 ppm/application at 3 to 10 day intervals. Apply in a sufficient amount of water to ensure thorough coverage without excessive run-off. Use calibrated spray equipment to ensure uniform coverage of leaves and fruit. Adjust water volumes based on tree size and spacing. In many cases, spray volumes of approximately 100 gal/A have been shown to be adequate.
- Direct 80% of the spray into the upper 2/3 of the tree canopy.
- Applications will be most effective when the maximum temperature is above 65°F on the day of application, and the following 2-3 days.

Improving Fruit Quality and Preharvest Fruit Cracking Suppression

ProVide® 10SG (Table 10.4)
ProVide® 10SG use for suppressing skin russeting and cracking:

- Apply 4-6 applications (3.5-7 oz/A per 100 gallons of water), starting the first application 2 weeks before cracking begins. This is typically early to mid-July. Intervals between applications should be 14 to 21 days. When conditions favor heavy cracking, better results are obtained by using more applications and closer spray intervals. Research in Virginia has shown that 6 applications at 14-day intervals provide the best cracking suppression.
- Do not use a surfactant. Where Captan is not being used, oils, at the rate of 1.0 qt/100 gal, improve the penetration of ProVide.

Testing Fruit Cracking Potential.
A water bath, developed by Dr. Ross Byers of Virginia Tech, is very effective in testing the crack potential of Stayman fruit. The following is the procedure:
1) Sample 5 non-cracked fruit from around 4 trees/block;
2) Submerge the 20-fruit sample in a 5.0 gal pail containing a solution of 1.0 fl oz of X-77 surfactant;
3) Count the cracked fruit after one and three days;
4) If half the fruit cracks, then fruit on the trees will likely crack when exposed to the proper weather conditions and preventative treatment should be applied;
5) Since the cracking potential of fruit changes throughout the season, the test should be repeated every 2 weeks.

Table 10.4 Improving Apple Fruit Quality, Size, and Shape

Spray Timing	Chemical Name	Trade Name	Concentration (Rate)	Use
Apply first spray at petal fall and continue at 7-10 day intervals for 4 to 6 applications	Gibberellic Acid (4+7)	ProVide® 10SG	3.5-7 oz/A or 100-200 g/A in 100 gal of water (25-50 ppm)	Suppresses skin russeting and cracking, and enhances fruit growth
Early king bloom to 50% bloom	6-Benzyladenine plus Gibberellic Acid (4+7)	Promalin®, Perlan®, Typy™	25 ppm at a rate of 1pt/100 gal apply at 50-100 gal per acre.	Improvement of shape in delicious and gala cultivars

Return Bloom

Twenty five to thirty days after full bloom is the beginning of the flower bud development stage for the following year's crop. This is a rough guideline, actual physiological responses are a result of degree day accumulations. Beginning at approximately 30-35 mm fruit size, growers should consider using NAA or ethephon for the primary purpose of return bloom. Detailed recommendations can be found in table 10.5.

When used 30 days after full bloom, ethephon can have a dramatic thinning effect on some of the easier to thin cultivars such as GingerGold, McIntosh, and Delicious. On early season cultivars such as Gingergold, Gala, and McIntosh, growers should not use more than 4 sprays of ethephon at 7 day intervals for return bloom beginning 45 days after full bloom, or undesirable fruit quality may result at harvest. Ethephon on non-bearing apples can be used at 2.0-8.0 pt/A beginning 2-4 weeks after full bloom. However, these trees should have filled their space and be ready to bear the following year, as tree growth will be reduced by ethephon.
A summarized guide for the use of PGRs for return bloom can be found in Table 10.5.

Table 10.5 Apple Return Bloom Enhancement

All PGR chemical thinning applications should be applied on a per acre basis calculated via TRV irrespective of the water volume applied. Tree Row Volume Gallonage (TRV)= (Tree Height X Tree Width X 43,560 X 0.7)/(Between Row Spacing X 1,000). See section 2.1, Sprayer Calibration and the Tree Row Volume Method.

Spray Timing	Chemical Name	Trade Name	Rate per 100 gal dilute TRV
First spray at 30-35 mm fruit size then up to 5 weekly subsequent applications[1]	Naphthaleneacetic Acid-Sodium [3]	Fruitone®-N, Fruitone®-L, PoMaxa®, Refine™ 3.5 WSG, Refine® 3.5L	2.0 oz (5 ppm)
First spray at 35mm fruit size then 3-4 weekly applications[2]	Ethephon	Ethephon[2]	0.5 pt (150 ppm)

[1] If NAA is already being used for chemical thinning at bloom, petal fall, and 8-15 mm fruitlet size, the spray will also encourage return bloom.

[2]Do not use prior to 35 mm fruit size, if temperatures are forecasted to exceed 85°F the day of application or if temperatures are forecasted above 85°F 4 days following application.

[3]NAA can reduce fruit size, use cation when applying on cultivars with small fruit size.

Preharvest Drop Control

NAA (Naphthaleneacetic Acid-Sodium)

NAA can be used for preharvest drop control of all cultivars. It becomes active within a few days of application and may be used at 10 or 20 ppm. At 10 ppm, drop is controlled for about 1 week; and at 20 ppm, drop is controlled for about 10 to 14 days.

ReTain® (aminoethoxyvinyl-glycine Hydrochloride or AVG)

ReTain® is a harvest management tool labeled for both apples and pears. ReTain® was evaluated in eight grower orchards and at the Rutgers Snyder Research and Extension Farm on McIntosh, Cortland, Liberty, Macoun, Stayman, Mutsu, and Empire cultivars. ReTain® works as a stop drop material, and is also effective preventing early fruit drop. In addition, it delays maturity an average from 7-10 days. Fruit treated with ReTain® can be picked during the normal harvest period for enhanced retention of firmness in storage, or harvest may be delayed, allowing the fruit to continue to grow and develop red color.

Research in NJ shows that ReTain® reduces preharvest drop on McIntosh from 10-30%. It is our observation that while labeled for application at 28 days PHI, it may be more effective if applied at 5 weeks before anticipated harvest. This is especially true on drought stressed blocks.

For cultivars with a narrow harvest windows, such as Liberty, ReTain® allows growers to delay harvest up to two weeks and pick larger, firmer fruit with improved coloring. ReTain® is also effective in reducing stem cracking in Gala.

Important considerations to follow with ReTain® applications in New Jersey:

- Use the full rate of ReTain®, 1 pouch or 333 gram/A of formulated product with an organosilicone surfactant at 0.10 % (v/v).
- Use only **ONE** of the following organosilicone surfactants:
  Silwet L77 at 13.0 fl oz/100 gal **OR**
  Sylgard 309 at 13.0 fl oz/100 gal
- Apply 4 weeks before anticipated harvest (28 day PHI). It is better to apply slightly earlier rather than later.
- ReTain® should be applied with a sufficient amount of water to ensure thorough wetting of the fruit while avoiding spray run- off. Adjust water volume based on tree size and spacing.
- For optimum results, apply during periods of slow drying weather conditions.
- Do not tank mix ReTain with other agricultural chemicals.

Harvista (1-Methyl-cyclopropane or 1-MCP)

- Use between 3-21 days prior to normal harvest. *(continued next page)*

(Harvista (1-Methyl-cyclopropane or 1-MCP - continued)

- Allow a minimum of 3 days between application and harvest.

Note: It is important to distinguish between Harvista and SmartFresh, a.i. 1-MCP for both, but used differently

A summary of harvest management and stop drop controls can be found in Table 10.6.

Table 10.6 Apple Pre-Harvest Drop Control

All PGR chemical thinning applications should be applied on a per acre basis calculated via TRV irrespective of the water volume applied. Tree Row Volume Gallonage (TRV)= (Tree Height X Tree Width X 43,560 X 0.7)/(Between Row Spacing X 1,000). See section 2.1, Sprayer Calibration and the Tree Row Volume Method.

Spray Timing	Chemical Name	Trade Name	Concentration	Rate	Use
Apply as apples begin to loosen	Naphthaleneacetic Acid-Sodium[1]	Fruitone®-N, Fruitone®-L, PoMaxa®, Refine™ 3.5 WSG, Refine® 3.5L	10 or 20 ppm, good coverage at tree row volume dilute (TRV) application	4 or 8 oz dry or liquid /100 gal applied TRV dilute	Stop Drop
Apply 28 to 7 days prior to anticipated harvest	Aminoethoxyvinyl-glycine Hydrochloride (AVG)	ReTain® [2]	–	1-2 pouches per acre, follow label for detailed instructions. Retain can retard red color. It is dose dependent. Consider reduced rates on Honeycrisp and Gala	Stop Drop and Harvest Management (delayed harvest)
Apply 3-21 days prior to anticipated harvest[3]	1-Methyl-cyclopropane (1-MCP)	Harvista[3]	–	48-242 fl oz/acre, but no more than 242 fl oz/crop	Stop Drop

[1] Note that NAA can ripen fruit and should not be used on fruit destined for mid-long term storage.

[2] Retain is dose dependent, variety and application time sensitive. Seek guidance from your local Extension Agent or Crop Consultant prior to use.

[3] Harvista requires a specialized sprayer, or custom application by Agrofresh- contact your Agrofresh sales representative for more information.

Fruit Ripening

In most cases, ethephon has hastened maturity, increased color development, and made it possible to harvest an entire crop in one picking. Ethephon has been used on Julyred, Raritan, Jerseymac, Britemac, Paulared, Opalescent, Wealthy, Mollie‘s Delicious, and McIntosh (see note about McIntosh below). The use of ethephon on summer-ripening apples should be confined mainly to fruit to be sold at retail markets within a week or two of harvest. Storage of ethephon treated apples beyond 2 weeks is not recommended.

- Wet fruit by applying ethephon at 0.5 pt/100 gal of dilute spray. The 0.5 pt rate is recommended for the summer-ripening cultivars and McIntosh to reduce the possibility of over maturity.
- Begin spraying 2 to 3 weeks before the normal harvest period, and about 1 to 2 weeks before desired harvest date.
- Ethephon is most effective at temperatures between 60 and 85°F. Color improvement may be minimal when high temperatures prevail.
- Do not apply ethephon to more trees than can be harvested in 2 days. A 1-day delay in harvest can result in fruit drop and loss of fruit quality.

McIntosh has not responded consistently well to ethephon sprays. In some instances, red color has been slow to develop, and fruit drop has been excessive. In contrast, many Delicious cultivars have responded well to ethephon.

The response in Stayman has been much the same as for Delicious, but the use of ethephon will probably not be as extensive as with Delicious because immediate fresh market sale of Stayman is not as great as for Delicious.

Postharvest Quality Maintenance

SmartFresh™ (1-methylcyclopropene or 1-MCP)

SmartFresh™ is a postharvest plant growth regulator product used to enhance post harvest quality of apples. It is used at very low rates (parts/billion) and has been favorably rated for its low toxicity.

SmartFresh™ is used in apple storage facilities to maintain harvest quality by temporarily slowing the apple's internal ripening. It works by slowing the effects of internal ethylene and by protecting the apple from outside sources of ethylene as well. In plant tissue, 1-MCP has a far greater affinity (10x) for ethylene receptors than ethylene and therefore, essentially halts the ripening process. The creation of new ethylene binding sites or long-term exposure to warmer temperatures eventually induces the ripening process again.

SmartFresh™ is formulated as a powder that when mixed with water, releases 1-MCP gas. SmartFresh™ is added to the air in the storage facility and is compatible with both controlled atmosphere (CA) and regular air storage regimes. Fruit is exposed to 1-MCP gas in an airtight storage room for 12-24 hours at 32 to 75°F (0 to 24°C). Timing is important to maintain harvest quality. This product will not make "bad" fruit good.

SmartFresh™ has wide usage in major apple-producing areas in the U.S. Fruit storage reports indicate that treated fruit stored for 6 months under refrigeration were 3.0 lb firmer than untreated fruit stored under the same conditions. In addition, treated fruit has a much longer shelf life once removed from storage than untreated fruit.

Other Uses for PGRs - Increasing apple branching in young trees, Summarized in Table 10.7.

Table 10.7 Improvement of Apple Branching

Research has resulted in a number of options for enhanced branching in young nursery trees. Products, timing and concentrations are listed below.

Spray Timing		Chemical Name	Trade Name	Concentration
1 year old wood	Prior to spring budbreak	6-Benzyladenine	MaxCel®, Exilis® Plus, Exilis® 9.5 SC	5,000 -7,500 ppm See label for rate and use instructions
		6-Benzyladenine plus Gibberellic Acid (4+7)	Promalin®, Typy™	5,000-7,500 ppm See label for rate and use instructions
	After spring budbreak	6-Benzyladenine	MaxCel®, Exilis® Plus, Exilis® 9.5 SC	400 to 500 ppm See label for rate and use instructions
		6-Benzyladenine plus Gibberellic Acid (4+7)	Promalin®, Typy™	400 to 500 ppm See label for rate and use instructions
2 year old wood	At budbreak	6-Benzyladenine	MaxCel®	1,500 ppm (9.2 fl oz per gal of water) See label for rate and use instructions

10.6 Apple Insect and Mite Control Strategies

Pesticides can consume a large part of the production budget. There are several things one can do to stabilize or reduce insecticide costs. First, use an Apple IPM program (see section 10.7). Treat only when needed, and use the minimum amounts of pesticide required to do the job.

This Tree Fruit Production Guide summarizes pesticide products and rates to be used for various pests throughout the season. There are times though, when there are several insect or mite pests present at the same time. These **"mini pest complexes"** are often challenging to manage. Minimizing the number of products and rates used at these times will help reduce potential costs while addressing pest control needs. This issue is addressed in the following paragraphs.

Apple - Dormant to Prebloom & Petal-Fall

Aphids (Rosy, Apple, Spirea), Leafminers and Leafhoppers, Plum Curculio, Oriental Fruit Moth (OFM), Leafrollers and Other Lepidoptera

Aphids start hatching at 1/4" green. Spotted tentiform leafminers (STLM) emerge at about the same time, and lay eggs during tight cluster through bloom. White apple leafhopper (WALH) eggs start hatching at petal-fall.

New insecticides may not have as broad a spectrum as some older materials but are much more effective for individual types of insects. For example, several new neonicotinoids or neonicotine compounds have good activity against aphids and other sucking insects, while the newer generation materials have an expanded activity range.

Admire, a first generation neonicotine, has excellent activity against certain sucking insects. It is labeled for aphids, leafhoppers and leafminers. Other neonicotinoids like Actara, Assail, Belay have a broader spectrum of control, but are all effective for aphids and leafhoppers, however, they have restrictions on the number of applications per year. Other newer chemistries like Sivanto and Transform are also good aphid materials. Transform and some of the neonicotinoids will also control scale crawlers. An OP insecticide like Imidan may be required at petal-fall for plum curculio and leafrollers. Avaunt is primarily a PC material, but also has activity on codling moth, leafrollers, European apple sawfly, OFM and leafhoppers . Delegate is an excellent material for codling moth, OFM and leafrollers. The premixes can have very broad spectrums of activity, but some have pyrethroids in the mix, which can be toxic to beneficials.

Synthetic pyrethroids: Asana, Declare, Pounce, Baythroid, Danitol, Lambda-Cy, Mustang/Mustang-Maxx, Tombstone, and Warrior, may be used for pre-bloom leafminer and leafroller control, and also to control aphids. Aphid control is limited, and not as good as if using a neonicotinoid, Transform, Sivanto, Movento, Bexar or other related materials and premixes designed for sucking insects (see Table 10.9, Efficacy of Insecticides and Acaricides for Apple Insect and Mite Control). Early season post bloom applications of pyrethroids are discouraged, since they kill predators and parasitoids, and therefore contribute to increased mite and scale populations. Although Danitol will also kill predators, it can suppress mite populations.

The best petal-fall materials for leafminers include any of the neonicotinoids listed above plus any compound containing avermectin like Agri-Mek. Most of these materials also control leafhoppers, although this is not usually a recommended target at petal fall. Recent research has demonstrated that treatments for WALH are not needed unless the population exceeds 3 nymphs per leaf. Since this only happens occasionally, petal-fall spray programs should no longer revolve around leafhopper control. It is more economical to control the key pests and leave leafhoppers for later in the season or until a treatment threshold is reached. If you were planning to use an Imidan plus a leafhopper material, then consider dropping the leafhopper material, and using the Imidan alone.

If aphids and leafminers are not an issue at petal fall, then Avaunt may be used for leafrollers, OFM, plum curculio, leafhopper, and plant bugs. No OP insecticide is needed in this case, unless sawflies are also an issue. Premixes that also provide sucking insect control may also function as the main insecticide at petal-fall. Several of these, like Voliam Flexi and Besiege, are diamide based products so provide excellent control of leafrollers and other 'worms'.

Apple - Early Season Post Bloom

Codling Moth, Plum Curculio, Tufted Apple Budmoth, and Other Leafrollers

Plum curculio (PC) management in NJ typically requires weekly sprays for 3-4 weeks beginning at petal-fall. In apples, management is needed through approximately 300 DD_{50} after petal-fall. Materials that cover PC and other key pests encountered at this time include Asana, Avaunt, Imidan, Endigo, and Voliam Flexi. Proper timing for the first codling moth treatment needs a strong CM material like Madex HP, a diamide product (Altacor, Besiege, Voliam Flexi, Verdepryn, Exirel), or Delegate. Imidan can still work, as do some pyrethroids, but many populations have shown resistance. Madex HP is a virus that is specific for codling moth and Oriental fruit moth, applied at the two degree-day timings for egg hatch and then again 5 days later (4 times/generation) and can be used at a lower rate if tank mixed. Because of its specificity, Madex HP is safe for natural enemies and pollinators.

Apple - Mid and Late Season

STLM, Aphids and Leafhoppers (Rose Leafhopper, Potato Leafhopper) and Leafrollers (TABM)

If second generation treatment for STLM is needed, consider that most of the same materials that control leafminers (STLM) also control aphids and leafhoppers, but some materials like Transform or some pyrethroids like Mustang do not control leafminers. Lannate may also be used for tufted apple budmoth where it is a problem. However, Delegate and Intrepid are more effective for TABM. Intrepid is also effective for leafminer control (at a slightly higher rate), as long as it is used during peak egg hatch. When used for TABM control, Intrepid can be used for both, as long as it is timed for egg hatch of both pests. Rimon is also very effective for leafrollers (and codling moth), and will also control leafminers at this time. As with other pests, Rimon must be applied at egg hatch, which is usually during the peak adult flight for STLM, or when young sap feeders are starting to appear on the undersides of the leaves.

Mites

Available materials include Acramite, Apollo, Envidor, Kanemite, Onager/Savey, Portal, Nealta, Nexter, Vendex, and Zeal. Nexter, FujiMite and Kanemite block cellular respiration and have similar modes of action. Therefore, all 3 materials should be treated as a group, and not be rotated with each other in the same season. Onager/Savey, Apollo, Envidor and Zeal are meant for young populations are best used early when mites first start to build. Make sure to use only 1 application of a specific miticide during the season and rotate with another chemical class. Treat Onager/Savey, Apollo and Zeal as one class since they have a related mode of action, although Zeal is slightly different.

Brown Marmorated Stink Bug (BMSB)

Brown Marmorated Stink Bug (BMSB) is an invasive stink bug that is primarily a mid-late season pest of apples. Feeding by BMSB can result in corked or dimpled fruit at harvest. Pressure is highest from the second generation beginning in early to mid-July. Adults and nymphs can be monitored with clear sticky traps (available from Trece Inc.) on 4’ wooden stakes and baited with an aggregation pheromone. Traps should be placed on the perimeter of the orchard. In apples, a cumulative threshold of 4 adult BMSB is used to trigger insecticide management. A full block spray followed by weekly border-based sprays have been effective in apples in the Mid-Atlantic region and significantly reduces insecticide use. Beginning around Labor Day populations in apples will be highest through the first frost. This is especially true in plots along wood lines. Borders of the crop have the highest injury and bugs can be observed migrating in from soybeans or peaches after they are no longer attractive.

10.7 Apple Integrated Pest Management

10.7.1 Mating Disruption Technology for Key Apple Insect Pests

Codling Moth (CM)

Just as Oriental fruit moth (OFM) is the key insect pest in peaches, codling moth (CM) is the key insect pest in apples. Like OFM, CM may be managed with mating disruption technology. There are several brands available. All hand-placed dispensers for CM should be placed in the upper third of the canopy during the pink to petal fall period. Application of dispensers should be completed by petal fall which is when codling moth typically begins to fly and mate. For mature trees on M-111 and other large trees, this means that a pole must be used to place the dispensers near the tops of the trees. If placed too low in the canopy, mating disruption will not be effective.

There are multiple companies and products for mating disruption for codling moth but not are all registered in New Jersey. Many formulations are dual products that also disrupt Oriental fruit moth. We have rigorously evaluated the following two products in New Jersey: Isomate OFM/CM TT (200 dispensers/A) and Trece Cidetrak CMDA + OFM MESO (32 dispensers/A). These are both hand-applied dispensers that have shown good disruption of both CM and OFM.

Other dispensers include Checkmate CM-XL 2.0 used at the rate of 120 to 200 dispensers/A and Cidetrak CM-OFM Combo used at the rate of 200 to 220 dispensers/A.

Mating disruption for codling moth does not work as well as mating disruption for Oriental fruit moth. However, this is a good tool to reduce population pressure and can provide protection against codling moth (and Oriental fruit moth) if weather conditions are not suitable for spraying or the degree-day models are not as reliable. It is also a good resistance management tool and resistance to some insecticide classes has been reported for CM in New Jersey. Mating disruption can be an important tool to use in combination with other management strategies, such as timed sprays, alternative chemistries, granulovirus, and insect growth regulators. Once codling moth populations are reduced, a reduction in dispenser levels and supplemental insecticide sprays are options, but as with any IPM practice, regular trapping and field monitoring is strongly recommended and supplemental insecticide applications should be applied as needed.

Dogwood Borer

Similar to the other borer pests, mating disruption technologies are available for dogwood borer, a pest in apples. Dogwood borer attacks burr knots, common in high density plantings. Mating disruption is available through Pacific Biocontrol (CBC America).

Pacific Biocontrol Isomate DWB should be applied at a minimum rate of 100 dispensers per acre with an initial recommended rate of 150 dispensers. Dispensers should be placed before the end of May, prior to adult emergence. As with all management strategies, pheromone traps should be placed (2/acre) to monitor male moth populations. Mating disruption is more successful when used for successive years. This is an acceptable practice for organic operations.

10.7.2 Apple IPM Treatment Guidelines

Pest	Time of Season or Generation	Monitoring and Treatment Levels		
Apple Maggot	Late June or early July in Southern Jersey; early to mid-July in Northern New Jersey	Start treatment when flies are found in excess of 2 to 5/red sticky ball trap/week. Continue as long as flies are found.		
Codling Moth	There are three generations/year. Insecticide applications should be timed with a degree day model based on accumulating degree days (base 50) from the first sustained moth catch (biofix). The first spray will roughly coincide with 2-3 weeks after petal fall. Once treatments are applied for either generation, supplemental sprays may be needed if pheromone trap captures exceed 5 moths/trap/week. Use the following table as a guide for timing insecticide applications. Under heavy populations, spray timing may have to be earlier than table guidelines. Timing depends in part on the type of insecticide being used.	**Codling Moth (CM) Timing in Apple**		
		Degree Day (DD_{50}) Targets from Biofix		
		Brood	**Avaunt, Neonicotinoids, Carbamates, OP's, Pyrethroids**	**Altacor, Besiege, Esteem*, Intrepid, Rimon*, Madex-HP, Verdepryn, Voliam**
		1	250	100-150
			550	450
		2	1250	1150-1200
			1550-1600	1450-1500
		3	2300	2200
		*Rimon 1st appl. @75-100 DD, Esteem 1st appl. @ 100 DD		
Oriental Fruit Moth	Timing is similar to peach with some adjustments.	**Oriental Fruit Moth (CM) Timing in Apple**		
		Degree Day (DD_{45}) Targets from Biofix		
		Brood	**OP's, Carbamates, Pyrethroids (Conv.), Broad-spectrum materials, Neonicotinoids, Diamides***	**Intrepid, Madex-HP, Rimon**
		1	Pink or 150-Timing falls 1st bloom	Pink
			350-375	250-300
		2	1450-1500	1300-1400
		3	2450-2500	2300-2400
			2900-3000	2750-2900
		4	By trap count if > 10-15 moths/trap/week	
		*Diamides should be applied about 50-75 DD earlier for all treatments, compared to the OP/carbamite timing		
European Apple Sawfly	PETAL FALL	Total cumulative capture of 4 to 7 per trap		
European Red Mite	May to Early June	2 mites/leaf		
	Late June to Mid-July	5 mites/leaf		
	Mid- to Late July	7.5 mites/leaf		
	Late July to Mid-August	10 mites/leaf		
	Late August onwards	at least 20 mites/leaf		

Apple IPM Treatment Guidelines continued next page

APPLES

Pest	Time of Season or Generation	Monitoring and Treatment Levels
Apple Aphid, Spirea Aphid	May - June Early July	When 50 percent or more of the terminals are infested with visible colonies
Rosy Apple Aphid	May	1 or more colonies/tree
San Jose Scale	DORMANT to DELAYED DORMANT or 1st generation crawlers	300-350 DD (base 50°F) after 1st adult catch in pheromone traps (about early to mid-June), or when 1st crawlers have been caught on sticky tape (about early to mid-June).
Spotted Tentiform Leafminer	First generation: PINK or PINK and PETAL FALL.	If leafminers were a severe problem the previous season.
	Second generation: late June to mid-July	If there is an average of 0.5-1 mine/leaf.
	Third generation: late July to early August.	If there is an average of 2 to 3 or more mines/leaf.
	Fourth generation: late August to mid-September	Only in an emergency – usually if the first through third generations have not been controlled. Fruit drop may occur if there is an average of 10 mines/leaf.
Tufted Apple Bud Moth	First generation: early to mid-June (SECOND and THIRD COVERS). Second generation: SIXTH and SEVENTH covers.	When pheromone trap counts are high, if injury was noted last year, or if leaf shelters and fruit feeding are easily found. This applies to both generations. Pheromone traps and degree-day records may be used for more precise timing. See table below:

Degree Day (DD) Spray Targets from Biofix

Brood	**Carbamates, OP's, Pyrethroids, Delegate, Diamides***		**Intrepid, Rimon**	***Bacillus thuringensis* (Bt)**
	Alt. Mid.	Complete	Complete	Complete
1	475-505	530-585	500-650	585-640
	610-640			
	750-775	805-855	805-850	805-855
	885-910			
2	2210-2245	2280-2355	2355-2435	2355-2435
	2395-2435			
	2585-2625	2665-2740	2665-2740	2585-2665
	2775-2815			2815-2890

*Diamides (Besiege, Exirel, Voliam, Verdepryn) should be applied @500-525 DD complete sprays or about 30-60 DD earlier than other complete sprays compared to OP/carbamate/pyrethroid timing.

White Apple Leafhopper (WALH), Rose Leafhopper (RLH) (July-Sept.)	First generation WALH: PETAL FALL, FIRST, SECOND COVER (last of May, early June)	3-4 leafhopper nymphs/leaf.
	Second generation WALH: FIFTH, SIXTH COVER (early to mid-August). This includes various generations of RLH and PLH.	3-4 leafhopper nymphs/leaf (WALH and/or RLH).
Potato Leafhopper (PLH) (July-Sept.)	June through September	Treat young plantings when PLH populations are increasing.

10.8 Efficacy of Pesticides for Apple Disease, Insect and Mite Control

Table 10.8 Efficacy of Fungicides and Bactericides for Apple Disease Control

(++++ = excellent, +++ = good, ++ = fair, + = poor, – = ineffective or not rated)

Note: Fungicide Resistance Management

Fungicides for all FRAC Codes except M1-M4 are at risk for resistance development. These materials should be alternated or mixed with fungicides of a different chemistry. See labels for details.

Chemistry (FRAC Code)	Fungicide or Bactericide	Bitter Rot	Black Rot and White Rot	Fire Blight	Powdery Mildew	Rusts	Scab	Sooty Blotch and Flyspeck
COPPER COMPOUND (M1)	Copper, fixed	-	-	++	-	-	-	-
INORGANIC, SULFUR (M2)	Sulfur	+	+	-	+++	+	+	+
DITHIOCARBAMATE (M3)	Ferbam 76WDG	+++	++	-	-	+++	++	++
	Ziram 76DF	++	-	-	+	++	++	+++/++
ETHYLENEBISDITHIO-CARBAMATE (M3)	Dithane, Manzate, Penncozeb 75DF	+++	++	-	-	+++	+++	++
	Polyram 80DF	+++	++	-	-	+++	+++	++
PHTHALIMIDE (M4)	Captan 80WDG	+++	+++	-	+	++	+++	+++ / ++
GUANIDINE (U12)	Syllit 3.4FL	-	-	-	-	-	+++	+
MBC (1)	Topsin M WSB	+	+++	-	+++	-	++++	+++
DMI (3)	Cevya	+	-	-	++	++++	++++	++++
	Indar 2F	-	-	-	+++	++++	++++	+++
	Procure 50WS	-	-	-	++++	++++	++++	-
	Rally 40WSP	-	-	-	++++	++++	+++	-
	Topguard	-	-	-	++++	++++	++++	-
DMI + AP (3 + 9)	Inspire Super 2.82EW		++	-	+++	++++	++++	++++
SDHI (7)	Aprovia	++	+++	-	++	-	+++	+++
	Fontelis 1.67SC	++	++	-	++	-	+++	+
	Miravis	-	-	-	++	-	++++	-
	Sercadis	-	-	-	++	-	+++	+++
AP (9)	Scala 5SC	-	-	-	+++	-	+++	-
	Vangard 75WG	-	-	-	++	-	+++	-
SDHI + AP (7 + 9)	Luna Tranquility 4.16SC	+++	+++	-	++	+++	++	+++
QoI (11)	Flint Extra 4.05SC	++	++	-	+++	+	++++	+++
	Sovran 50WG	++	++	-	+++	+	++++	++++
QoI + SDHI (11+ 7)	Luna Sensation 4.2SC	+++	++++	-	+++	+++	+++	++++
	Merivon 4.18SC	+++	++++	-	+++	++++	++++	++++
	Pristine 38WG	+++	++++	-	+++	++++	+++	++
UOP (29)	Omega 500F	++	++		-	++	++	+++/++++
Phosphonates (P7)	ProPhyt, Aliette, etc…	+	+++	-	+	-	+++	++
ANTIBIOTIC, aminoglycoside (24)	Kasumin 2L	-	-	+++	-	-	-	-
ANTIBIOTIC, glucopyranosyl (25)	Agri-Mycin	-	-	+++	-	-	-	-
ANTIBIOTIC, tetracycline (41)	Mycoshield 17WP, FireLine 17WP	-	-	+++	-	-	-	-

Table 10.9 Efficacy of Insecticides and Acaricides for Apple Insect and Mite Control

(++++ = excellent, +++ = good, ++ = fair, + = poor, - = not rated, S=suppression only)

INSECTICIDE/ ACARICIDE AND FORMULATION	INSECTS[1]															MITES[2]		
	AM	CM	EAS	GAA	GFW	LR	OFM	PC	RAA	BMSB	SB/ TPB	SJS	STLM	WALH	WAA	ARM	ERM	TSM
Acramite 50WS	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	++++	++++
Actara WG	–	–	++	++++	–	–	–	+++	++++	+++	+++	–	+++	++++	–	–	–	–
Admire Pro (foliar)	+	–	–	++++	–	–	–	–	++++	+++	–	+++	++++	++++	–	–	–	–
Agri-Flex	–	–	++	++++	–	++	–	+++	–	–	–	–	+++	++++	++++	++	++++	++++
Agri-Mek SC	–	–	–	–	–	–	–	–	–	–	–	–	++++	+++	–	++	++++	++++
Altacor	+	+++	–	–	++++	++++	++++	+	–	–	–	–	++++	–	–	–	–	–
Apollo SC	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	+	++++	++++
Apta/Bexar	+++	–	–	++++	–	++	–	++	++++	–	–	–	–	++++	–	–	–	–
Asana XL	+++	+++	+++	–	+++	++++	++++	+++	+++	++	+++	–	++++	+++	–	–	–	–
Assail 30SG	++++	+++	+++	++++	–	–	+++	++	++++	++	+++	+++	++++	++++	–	–	–	–
Avaunt	++	+++	+++	–	+++	+++	++	+++	–	+	+++	–	+	+++	–	–	–	–
Bacillus thuringiensis	–	–	–	–	–	++++	+++	–	–	–	–	–	–	–	–	–	–	–
Baythroid XL	+++	++	++	++	+++	++++	++++	++	+++	+++	++++	–	++++	+++	–	–	–	–
Belay	+++	++	–	++++	–	+	++	+++	++++	++++	–	+++	++++	++++	–	–	–	–
Beleaf 50SG	–	–	–	+++	–	–	–	–	–	+	+++	–	–	–	–	–	–	–
Besiege	+++	++	+++	–	+++	++++	++++	++	+++	+++	+++	–	+++	+++	–	–	–	–
Brigade/ Bifenthrin 2EC	–	–	–	–	–	–	–	–	–	++++	+++	–	–	–	–	–	–	–
Centaur WDG	–	–	–	–	–	–	–	–	–	–	–	++++	–	–	–	–	–	–
Cormoran	++++	++++	+++	++++	–	++++	++++	++	++++	++	+++	+++	++++	++++	–	–	–	–
Danitol 2.4EC	+++	+++	++++	–	+++	++++	++++	+++	++	+++	+++	–	++++	+++	–	+++	+++	+++
Declare	++++	+++	–	+	++	++++	++++	++	++	+++	++++	–	++++	++++	–	–	–	–
Delegate 25WG	++	++++	–	–	++++	++++	++++	+	–	–	–	–	++++	–	–	–	–	–
Diazinon 50W	+++	+++	–	++	++	–	++	+++	++	–	+++	+++	+	++	++++	–	–	
Endigo ZC	+++	+++	+++	+++	–	–	++++	+++	++++	++++	++++	–	++++	++++	–	–	–	–
Envidor 2SC	–	–	–	–	–	–	–	–	–	–	–	–	–	++	–	++++	++++	++++
Entrust		+++	–	–	–	++++	++++	–	–	–	–	–	++	–	–	–	–	–
Esteem 35WP	–	+++	–	–	–	–	+++	–	+++	+	–	++++	+++	–	–	–	–	–
Exirel	++	+++	+++	–	–	+++	++++	++	–	–	–	–	+++	+++	–	–	–	–
Gladiator	+	+	+++	+++	–	++++	++++	+	–	+++	++++	–	+	++++	–	–	+++	++++
Imidan 70W	++++	++++	+++	+	+++	+++	++++	+++	+	–	++	–	+	+	+	–	–	–
Intrepid 2F	–	+++	–	–	++++	++++	+++	–	–	–	–	–	+++	–	–	–	–	–
Kanemite 15SC	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	++++	++++	++++

Table 10.9 Efficacy of Insecticides and Acaricides for Apple Insect and Mite Control - continued next page

Table 10.9 Efficacy of Insecticides and Acaricides for Apple Insect and Mite Control - continued

INSECTICIDE/ ACARICIDE AND FORMULATION	INSECTS[1]															MITES[2]		
	AM	CM	EAS	GAA	GFW	LR	OFM	PC	RAA	BMSB	SB/ TPB	SJS	STLM	WALH	WAA	ARM	ERM	TSM
Lambda-Cy/ Warrior II	+++	++	+++	+	+++	++++	++++	++	+++	++	++++	–	++++	+++	–	–	–	–
Lannate	++	+++	+	+++	+++	++++	+++	++	++	++	++++	–	+++	+++	+	–	–	–
Leverage 360	+++	+++	+++	++++	+++	+++	+++	++	+++	+++	+++	++	++++	++++	–	–	–	–
Madex HP	–	++++	–	–	–	–	++++	–	–	–	–	–	–	–	–	–	–	–
Minecto Pro	S	+++	–	–	–	–	++++	++	–	–	–	–	+++	–	–	++	++++	++++
Movento	–	–	–	++++	–	–	–	–	++++	–	–	++++	–	–	++++	–	–	–
Mustang Maxx	+	+	+++	+++	–	++++	++++	+	–	+++	++++	–	+	++++	–	–	–	–
Nealta	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	++	++++	++++
Nexter 75WP	–	–	–	–	–	–	–	–	–	–	–	–	–	++	–	++++	++++	+++
Oil, 70 second	–	–	–	+++	–	–	+	–	++	–	–	+++	–	–	–	+	++++	+
Onager EC	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	++++	++++
Portal XLO	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	++	++++	++++
Pounce	–	–	–	–	–	–	++++	–	+++	–	–	–	+++	–	–	–	–	–
Proclaim SG	–	++	–	–	+++	++++	++	–	–	–	++++	–	+++	+++	–	–	+	+
Rimon 0.83EC	–	++++	–	–	–	++++	++++	S	–	–	–	–	++++	–	–	–	–	–
Savey 50DF	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	++++	++++
Sevin XLR	+++	+++	–	++	++	+	+++	+++	+	–	++	++	++	++	–	+++	–	–
Sivanto PRIME	–	–	–	++++	–	–	–	–	++++	–	–	++	–	++++	–	–	–	–
Tombstone	++++	++	++	–	–	++++	++	++	–	–	–	-	++++	+++	–	–	–	–
Transform WG	–	–	–	++++	–	–	–	–	++++	+	++	+++	–	++++	–	–	–	–
Vendex 50WP	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	+++	+++	+++
Verdepryn 100SL	–	++++	+++	–	–	++++	++++	+++	–	–	+	+	+++	+++	–	–	–	–
Venerate XC	–	–	–	–	–	–	+++	S	–	+++	–	+++	–	–	–	–	–	–
Versys	–	–	--	++++	–	–	–	–	++++	–	–	–	–	–	–	–	–	–
Voliam Flexi WG	–	++++	–	++++	–	++++	++++	+++	++++	++	+++	–	+++	++++	–	–	–	–
Vydate 2L	+	–	–	+++	–	–	++	+	+++	–	+++	–	++++	+++	–	+	+	+
Zeal	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	++++	++++

[1] **AM** = Apple Maggot
CM = Codling Moth
EAS = European Apple Sawfly
GAA = Green Apple Aphid
GFW = Green Fruit Worm
LR = Leafrollers
OFM = Oriental Fruit Moth
PC = Plum Curculio
RAA = Rosy Apple Aphid
BMSB = Brown Marmorated Stink Bug
SB = Stink Bugs (Native Only)
TPB = Tarnished Plant Bug
SJS = San Jose Scale
STLM = Spotted Tentiform Leafminer
WAA = Woolly Apple Aphid
WALH = White Apple Leafhopper

[2] **ARM** = Apple Rust Mite
ERM = European Red Mite
TSM = Two-Spotted Spider Mite

10.9 Apple Disease and Pest Management

Apple Disease Management Program – Fungicide and Bactericide Timing

See also Table 10.8 Efficacy of Fungicides and Bactericides for Apple Disease Control

Disease	Dormant	Delayed Dormant - ½ Inch Green	Tight Cluster, Pre-Pink	Pink	Bloom	Petal-Fall	First Cover	Second Cover	Third and Fourth Covers	Fifth, Sixth, and Later Covers
Fire Blight										
Apple Scab										
Powdery Mildew										
Cedar Apple Rust										
Bitter Rot										
Black and White Rots										
Sooty Blotch/Flyspeck										

Apple Insect and Mite Pest Management Program – Insecticide and Acaricide Timing

See also sections 10.6 through 10.8 for Insect and Mite Control Strategies, IPM, and Efficacy of Pesticides.

Insect and Mite Pests	Dormant	Delayed Dormant - ½ Inch Green	Tight Cluster, Pre-Pink	Pink	Bloom	Petal-Fall	First Cover	Second Cover	Third and Fourth Covers	Fifth, Sixth, and Later Covers
Rosy Apple Aphid					Do not apply insecticides during Bloom!					
Scale Insects										
Spotted Tentiform Leafminer										
European Apple Sawfly										
Oriental Fruit Moth										
Apple Aphid										
Woolly Apple Aphid										
Codling Moth										
Leafrollers/ Tufted Apple Budmoth										
Plum Curculio										
Native Stink Bugs										
Tarnished Plant Bug										
White Apple Leafhopper										
Brown Marmorated Stink Bug										
Apple Maggot										
European Red Mite		Eggs	Eggs	eggs/ nymphs						
Apple Rust Mite										
Two-Spotted Spider Mite										

Key: = Optimum timing = Some control possible

The Label is the Law
A pesticide applicator is legally bound by the labeling found on and with the pesticide container in their possession. Before using a pesticide, check and always follow the **labeling distributed with the product at the point of sale for legally enforceable rates and restrictions. See the Pesticide Use Disclaimer on page 2.**

Observe cautions on the product label to minimize potential exposure to bees and other pollinating insects.

The following Pest Management Tables are listed for individual cover sprays, but growers should think about whole season approaches, see section 10.6, Apple Insect and Mite Control Strategies, and section 10.7, Apple Integrated Pest Management.

Abbreviations			
Pome Fruit Preharvest Interval Key		**Units of Measurement**	
D	Dormant application only	/A	per acre
DD	Delayed dormant application only	D	day(s)
TC	No later than tight cluster	fl oz	fluid ounce(s)
P	No later than pink	Gal	gallon(s)
PB	No later than prebloom	H	hour(s)
FB	No later than full bloom	Lb	pound(s)
PF	No later than petal-fall	Oz	ounce(s)
NTL	No time limit (usually up to the day of harvest) - consult label	Pt	pint(s)
		Qt	quart(s)
NA	Not applicable		

DORMANT						APPLES
DISEASE		**Fire Blight**				
Product and Formulation[1]	**FRAC Code**	**Product Efficacy Rating[2] and Rate/A[3]**				**REI PHI**
Bordeaux mixture (lb/100 gal)	M1 + M2	++ 8, 8				48 h D
Champ Formula (gal)	M1	++ 0.66-1.33				48 h D
Cuprofix Ultra 40DF[4] (lb)	M1	++ 5.0-7.5				48 h D
Kocide 3000 30DF[4] (lb)	M1	++ 5.25-7.0				48 h D
Nu-Cop 50DF (lb)	M1	++ 8.0-16.0				48 h D

[1] Copper materials cause injury if applied beyond half-inch green. Kocide, Champ, Nu-Cop are copper hydroxide products; Cuprofix is basic copper sulfate.
[2] ++++ =excellent, +++ = good, ++ = fair, + = poor, – = ineffective or not rated.
[3] Rates are in amount of formulated product per acre, unless otherwise noted. REI=Restricted Entry Interval. PHI=Preharvest Interval.
[4] Generic products and/or alternate formulations available.

Note: For nonbearing and processing apples, a protectant-based program is recommended. A standard fire blight program, however, will be required for susceptible cultivars.

DELAYED DORMANT - 1/2-INCH GREEN						APPLES
DISEASE		**Apple Scab**	**Powdery Mildew**			
Product and Formulation[1]	**FRAC Code**	**Product Efficacy Rating[2] and Rate/A[3]**				**REI PHI**
PROTECTANT FUNGICIDES[4]						
Captan 80WDG[5] (lb)	M4	+++ 2.5-5.0	+ 2.5-5.0			24 h 0 d
Ferbam 76WDG (lb)	M3	++ 4.6	–			24 h 7 d
Mancozeb 75DF[6] (lb)	M3	+++ 3.0-6.0	–			24 h FB
Polyram 80DF[6] (lb)	M3	+++ 3.0-6.0	–			24 h FB
Ziram 76DF (lb)	M3	++ 6.0	+ 6.0			48 h 14 d
RESISTANCE RISK FUNGICIDES						
Aprovia (fl oz)	7	+++ 5.5-7.0	++ 5.5-7.0			12 h 30 d
Cevya (fl oz)	3	++++ 4.0-5.0	++ 4.0-5.0			12 h 0 d
Flint Extra 4.05SC (fl oz)	11	++++ 2.5-2.9	+++ 2.5-2.9			12 h 14 d
Fontelis 1.67SC (fl oz)	7	+++ 16.0-20.0	++ 16.0-20.0			12 h 28 d
Indar 2F (fl oz)	3	++++ 6.0-8.0	+++ 6.0-8.0			12 h 14 d
Inspire Super 2.82EW (fl oz)	3 + 9	++++ 12.0	+++ 12.0			12 h 14 d
Luna Sensation 4.2SC (fl oz)	7 + 11	+++ 4.0-5.8	+++ 5.0-5.8			12 h 14 d
Luna Tranquility 4.16SC (fl oz)	7 + 9	++ 11.2-16.0	++ 11.2-16.0			12 h 72 d
Merivon 4.18SC (fl oz)	7 + 11	++++ 4.0-5.5	+++ 4.0-5.5			12 h 0 d
Miravis (fl oz)	7	++++ 3.4	++ 3.4			12 h 30 d
Omega 500F (fl oz)	29	++ 10-13.8	– 10-13.8			12 h 28 d
Pristine 38WG (oz)	7 + 11	+++ 14.5-18.5	+++ 14.5-18.5			12 h 0 d
Procure 50WS (oz)	3	++++ 8.0-16.0	++++ 8.0-16.0			12 h 14 d
ProPhyt[7] (pt)	33	+++ 3.0-4.0	+ 3.0-4.0			4 h 0 d
Rally 40WSP (oz)	3	+++ 5.0-8.0	++++ 5.0-10.0			24 h 14 d
Scala 5SC (fl oz)	9	++ 7.0-10.0	++ 7.0-10.0			12 h 72 d
Sercadis (fl oz)	7	+++ 3.5-4.5	++ 3.5-4.5			12 h 0 d
Sovran 50WG (oz)	11	++++ 3.2-6.4	+++ 4.0-6.4			12 h 30 d
Syllit 3.4FL (pt)	U12	+++ 1.5	–			48 h P

*Delayed Dormant - ½ Inch Green DISEASE **Resistance Risk Fungicides** - continued next page*

Delayed Dormant - ½ Inch Green DISEASE ***Resistance Risk Fungicides*** *- continued*

DELAYED DORMANT - 1/2-INCH GREEN						APPLES
DISEASE		**Apple Scab**	**Powdery Mildew**			
RESISTANCE RISK FUNGICIDES – *continued*						
Topguard (fl oz)	3	++++ 13.0	++++ 8.0-12.0			12 h 14 d
Topsin M WSB (lb)	1	++++ 0.75-1.0	+++ 0.75-1.0			48 h 1 d
Vangard 75WG (oz)	9	+++ 3.0-5.0	++ 3.0-5.0			12 h 0 d

[1] Combine or alternate protectant fungicides and resistance risk fungicides. Use half rate of protectant fungicides when using in combination.

[2] ++++ =excellent, +++ = good, ++ = fair, + = poor, – = ineffective or not rated.

[3] Rates are in amount of formulated product per acre, unless otherwise noted. REI=Restricted Entry Interval. PHI=Preharvest Interval.

[4] Generic products and/or alternate formulations available.

[5] Do not Combine Captan or Sulfur with Oil products. See specific product label precautions for additional crop safety precautions.

[6] EBDC fungicides: Prebloom schedule allows applications at full rate through bloom. Extended schedule allows applications at half rate up to 77 days before harvest. Do not combine or integrate prebloom schedule with the extended schedule (mixture of 1/2 rate of protectant and resistance risk fungicide). [7] Other available phosponate materials are Aliette, Phostrol, Rampart, etc…

DELAYED DORMANT - 1/2-INCH GREEN						APPLES
INSECT OR MITE PEST		INSECTS		MITES		
		Rosy Apple Aphid	Scale Insects	European Red Mite Eggs		
Product and Formulation[1]	IRAC Group	Product Efficacy Rating[2] and Rate/A[3]				REI PHI
Superior Oil[1] (gal)	UN	–	++++ 6.0	++++ 6.0		4 h 0 d
Centaur WDG[7] (oz)	16	–	++++ 34.5	–		12 h 14 d
Venerate XC (qt)	UNB	–	+++ 2.0-4.0	–		4 h 0 d
OR						
Superior Oil (gal) PLUS	UN	+	++++	++++		
one of the following:		1.0	4.0	4.0		
Apollo SC[5] (oz)	10A	–	–	++++ 4.0-8.0		12 h 45 d
Asana XL[4] (fl oz)	3A	+++ 5.0-8.0	–	–		12 h 21 d
Baythroid XL (fl oz)	3A	+++ 2.0-2.8	–	–		12 h 7 d
Besiege (fl oz)	3A + 28	+++ 6.0-12.0	–	–		24 h 21 d
Danitol 2.4EC (fl oz)	3A	++ 10.0-21.0	–	–		24 h 14 d
Diazinon 50W[9] (lb)	1B	++ 2.0-3.0	+++ 2.0-3.0	–		96 h 21 d
Esteem 35WP[6] (oz)	7C	+++ 4.0-5.0	++++ 4.0-5.0	–		12 h 45 d
Lambda-Cy (fl oz)	3A	+++ 2.56-5.12	–	–		24 h 21 d
Perm-UP 3.2EC (fl oz)	3A	+++ 4.0-16.0	–	–		12 h PB[8]
Pounce 25WP[4] (oz)	3A	+++ 6.4-16	–	–		12 h PF[8]
Versys (fl oz)	9D	++++ 1.5	–	–		12 h 7 d
Warrior II[4] (fl oz)	3A	+++ 1.28-2.56	–	–		24 h 21 d

[1] Prebloom oil applications facilitate integrated mite management. If no oil is used, check for mites and San Jose scale during foliar season.
[2] ++++ =excellent, +++ = good, ++ = fair, + = poor, – = ineffective or not rated.
[3] Rates are in amount of formulated product per acre, unless otherwise noted. REI=Restricted Entry Interval. PHI=Preharvest Interval.
[4] When noted, generic products are available.
[5] Apply Apollo alone or add 1.0 gal oil/A to improve control.
[6] Apply at 0.25 inch green.
[7] Centaur can also be used at pink, petal fall or at the crawler stage for scale control, but only one application may be made/season.
[8] PHI key: D=Dormant application only, DD=Delayed dormant application only, PB=No later than prebloom, PF=No later than petal fall.
[9] Only 2 applications allowed per year: 1) A maximum of one may be a dormant application, and 2) A maximum of one may be an in season foliar application.

TIGHT CLUSTER, PREPINK						APPLES
DISEASE		**Apple Scab**	**Powdery Mildew**			
Product and Formulation	**FRAC Code**	**Product Efficacy Rating[2] and Rate/A[3]**				**REI, PHI**
PROTECTANT FUNGICIDES[1,4]						
Captan 80WDG[5] **(lb)**	M4	+++ 2.5-5.0	+ 2.5-5.0			24 h 0 d
Ferbam 76WDG **(lb)**	M3	++ 4.6	–			24 h 7 d
Mancozeb 75DF[6] **(lb)**	M3	+++ 3.0-6.0	–			24 h FB[8]
Polyram 80DF[6] **(lb)**	M3	+++ 3.0-6.0	–			24 h FB[8]
Sulfur 80WP[4,7] **(lb)**	M2	+ 10.0-20.0	+++ 10.0-20.0			24 h NTL[8]
Ziram 76DF **(lb)**	M3	++ 6.0	+ 6.0			48 h 14 d
RESISTANCE RISK FUNGICIDES[1]						
Aprovia **(fl oz)**	7	+++ 5.5-7.0	++ 5.5-7.0			12 h 30 d
Cevya **(fl oz)**	3	++++ 4.0-5.0	++ 4.0-5.0			12 h 0 d
Flint Extra 4.05SC **(fl oz)**	11	++++ 2.5-2.9	+++ 2.5-2.9			12 h 14 d
Fontelis 1.67SC **(fl oz)**	7	+++ 16.0-20.0	++ 16.0-20.0			12 h 28 d
Indar 2F **(fl oz)**	3	++++ 6.0-8.0	+++ 6.0-8.0			12 h 14 d
Inspire Super 2.82EW **(fl oz)**	3 + 9	++++ 12.0	+++ 12.0			12 h 14 d
Luna Sensation 4.2SC **(fl oz)**	7 + 11	+++ 4.0-5.8	+++ 5.0-5.8			12 h 14 d
Luna Tranquility 4.16SC **(fl oz)**	7 + 9	++ 11.2-16.0	++ 11.2-16.0			12 h 72 d
Merivon 4.18SC **(fl oz)**	7 + 11	++++ 4.0-5.5	+++ 4.0-5.5			12 h 0 d
Miravis **(fl oz)**	7	++++ 3.4	++ 3.4			12 h 30 d
Omega 500F **(fl oz)**	29	++ 10-13.8	– 10-13.8			12 h 28 d
Pristine 38WG **(oz)**	7 + 11	+++ 14.5-18.5	+++ 14.5-18.5			12 h 0 d
Procure 50WS **(oz)**	3	++++ 8.0-16.0	++++ 8.0-16.0			12 h 14 d
ProPhyt[9] **(pt)**	33	+++ 3.0-4.0	+ 3.0-4.0			4 h 0 d
Rally 40WSP **(oz)**	3	+++ 5.0-8.0	++++ 5.0-10.0			24 h 14 d
Scala 5SC **(fl oz)**	9	+++ 7.0-10.0	++ 7.0-10.0			12 h 72 d
Sercadis **(fl oz)**	7	+++ 3.5-4.5	++ 3.5-4.5			12 h 0 d
Sovran 50WG **(oz)**	11	++++ 3.2-6.4	+++ 4.0-6.4			12 h 30 d
Syllit 3.4FL **(pt)**	U12	+++ 1.5	–			48 h P[7]

*Tight Cluster, Prepink DISEASE **Resistance Risk Fungicides** - continued next page*

*Tight Cluster, Prepink DISEASE **Resistance Risk Fungicides** - continued*

TIGHT CLUSTER, PREPINK						APPLES
DISEASE		**Apple Scab**	**Powdery Mildew**			
RESISTANCE RISK FUNGICIDES[1] – *continued*						
Topguard (fl oz)	3	++++ 13.0	++++ 8.0-12.0			12 h 14 d
Topsin M WSB (lb)	1	++++ 0.75-1.0	+++ 0.75-1.0			48 h 1 d
Vangard 75WG (oz)	9	+++ 3.0-5.0	++ 3.0-5.0			12 h 0 d

[1] Combine or alternate protectant fungicides and resistance risk fungicides. Use half rate of protectant fungicides when using in combination.
[2] ++++ =excellent, +++ = good, ++ = fair, + = poor, – = ineffective or not rated.
[3] Rates are in amount of formulated product per acre, unless otherwise noted. REI=Restricted Entry Interval. PHI=Preharvest Interval.
[4] Generic products and/or alternate formulations available.
[5] Do not Combine Captan or Sulfur with Oil products. See specific product label precautions for additional crop safety precautions.
[6] EBDC fungicides: Prebloom schedule allows applications at full rate through bloom. Extended schedule allows applications at half rate up to 77 days before harvest. Do not combine or integrate prebloom schedule with the extended schedule (mixture of 1/2 rate of protectant and resistance risk fungicide).
[7] Wettable sulfur is recommended at the tight cluster stage for mildew susceptible cultivars. Do not apply to Stayman or Delicious, as this may reduce bud set if applied too close to bloom. Avoid drift on sensitive D'Anjou pears or apricots.
[8] PHI Key: FB=No later than full bloom, P=No later than pink, NTL= No time limit (usually up to the day of harvest) - consult label.).
[9] Other available phosponate materials are Aliette, Phostrol, Rampart, etc…

TIGHT CLUSTER, PREPINK						APPLES
INSECT OR MITE PEST		**INSECTS**		**MITES**		
		Rosy Apple Aphid	**Spotted Tenti-form Leafminer**	**European Red Mite Eggs**		
Product and Formulation	**IRAC Group**	**Product Efficacy Rating[2] and Rate/A[3]**				**REI PHI**
Superior Oil (gal)	UN	–	–	++++ 2.0-3.0		4 h 0 d
<u>OR</u>						
Superior Oil (gal) <u>PLUS one of the following</u>	UN			++ 1.0		
Actara 25WG[6] (oz)	4A	++++ 4.5	+++ 4.5	–		12 h 14/35 d[6]
Apollo SC[5] (oz)	10A	–	–	++++ 4.0-8.0		12 h 45 d
Asana XL[1,4] (fl oz)	3A	+++ 4.0-8.0	++++ 4.0-8.0	–		12 h 21 d
Assail 30SG (oz)	4A	++++ 2.5-4.0	++++ 2.5	–		12 h 7 d
Baythroid XL[4] (fl oz)	3A	+++ 2.0-2.4	++++ 2.0-2.4	–		12 h 7 d
Belay (fl oz)	4A	++++ 4.0-6.0	++++ 4.0-6.0	–		12 h 7 d
Besiege (fl oz)	3A + 28	+++ 9.0-12.0	+++ 9.0-12.0	–		24 h 21 d
Cormoran (fl oz)	15 + 4A	++++ 20.0-28.0	++++ 20.0-28.0	–		12 h 14 d

Tight Cluster, Prepink INSECT OR MITE PESTS - continued next page

Tight Cluster, Prepink INSECT OR MITE PESTS - continued

TIGHT CLUSTER, PREPINK						APPLES
INSECT OR MITE PEST		INSECTS		MITES		
		Rosy Apple Aphid	Spotted Tentiform Leafminer	European Red Mite Eggs		
Danitol 2.4 EC[4] (fl oz)	3A	++ 10.6-21.3	++++ 10.6-21.3	–		24 h 14 d
Diazinon 50W[8] (lb)	1B	++ 1.0-2.0	+ 1.0-2.0	–		96 h 21 d
Lambda-Cy (fl oz)	3A	+++ 2.56-5.12	++++ 2.56-5.12	–		24 h 21 d
Leverage 360 (fl oz)	3A + 4A	+++ 2.4-2.8	++++ 2.4-2.8	–		12 h 7 d
Perm-UP 3.2EC (fl oz)	3A	+++ 4.0-16.0	+++ 4.0-16.0	–		12 h PB[7]
Pounce 25WP[1,4] (oz)	3A	+++ 6.4-16	+++ 6.4-16	–		12 h PF[7]
Savey 50DF (oz)	10A	–	–	++++ 3.0		12 h 28 d
Sivanto Prime (oz)	4D	++++ 10.5-14.0	++++ 10.5-14.0	–		4 h 14 d
Transform WG (fl oz)	4C	+++ 1.5-2.75	–	–		24 h 7 d
Verdepryn 100SL (fl oz)	28	–	+++ 5.5-11.0	–		4 h 7 d
Versys (fl oz)	9D	++++ 1.5	–	–		12 h 7 d
Vydate 2L (pt)	1A	+++ 2.5-3.0	++++ 2.5-3.0	+ 2.5-3.0		48 h 14 d
Warrior II[1,4] (fl oz)	3A	+++ 1.28-2.56	++++ 1.28-2.56	–		24 h 21 d

[1] When noted, generic products are available.
[2] ++++ =excellent, +++ = good, ++ = fair, + = poor, – = ineffective or not rated.
[3] Rates are in amount of formulated product per acre, unless otherwise noted. REI=Restricted Entry Interval. PHI=Preharvest Interval.
[4] The use of these materials (pyrethroids) may exacerbate mite problems. [5] Apply Apollo alone or add 1.0 gal oil/A to improve control.
[6] 35 day PHI for use rates greater than 2.75 oz/A; 14 day PHI for rates equal to or less than 2.75 oz/A.
[7] PHI Key: PB=No later than prebloom, PF=No later than petal fall.
[8] Only 2 applications allowed per year: 1) A maximum of one may be a dormant application, and 2) A maximum of one may be an in season foliar application.

PINK						APPLES
DISEASE		Apple Scab	Cedar Apple Rust	Powdery Mildew		
Product and Formulation	FRAC Code	Product Efficacy Rating[2] and Rate/A[3]				REI, PHI
PROTECTANT FUNGICIDES[1,4]						
Captan 80WDG[5] (lb)	M4	+++ 2.5-5.0	++ 2.5-5.0	+ 2.5-5.0		24 h 0 d
Mancozeb 75DF[6] (lb)	M3	+++ 3.0-6.0	+++ 3.0-6.0	–		24 h FB[7]
Polyram 80DF[6] (lb)	M3	+++ 3.0-6.0	+++ 3.0-6.0	–		24 h FB[7]
Ziram 76DF (lb)	M3	++ 6.0	++ 6.0	+ 6.0		48 h 14 d

*Pink DISEASE **Resistance Risk Fungicides**- next page*

APPLES

Pink DISEASE ***Resistance Risk Fungicides***

PINK						APPLES
DISEASE		**Apple Scab**	**Cedar Apple Rust**	**Powdery Mildew**		
RESISTANCE RISK FUNGICIDES[1]						
Aprovia (fl oz)	7	+++ 5.5-7.0	–	++ 5.5-7.0		12 h 30 d
Cevya (fl oz)	3	++++ 4.0-5.0	++++ 4.0-5.0	++ 4.0-5.0		12 h 0 d
Flint Extra 4.05SC (fl oz)	11	++++ 2.5-2.9	+ 2.5-2.9	+++ 2.5-2.9		12 h 14 d
Fontelis 1.67SC (fl oz)	7	+++ 16.0-20.0	-	++ 16.0-20.0		12 h 28 d
Indar 2F (fl oz)	3	++++ 6.0-8.0	++++ 6.0-8.0	+++ 6.0-8.0		12 h 14 d
Inspire Super 2.82EW (fl oz)	3 + 9	++++ 12.0	++++ 12.0	+++ 12.0		12 h 14 d
Luna Sensation 4.2SC (fl oz)	7 + 11	+++ 4.0-5.8	+++ 4.0-5.8	+++ 5.0-5.8		12 h 14 d
Luna Tranquility 4.16SC (fl oz)	7 + 9	++ 11.2-16.0	+++ 11.2-16.0	++ 11.2-16.0		12 h 72 d
Merivon 4.18SC (fl oz)	7 + 11	++++ 4.0-5.5	+++ 4.0-5.5	+++ 4.0-5.5		12 h 0 d
Miravis (fl oz)	7	++++ 3.4	–	++ 3.4		12 h 30 d
Omega 500F (fl oz)	29	++ 10-13.8	+++ 10-13.8	– 10-13.8		12 h 28 d
Pristine 38WG (oz)	7 + 11	+++ 14.5-18.5	+++ 14.5-18.5	+++ 14.5-18.5		12 h 0 d
Procure 50WS (oz)	3	++++ 8.0-16.0	++++ 8.0-16.0	++++ 8.0-16.0		12 h 14 d
ProPhyt[8] (pt)	33	+++ 3.0-4.0	–	+ 3.0-4.0		4 h 0 d
Rally 40WSP (oz)	3	+++ 5.0-8.0	++++ 5.0-8.0	++++ 5.0-10.0		24 h 14 d
Scala 5SC (fl oz)	9	+++ 7.0-10.0	–	++ 7.0-10.0		12 h 72 d
Sercadis (fl oz)	7	+++ 3.5-4.5	–	++ 3.5-4.5		12 h 0 d
Sovran 50WG (oz)	11	++++ 3.2-6.4	++ 3.2-6.4	+++ 4.0-6.4		12 h 30 d
Syllit 3.4FL (pt)	U12	+++ 1.5	–	–		48 h P[6]
Topguard (fl oz)	3	++++ 13.0	++++ 8.0-12.0	++++ 8.0-12.0		12 h 14 d
Topsin M WSB (lb)	1	++++ 0.75-1.0	–	+++ 0.75-1.0		48 h 1 d
Vangard 75WG (oz)	9	+++ 3.0-5.0	–	++ 3.0-5.0		12 h 0 d

[1] Combine or alternate protectant fungicides and resistance risk fungicides. Use half rate of protectant fungicides when using in combination. [2] ++++ =excellent, +++ = good, ++ = fair, + = poor, – = ineffective or not rated.

[3] Rates are in amount of formulated product per acre, unless otherwise noted. REI=Restricted Entry Interval. PHI=Preharvest Interval.

[4] Generic products and/or alternate formulations available.

[5] Do not Combine Captan or Sulfur with Oil products. See label precautions for additional crop safety precautions.

[6] EBDC fungicides: Prebloom schedule allows applications at full rate through bloom. Extended schedule allows applications at half rate up to 77 d before harvest. Do not combine or integrate prebloom schedule with the extended schedule (mixture of 1/2 rate of protectant and resistance risk fungicide).

[7] PHI Key: FB=No later than full bloom; P=No later than pink.

[8] Other available phosponate materials are Aliette, Phostrol, Rampart, etc…

PINK						APPLES
INSECT OR MITE PEST		INSECTS		MITES		
		European Apple Sawfly	Oriental Fruit Moth	European Red Mite Eggs and Nymphs		
Product and Formulation	IRAC Group	Product Efficacy Rating[1] and Rate/A[2]				REI PHI
Note: Other insecticides as listed under prepink may also be used here						
Apollo SC[3] (oz)	10A	–	–	++++ 4.0-8.0		12 h 45 d
Assail 30SG (oz)	4A	+++ 2.5-4.0	+++ 2.5-4.0	–		12 h 7 d
Avaunt (oz)	22	+++ 5.0-6.0	+++ 5.0-6.0	–		12 h 14 d
Envidor 2SC (fl oz)	23	–	–	++++ 16.0-18.0		12 h 7 d
Esteem 35WP (oz)	7C	–	+++ 4.0-5.0	–		12 h 14 d
Onager EC (oz)	10A	–	–	++++ 12.0-24.0		12 h 28 d
Savey 50DF (oz)	10A	–	–	++++ 3.0		12 h 28 d
Vydate 2L (pt)	1A	–	++ 2.5-3.0	+ 2.5-3.0		48 h 14 d
Zeal (oz)	10B	–	–	++++ 2.0-3.0		12 h 14 d

[1] ++++ =excellent, +++ = good, ++ = fair, + = poor, – = ineffective or not rated. [2] Rates are in amount of formulated product per acre, unless otherwise noted. REI=Restricted Entry Interval. PHI=Preharvest Interval. [3] Apply Apollo alone or add 1 gal oil/A to improve control.

BLOOM						APPLES
DISEASE		Apple Scab	Cedar Apple Rust	Fire Blight[1]	Powdery Mildew	
Product and Formulation[2]	FRAC Code	Product Efficacy Rating[3] and Rate/A[4]				REI PHI
BACTERICIDES						
Agri-Mycin 17WP[1] (oz)	25	–	–	+++ 24.0-48.0	–	12 h 50 d
Agri-Mycin 17WP[1] (oz) plus Glycerin (qt)	25	–	–	+++ 12.0-24.0 plus 4.0	–	12 h 50 d
Agri-Mycin 17WP[1] (oz) plus Regulaid (oz)	25	–	–	+++ 12.0-24.0 plus 8.0	–	12 h 50 d
FireLine 17WP[1] (oz)	41	–	–	+++ 24.0	–	12 h 60 d
Kasumin 2L[1] (fl oz)	24	–	–	+++ 64	–	12 h PF[7]
Mycoshield 17WP[1] (oz)	41	–	–	+++ 16.0	–	12 h 60 d
PROTECTANT FUNGICIDES[5]						
Captan 80WDG[5] (lb)	M4	+++ 2.5-5.0	++ 2.5-5.0	–	+ 2.5-5.0	24 h 0 d
Mancozeb 75DF[6] (lb)	M3	+++ 3.0-6.0	+++ 3.0-6.0	–	–	24 h FB[7]
Polyram 80DF[6] (lb)	M3	+++ 3.0-6.0	+++ 3.0-6.0	–	–	24 h FB[7]

*Bloom DISEASE **Protectant and Risk Fungicides** - continued next page*

Bloom DISEASE ***Protectant and Risk Fungicides*** *- continued*

BLOOM						APPLES
DISEASE		**Apple Scab**	**Cedar Apple Rust**	**Fire Blight[1]**	**Powdery Mildew**	
PROTECTANT FUNGICIDES[5-] ***continued***						
Ziram 76DF (lb)	M3	++ 6.0	++ 6.0	–	+ 6.0	48 h 14 d
RESISTANCE RISK FUNGICIDES						
Aprovia (fl oz)	7	++++ 5.5-7.0	–	–	++ 5.5-7.0	12 h 30 d
Cevya (fl oz)	3	++++ 4.0-5.0	++++ 4.0-5.0	–	++ 4.0-5.0	12 h 0 d
Flint Extra 4.05SC (fl oz)	11	++++ 2.5-2.9	+ 2.5-2.9	–	+++ 2.5-2.9	12 h 14 d
Fontelis 1.67SC (fl oz)	7	+++ 16.0-20.0	–	–	++ 16.0-20.0	12 h 28 d
Indar 2F (fl oz)	3	++++ 6.0-8.0	++++ 6.0-8.0	–	+++ 6.0-8.0	12 h 14 d
Inspire Super 2.82EW (fl oz)	3 + 9	++++ 12.0	++++ 12.0	–	+++ 12.0	12 h 14 d
Luna Sensation 4.2SC (fl oz)	7 + 11	+++ 4.0-5.8	+++ 4.0-5.8	–	+++ 5.0-5.8	12 h 14 d
Luna Tranquility 4.16SC (fl oz)	7 + 9	++ 11.2-16.0	+++ 11.2-16.0	–	++ 11.2-16.0	12 h 72 d
Merivon 4.18SC (fl oz)	7 + 11	++++ 4.0-5.5	+++ 4.0-5.5	–	+++ 4.0-5.5	12 h 0 d
Miravis (fl oz)	7	++++ 3.4	–	–	++ 3.4	12 h 30 d
Omega 500F (fl oz)	29	++ 10-13.8	+++ 10-13.8	–	– 10-13.8	12 h 28 d
Pristine 38WG (oz)	7 + 11	+++ 14.5-18.5	+++ 14.5-18.5	–	+++ 14.5-18.5	12 h 0 d
Procure 50WS (oz)	3	++++ 8.0-16.0	++++ 8.0-16.0	–	++++ 8.0-16.0	12 h 14 d
ProPhyt[8] (pt)	33	+++ 3.0-4.0	–	–	+ 3.0-4.0	4 h 0 d
Rally 40WSP (oz)	3	+++ 5.0-8.0	++++ 5.0-8.0	–	++++ 5.0-10.0	24 h 14 d
Scala 5SC (fl oz)	9	+++ 7.0-10.0	–	–	++ 7.0-10.0	12 h 72 d
Sercadis (fl oz)	7	+++ 3.5-4.5	–	–	++ 3.5-4.5	12 h 0 d
Sovran 50WG (oz)	11	++++ 3.2-6.4	++ 3.2-6.4	–	+++ 4.0-6.4	12 h 30 d
Topguard (fl oz)	3	++++ 13.0	++++ 8.0-12.0	–	++++ 8.0-12.0	12 h 14 d
Topsin M WSB (lb)	1	++++ 0.75-1.0	–	–	+++ 0.75-1.0	48 h 1 d
Vangard 75WG (oz)	9	+++ 3.0-5.0	–	–	++ 3.0-5.0	12 h 0 d

[1] Apply when first blossoms open; repeat sprays at 3-7 day intervals during bloom. Use dilute, complete sprays to obtain thorough coverage. Firewall 17WP and Streptrol 17WP can be substituted at similar rates for Agri-Mycin. Rotate materials with different active ingredients for resistance management. Kasumin not labeled after Petal Fall. [2] Combine or alternate protectant fungicides and resistance risk fungicides. Use half rate of protectant fungicides when using in combination. [3] ++++ =excellent, +++ = good, ++ = fair, + = poor, – = ineffective or not rated. [4] Rates are in amount of formulated product per acre, unless otherwise noted. REI=Restricted Entry Interval. PHI=Preharvest Interval. [5] Generic products and/or alternate formulations available. [6] EBDC fungicides: Prebloom schedule allows applications at full rate through bloom. Extended schedule allows applications at half rate up to 77 d before harvest. Do not combine or integrate prebloom schedule with the extended schedule (mixture of 1/2 rate of protectant and resistance risk fungicide). [7] PHI Key: FB=No later than full bloom; PF= No later than petal fall [8] Other available phosponate materials are Aliette, Phostrol, Rampart, etc…

BLOOM	APPLES
INSECT PEST	**Do not apply insecticides during bloom!**

PETAL FALL						APPLES
DISEASE		**Apple Scab**	**Cedar Apple Rust**	**Fire Blight[1]**	**Powdery Mildew**	
Product and Formulation[2]	**FRAC Code**	**Product Efficacy Rating[3] and Rate/A[4]**				**REI PHI**
BACTERICIDES						
Agri-Mycin 17WP[1] (oz)	25	–	–	+++ 24.0-48.0	–	12 h 50 d
Agri-Mycin 17WP[1] (oz) plus Glycerin (qt)	25	–	–	+++ 12.0-24.0 plus 4.0	–	12 h 50 d
Agri-Mycin 17WP[1] (oz) plus Regulaid (oz)	25	–	–	+++ 12.0-24.0 plus 8.0	–	12 h 50 d
FireLine 17WP[1] (oz)	41	–	–	+++ 24.0	–	12 h 60 d
Kasumin 2L[1] (fl oz)	24	–	–	+++ 64	–	12 h PF[7]
Mycoshield 17WP[1] (oz)	41	–	–	+++ 16.0	–	12 h 60 d
PROTECTANT FUNGICIDES[5]						
Captan 80WDG[5] (lb)	M4	+++ 2.5-5.0	++ 2.5-5.0	–	+ 2.5-5.0	24 h 0 d
Mancozeb 75DF[6] (lb)	M3	+++ 3.0-6.0	+++ 3.0-6.0	–	–	24 h FB[7]
Polyram 80DF[6] (lb)	M3	+++ 3.0-6.0	+++ 3.0-6.0	–	–	24 h FB[7]
Ziram 76DF (lb)	M3	++ 6.0	++ 6.0	–	+ 6.0	48 h 14 d
RESISTANCE RISK FUNGICIDES						
Aprovia (fl oz)	7	++++ 5.5-7.0	–	–	++ 5.5-7.0	12 h 30 d
Cevya (fl oz)	3	++++ 4.0-5.0	++++ 4.0-5.0	–	++ 4.0-5.0	12 h 0 d
Flint Extra 4.05SC (fl oz)	11	++++ 2.5-2.9	+ 2.5-2.9	–	+++ 2.5-2.9	12 h 14 d
Fontelis 1.67SC (fl oz)	7	+++ 16.0-20.0	–	–	++ 16.0-20.0	12 h 28 d
Indar 2F (fl oz)	3	++++ 6.0-8.0	++++ 6.0-8.0	–	+++ 6.0-8.0	12 h 14 d
Inspire Super 2.82EW (fl oz)	3 + 9	++++ 12.0	++++ 12.0	–	+++ 12.0	12 h 14 d
Luna Sensation 4.2SC (fl oz)	7 + 11	+++ 4.0-5.8	+++ 4.0-5.8	–	+++ 5.0-5.8	12 h 14 d
Luna Tranquility 4.16SC (fl oz)	7 + 9	++ 11.2-16.0	+++ 11.2-16.0	–	++ 11.2-16.0	12 h 72 d
Merivon 4.18SC (fl oz)	7 + 11	++++ 4.0-5.5	+++ 4.0-5.5	–	+++ 4.0-5.5	12 h 0 d

*Petal Fall DISEASE **Resistance Risk Fungicides** – continued next page*

Petal Fall DISEASE ***Resistance Risk Fungicides continued***

PETAL FALL						APPLES
DISEASE		**Apple Scab**	**Cedar Apple Rust**	**Fire Blight[1]**	**Powdery Mildew**	
RESISTANCE RISK FUNGICIDES – *continued*						
Miravis (fl oz)	7	++++ 3.4	–	–	++ 3.4	12 h 30 d
Omega 500F (fl oz)	29	++ 10-13.8	+++ 13.8	–	–	12 h 28 d
Pristine 38WG (oz)	7 + 11	+++ 14.5-18.5	+++ 14.5-18.5	–	+++ 14.5-18.5	12 h 0 d
Procure 50WS (oz)	3	++++ 8.0-16.0	++++ 8.0-16.0	–	++++ 8.0-16.0	12 h 14 d
ProPhyt[8] (pt)	33	+++ 3.0-4.0	–	–	+ 3.0-4.0	4 h 0 d
Rally 40WSP (oz)	3	+++ 5.0-8.0	++++ 5.0-8.0	–	++++ 5.0-10.0	24 h 14 d
Scala 5SC (fl oz)	9	+++ 7.0-10.0	–	–	++ 7.0-10.0	12 h 72 d
Sercadis (fl oz)	7	+++ 3.5-4.5	–	–	++ 3.5-4.5	12 h 0 d
Sovran 50WG (oz)	11	++++ 3.2-6.4	++ 3.2-6.4	–	+++ 4.0-6.4	12 h 30 d
Topguard (fl oz)	3	++++ 13.0	++++ 8.0-12.0	–	++++ 8.0-12.0	12 h 14 d
Topsin M WSB (lb)	1	++++ 0.75-1.0	–	–	+++ 0.75-1.0	48 h 1 d
Vangard 75WG (oz)	9	+++ 3.0-5.0	–	–	++ 3.0-5.0	12 h 0 d

[1] Apply when first blossoms open; repeat sprays at 3-7 d intervals during bloom. Use dilute, complete sprays to obtain thorough coverage. Firewall 17WP and Streptrol 17WP can be substituted at similar rates for Agri-Mycin. Where pressure is high and/or Cultivar is highly susceptible continue rotating active ingredients through second cover. Kasumin Not Labeled after Petal Fall.

[2] Combine or alternate protectant fungicides and resistance risk fungicides. Use half rate of protectant fungicides when using in combination.

[3] ++++ =excellent, +++ = good, ++ = fair, + = poor, – = ineffective or not rated.

[4] Rates are in amount of formulated product per acre, unless otherwise noted. REI=Restricted Entry Interval. PHI=Preharvest Interval.

[5] Generic products and/or alternate formulations available.

[6] EBDC fungicides: Prebloom schedule allows applications at full rate through bloom. Extended schedule allows applications at half rate up to 77 d before harvest. Do not combine or integrate prebloom schedule with the extended schedule (mixture of 1/2 rate of protectant and resistance risk fungicide).

[7] PHI Key: FB=No later than full bloom; PF= No later than petal fall

[8] Other available phosponate materials are Aliette, Phostrol, Rampart, etc…

PETAL FALL See also table: Miticides for Postbloom Use. Avoid killing bees on blooming ground cover.													APPLES
INSECT PEST		Green Apple Aphid	Woolly Apple Aphid	Codling Moth[1]	European Apple Sawfly	Leaf-roller	Oriental Fruit Moth	Plum Curculio	Spotted Tentiform Leafminer	Tarnished Plant Bug	White Apple Leaf-hopper		
Product and Formulation[2]	IRAC Group	Product Efficacy Rating[3] and Rate/A[4]											REI PHI
Actara 25WG[5] (oz)	4A	++++ 4.5-5.5	–	–	++ 4.5-5.5	–	–	+++ 4.5-5.5	+++ 4.5-5.5	+++ 5.5	++++ 2.0-2.75		12 h 14/35 d[5]
Admire Pro - foliar (fl oz)	4A	++++ 1.4-2.8	–	–	–	–	–	–	–	–	++++ 1.4-2.8		12 h 7 d
Admire Pro - soil (fl oz)	4A	+++ 7.0-10.5	++ 7.0-10.5	–	–	–	–	–	++++ 4.0-6.0	–	++++ 7.0-10.5		12 h 21 d
Agri-Flex (fl oz)	6 + 4A	++++ 5.5-8.0	–	–	++ 5.5-8.0	–	–	+++ 5.5-8.0	+++ 5.5-8.0	+++ 5.5-8.0	++++ 5.5-8.0		12 h 35 d
Agri-Mek SC [2,6] (fl oz)	6	–	–	–	–	–	–	–	++++ 2.25-4.25	–	+++ 2.25-4.25		12 h 28 d
Altacor (oz)	28	–	–	+++ 2.5-4.5	–	++++ 2.5-4.5	++++ 2.5-4.5	+ 2.5-4.5	++++ 2.5-4.0	–	–		4 h 5 d
Apta/Bexar (fl oz)	21A	++++ 17.0-21.0	–	–	–	++ 21.0-27.0	–	+++ 21.0-27.0	–	–	++++ 14.0-21.0		12 h 14 d
Asana XL[2] (fl oz)	3A	–	–	+++ 8.0-10	+++ 8.0-10.0	++++ 4.8-8.0	++++ 4.8-8.0	+++ 10.0-14.0	++++ 6.0-14.0	++++ 4.8-8.0	+++ 8.0-14.0		12 h 21 d
Assail 30SG (oz)	4A	++++ 2.5-4.0	–	+++ 5.0-8.0	+++ 5.0-8.0	–	+++ 5.0-8.0	++ 8.0	++++ 2.5	+++ 6.0-8.0	++++ 2.5-4.0		12 h 7 d
Avaunt (oz)	22	–	–	+++ 5.0-6.0	+++ 5.0-6.0	+++ 5.0-6.0	+++ 5.0-6.0	++++ 5.0-6.0	+(++)[7] 6.0	+++ 5.0-6.0	+++ 6.0		12 h 14 d
Bacillus thuringiensis (lb)	11	–	–	–	–	++++ 0.5-2.0	+++ 0.5-2.0	–	–	–	–		4 h 0 d
Baythroid XL (fl oz)	3A	++ 2.4-2.8	–	++ 2.4-2.8	++ 2.4-2.8	++++ 2.4-2.8	++++ 2.0-2.4	++ 2.4-2.8	++++ 2.0-2.4	++++ 2.0-2.4	+++ 1.4-2.0		12 h 7 d
Belay 2.13SC[8] (fl oz)	4A	++++ 4.0-6.0	–	++ 6.0-12.0	–	+ 6.0-12.0	++ 6.0-12.0	++ 6.0	++++ 6.0	++++ 6.0	++++ 4.0-6.0		12 h 7 d
Besiege (fl oz)	3A+28	–	–	++ 6.0-12.0	+++ 9.0-12.0	++++ 6.0-12.0	++++ 6.0-12.0	++ 9.0-12.0	++++ 9.0-12.0	+++ 9.0-12.0	+++ 9.0-12.0		24 h 21 d
Cormoran (fl oz)	15+4A	++++ 20.0-28.0	–	++++ 20.0-28.0	+++ 20.0-28.0	++++ 20.0-28.0	++++ 20.0-28.0	++ 20.0-28.0	++++ 20.0-28.0	+++ 20.0-28.0	++++ 20.0-28.0		12 h 14 d

Petal Fall INSECT PESTS - continued next page

Petal Fall INSECT PESTS - continued

PETAL FALL See also table: Miticides for Postbloom Use. Avoid killing bees on blooming ground cover.													APPLES
INSECT PEST		**Green Apple Aphid**	**Woolly Apple Aphid**	**Codling Moth[1]**	**European Apple Sawfly**	**Leaf-roller**	**Oriental Fruit Moth**	**Plum Curculio**	**Spotted Tentiform Leafminer**	**Tarnished Plant Bug**	**White Apple Leaf-hopper**		
Danitol 2.4EC (fl oz)	3A	–	–	+++ 16.0-21.3	++++ 16.0-21.3	++++ 16.0-21.3	++++ 16.0-21.3	+++ 16.0-21.3	+++ 10.6-21.3	+++ 10.6-21.3	+++ 10.6-21.3		24 h 14 d
Declare (fl oz)	3A	+ 1.02-2.05	–	++ 1.02-2.05	–	++++ 1.02-2.05	++ 1.02-2.05	++ 1.02-2.05	++++ 1.02-2.05	++ 1.02-2.05	+++ 1.02-2.05		24 h 21 d
Delegate 25WG (oz)	5	–	–	++++ 4.5-7.0	–	++++ 4.5-7.0	++++ 4.5-7.0	+ 6.0-7.0	++++ 4.5-7.0	–	–		4 h 7 d
Endigo ZC (fl oz)	3A+4A	+++ 5.0-6.0	–	+++ 5.0-6.0	+++ 5.0-6.0	–	++++ 5.0-6.0	+++ 5.0-6.0	–	++++ 5.0-6.0	++++ 5.0-6.0		24 h 35 d
Entrust SC (fl oz)	5	–	–	+++ 6.0-10.0	–	++++ 6.0-10.0	++++ 6.0-10.0	–	++ 4.0-10.0	–	–		4 h 7 d
Esteem 35WP (oz)	7C	–	–	+++ 4.0 – 5.0	–	–	+++ 4.0 – 5.0	–	+++ 3.0-5.0	–	–		12 h 45 d
Exirel (fl oz)	28	–	–	+++ 8.8-17.0	–	+++ 8.8-17.0	++++ 8.8-17.0	++ 13.5-20.5	+++ 8.8-17.0	–	+++ 8.8-17.0		12 h 3 d
Imidan 70W (lb)	1B	+ 2.0-3.0	–	++++ 2.5-3.0	+++ 2.0-3.0 lb	+++ 2.5-3.0	++++ 2.5-3.0	+++ 2.5-3.0	+ 2.5-3.0	++ 2.5-3.0	+ 2.5-3.0		4/14 d[9] 7 d
Intrepid 2F (fl oz)	18	–	–	+++[1] 16.0	–	++++ 8.0-16.0	+++[1] 12.0-16.0	–	+++ 8.0-12.0	–	–		4 h 14 d
Lambda-Cy (fl oz)	3A	+ 2.56-5.12	–	++ 2.56-5.12	+++ 2.56-5.12	++++ 2.56-5.12	++++ 2.56-5.12	++ 2.56-5.12	++++ 2.56-5.12	+++ 2.56-5.12	+++ 2.56-5.12		24 h 21 d
Leverage 360 (fl oz)	3A+4A	++++ 2.4-2.8	–	+++ 2.4-2.8	+++ 2.4-2.8	+++ 2.4-2.8	+++ 2.4-2.8	++ 2.4-2.8	++++ 2.4-2.8	+++ 2.4-2.8	++++ 2.4-2.8		12 h 7 d
Madex HP (fl oz)	31	–	–	++++[9] 0.5-3.0	–	–	++++[9] 0.5-3.0	–	–	–	–		4 h 0 d
Movento (fl oz)	23	++++ 6.0-9.0	+++ 6.0-9.0	–	–	–	–	–	–	–	–		24 h 7 d
Mustang Maxx (fl oz)	3A	+++ 1.28-4.0	–	+ 1.28-4.0	+++ 1.28-4.0	++++ 1.28-4.0	++++ 1.28-4.0	+ 1.28-4.0	+ 1.28-4.0	++++ 1.28-4.0	++++ 1.28-4.0		12 h 14 d
Rimon 0.83EC (fl oz)	15	–	–	++++[1] 20.0-30.0	–	++++ 20.0-30.0	++++ 20.0-30.0	–	++++ 20.0-30.0	–	–		12 h 14 d
Sivanto Prime (fl oz)	4D	++++ 10.5-14.0	–	–	–	–	–	–	–	–	–		4 h 14 d
Tombstone (fl oz)	**3A**	–	–	++ 2.0-2.4	++ 2.4-2.8	++++ 2.4-2.8	++ 2.0-2.4	++ 2.4-2.8	++++ 2.0-2.4	++++ 2.0-2.4	+++ 1.4-2.0		12 h 7 d

Petal Fall INSECT PESTS - continued next page

Petal Fall INSECT PESTS - continued

PETAL FALL See also table: Miticides for Postbloom Use. Avoid killing bees on blooming ground cover.													APPLES
INSECT PEST		**Green Apple Aphid**	**Woolly Apple Aphid**	**Codling Moth[1]**	**European Apple Sawfly**	**Leaf-roller**	**Oriental Fruit Moth**	**Plum Curculio**	**Spotted Tentiform Leafminer**	**Tarnished Plant Bug**	**White Apple Leaf-hopper**		
Venerate XC (qt)	UNB	–	–	–	–	–	+++ 1.0-2.0	++ 1.0-2.0	–	–	–		4 h 0 d
Verdepryn 100SL (fl oz)	**28**	–	–	++ 5.5-11.0	+++ 5.5-11.0	++++ 5.5-11.0	++++ 5.5-11.0	+++ 5.5-11.0	+++ 5.5-11.0	+ 5.5-11.0	+++ 5.5-11.0		4 h 7 d
Voliam Flexi WG (oz)	4A+28	++++ 6.0-7.0	–	++ 4.0-7.0	–	++++ 4.0-7.0	++++ 4.0-7.0	+++ 6.0-7.0	+++ 4.0-7.0	+++ 6.0-7.0	++++ 4.0-7.0		12 h 35 d
Warrior II[2] (fl oz)	3A	–	–	++ 1.28-2.56	+++ 1.28-2.56	++++ 1.28-2.56	+++ 1.28-2.56	++ 1.28-2.56	++++ 1.28-2.56	++++ 1.28-2.56	+++ 1.28-2.56		24 h 21 d

[1] Special timing: Apply Rimon at 75-100 Degree Days (DD) after bio-fix (usually late petal-fall); Apply Intrepid at 150 DD; Typical timing for most other products is 250 Degree Days (DD) after bio-fix (see first cover).
[2] When noted, generic products are available.
[3] ++++ =excellent, +++ = good, ++ = fair, + = poor, – = ineffective or not rated.
[4] Rates are in amount of formulated product per acre, unless otherwise noted. REI=Restricted Entry Interval. PHI=Preharvest Interval.
[5] 35 day PHI for use rates greater than 2.75 oz/A; 14 day PHI for rates equal to or less than 2.75 oz/A.
[6] For best results, apply with at least 1 gal of horticultural oil/A within 10 days of petal-fall. Other silicone-based penetrants may be substituted but may not be as effective.
[7] Control of Spotted Tentiform Leafminer with Avaunt goes to"+++" with the addition of 0.5% spray oil.
[8] Efficacy is better for first brood. [9] Imidan REI 4 d for farm labor, but 14 d for u-pick operations.
[9] Madex HP: Apply every 5-7 days during risk period.

FIRST COVER								APPLES
DISEASE		**Apple Scab**	**Bitter Rot**	**Black and White Rots**	**Cedar Apple Rust**	**Fire Blight[1]**	**Powdery Mildew**	
Product and Formulation[2]	**FRAC Code**	**Product Efficacy Rating[3] and Rate/A[4]**						**REI PHI**
BACTERICIDES								
Agri-Mycin 17WP[1] (oz)	25	–	–	–	–	+++ 24.0-48.0	–	12 h 30 d
Agri-Mycin 17WP[1] (oz) plus Glycerin (qt)	25	–	–	–	–	+++ 12.0-24.0 plus 4.0	–	12 h 30 d
Agri-Mycin 17WP[1] (oz) plus Regulaid (oz)	25	–	–	–	–	+++ 12.0-24.0 plus 8.0	–	12 h 30 d
Mycoshield 17WP[1] (oz)	41	–	–	–	–	+++ 16.0	–	12 h 60 d
PROTECTANT FUNGICIDES[5]								
Captan 80WDG (lb)	M4	+++ 2.5-5.0	+++ 2.5-5.0	+++ 2.5-5.0	++ 2.5-5.0	–	+ 2.5-5.0	24 h 0 d
Mancozeb 75DF[7] (lb)	M3	+++ 3.0	+++ 3.0	++ 3.0	+++ 3.0	–	–	24 h 77 d
Polyram 80DF[7] (lb)	M3	+++ 3.0	+++ 3.0	++ 3.0	+++ 3.0	–	–	24 h 77 d
Ziram 76DF (lb)	M3	++ 6.0	++ 6.0	– 6.0	++ 6.0	–	+ 6.0	48 h 14 d
RESISTANT RISK FUNGICIDES								
Aprovia (fl oz)	7	++++ 5.5-7.0	++ 5.5-7.0	+++ 5.5-7.0	–	–	++ 5.5-7.0	12 h 30 d
Cevya (fl oz)	3	++++ 4.0-5.0	+ 4.0-5.0	–	++++ 4.0-5.0	–	++ 4.0-5.0	12 h 0 d
Flint Extra 4.05SC (fl oz)	11	++++ 2.5-2.9	++ 2.9	++ 1.5[8]	+ 2.5-2.9	–	+++ 2.5-2.9	12 h 14 d
Fontelis 1.67SC (fl oz)	7	+++ 16.0-20.0	++ 16.0-20.0	++ 16.0-20.0	–	–	++ 16.0-20.0	12 h 28 d
Indar 2F (fl oz)	3	++++ 6.0-8.0	–	–	++++ 6.0-8.0	–	+++ 6.0-8.0	12 h 14 d
Inspire Super 2.82EW (fl oz)	3 + 9	++++ 12.0	–	+++ 12.0	++++ 12.0	–	+++ 12.0	12 h 14 d
Luna Sensation 4.2SC (fl oz)	7 + 11	+++ 4.0-5.8	+++ 4.0-5.8	++++ 4.0-5.8	+++ 4.0-5.8	–	+++ 5.0-5.8	12 h 14 d
Luna Tranquility 4.16SC (fl oz)	7 + 9	++ 11.2-16.0	+++ 11.2-16.0	+++ 11.2-16.0	+++ 11.2-16.0	–	++ 11.2-16.0	12 h 72 d
Merivon 4.18SC (fl oz)	7 + 11	++++ 4.0-5.5	+++ 4.0-5.5	++++ 4.0-5.5	+++ 4.0-5.5	–	+++ 4.0-5.5	12 h 0 d
Miravis (fl oz)	7	++++ 3.4	+ 3.4	–	–	–	++ 3.4	12 h 30 d
Omega 500F (fl oz)	29	++ 10-13.8	++ 10-13.8	++ 10-13.8	+++ 10-13.8	–	–	12 h 28 d
Pristine 38WG (oz)	7 + 11	+++ 14.5-18.5	+++ 14.5-18.5	++++ 14.5-18.5	+++ 14.5-18.5	–	+++ 14.5-18.5	12 h 0 d
Procure 50WS (oz)	3	++++ 8.0-16.0	–	–	++++ 8.0-16.0	–	++++ 8.0-16.0	12 h 14 d
ProPhyt[9] (pt)	33	+++ 3.0-4.0	+ 3.0-4.0	+++ 3.0-4.0	–	–	+ 3.0-4.0	4 h 0 d

*First Cover DISEASE **Resistant Risk Fungicides**- continued next page*

First Cover DISEASE ***Resistant Risk Fungicides*** *- continued*

FIRST COVER								APPLES
DISEASE		**Apple Scab**	**Bitter Rot**	**Black and White Rots**	**Cedar Apple Rust**	**Fire Blight[1]**	**Powdery Mildew**	
RESISTANT RISK FUNGICIDES – *continued*								
Rally 40WSP (oz)	3	++++ 5.0-8.0	–	–	++++ 5.0-8.0	–	++++ 5.0-10.0	24 h 14 d
Scala 5SC (fl oz)	9	+++ 7.0-10.0	–	–	–	–	++ 7.0-10.0	12 h 72 d
Sercadis (fl oz)	7	+++ 3.5-4.5	+ 3.5-4.5	–	–	–	++ 3.5-4.5	12 h 0 d
Sovran 50WG (oz)	11	++++ 3.2-6.4	++ 4.0-6.4	+++ 4.0-6.4	++ 3.2-6.4	–	+++ 4.0-6.4	12 h 30 d
Topguard (fl oz)	3	++++ 13.0	–	–	++++ 8.0-12.0	–	++++ 8.0-12.0	12 h 14 d
Topsin M WSB (lb)	1	++++ 0.75-1.0	–	+++ 0.75-1.0	–	–	+++ 0.75-1.0	48 h 1 day
Vangard 75WG (oz)	9	+++ 3.0-5.0	–	–	–	–	++ 3.0-5.0	12 h 0 d

[1] If disease pressure is high, spray after petal fall at 10-14 day intervals to control twig blight. Continue alternating active ingredients for resistance management through second cover. FireLine 17WP can be substituted for Mycoshield at similar rates; both contain oxytetracycline. FireWall 17WP or Streptrol 17WP can be substituted for Agri-Mycin 17WP at similar rates; all contain streptomycin.

[2] Combine or alternate protectant fungicides and resistance risk fungicides. Use half rate of protectant fungicides when using in combination. Use full rate listed under fruit rots if using in combination.

[3] ++++ =excellent, +++ = good, ++ = fair, + = poor, – = ineffective or not rated.

[4] Rates are in amount of formulated product per acre, unless otherwise noted. REI=Restricted Entry Interval. PHI=Preharvest Interval.

[5] Generic products and/or alternate formulations available.

[6] Do not apply Ferbam for late cover sprays, residues may affect finish.

[7] EBDC fungicides can only be used with extended schedule (half rate).

[8] Tank mix with Captan, see label.

[9] Other available phosponate materials are Aliette, Phostrol, Rampart, etc…

FIRST COVER INSECT PESTS: See First through Second Covers Insects

FIRST THROUGH SECOND COVERS See also table: Miticides for Postbloom Use. Avoid killing bees on blooming ground cover. **APPLES**

NOTE: Plum Curculio occurs mostly in Petal Fall through First and Second Covers.
Apple Maggot occurs mostly in Third through Seventh Covers.

INSECT PEST		Green Apple Aphid	Woolly Apple Aphid	Codling Moth	Leaf-rollers	Oriental Fruit Moth	Plum Curculio	San Jose Scale	Spotted Tentiform Leafminer	Brown Marmo-rated Stink Bug	Native Stink Bugs, Tarnished Plant Bug	White Apple Leaf-Hopper	
Product and Formulation[1]	IRAC Group	Product Efficacy Rating[2] and Rate/A[3]											REI PHI
Actara 25WG[4] (oz)	4A	++++ 4.5-5.5	–	–	–	–	+++ 4.5-5.5	–	+++ 4.5-5.5	++++ 5.5	+++ 5.5	++++ 2.0-2.75	12 h 14/35 d[4]
Admire Pro - foliar (fl oz)	4A	++++ 1.4-2.8	–	–	–	–	–	+++ 2.8	++++ 2.8	+++ 2.8	–	++++ 1.4-2.8	12 h 7 d
Admire Pro- - soil (fl oz)	4A	+++ 7.0-10.5	++ 7.0-10.5	–	–	–	–	–	–	–	–	++++ 7.0-10.5	12 h 21 d
Agri-Flex (fl oz)	6 + 4A	++++ 5.5-8.5	++++ 5.5-8.5	–	++ 5.5-8.5	–	+++ 5.5-8.5		+++ 5.5-8.5	–		+++ 5.5-8.5	12 h 35 d
Agri-Mek SC[1,5] (fl oz)	6	–	–	–	–	–	–	–	++++ 2.25-4.5	–	–	+++ 2.25-4.5	12 h 28 d
Altacor (oz)	28	–	–	+++ 2.5-4.5	++++ 2.5-4.5	++++ 2.5-4.5	+ 2.5-4.5	–	++++ 2.5-4.0	–	–	–	4 h 5 d
Apta/Bexar (fl oz)	21A	++++ 17.0-21.0	–	–	++ 21.0-27.0	–	+++ 21.0-27.0	–	–	–	–	++++ 14.0-21.0	12 h 14 d
Asana XL[1] (fl oz)	3A	–	–	+++ 4.8-8.0	++++ 4.8-8.0	++++ 4.8-8.0	+++ 10.0-14.0	–	++++ 6.0-14.0	++ 14.5	++++ 4.8-8.0	+++ 4.8-8.0	12 h 21 d
Assail 30SG (oz)	4A	++++ 2.5-4.0	–	+++ 5.0-8.0	–	+++ 5.0-8.0	++ 8.0	+++ 8.0	++++ 2.5	++ 8.0	+++ 6.0-8.0	++++ 2.5-4.0	12 h 7 d
Avaunt (oz)	22	–	–	+++ 5.0-6.0	+++ 5.0-6.0	+++ 5.0-6.0	++++ 5.0-6.0	–	+(++)[6] 6.0	+ 6.0	+++ 5.0-6.0	+++ 6.0	12 h 14 d
Bacillus thurin-giensis (lb)	11	–	–	–	–	++++ 0.5-2.0	–	–	–	–	–	–	4 h 0 d
Baythroid XL (fl oz)	3A	++ 2.4-2.8	–	++ 2.0-2.4	++++ 2.4-2.8	++++ 2.0-2.4	++ 2.4-2.8		++++ 2.0-2.4	+++ 2.4	++++ 2.0-2.4	+++ 1.4-2.0	12 h 7 d
Belay 2.13SC[7] (fl oz)	4A	++++ 4.0-6.0	–	++ 6.0-12.0	+ 6.0-12.0	++ 6.0-12.0	++ 6.0	+++ 6.0	++++ 6.0	++++ 6.0-12.0	–	++++ 6.0	12 h 7 d
Besiege	3A+28	–	–	++	++++	++++	++	–	+++	+++	++++	+++	24 h
(fl oz)				6.0-12	6.0-12.0	6.0-12.0	9.0-12.0		9.0-12.0	9.0-12.0	6.0-12.0	9.0-12.0	21 d
Brigade/Bifen-thrin 2EC (fl oz)	3A	–	–	–	–	–	–	–	–	++++ 2.6-12.8	+++ 2.6-12.8	–	12 h 14 d

First through Second Covers INSECT PESTS - continued next page

First through Second Covers INSECT PESTS - continued

FIRST THROUGH SECOND COVERS **See also table: Miticides for Postbloom Use. Avoid killing bees on blooming ground cover.** **APPLES**

NOTE: Plum Curculio occurs mostly in Petal Fall through First and Second Covers.
Apple Maggot occurs mostly in Third through Seventh Covers.

INSECT PEST		Green Apple Aphid	Woolly Apple Aphid	Codling Moth	Leaf-rollers	Oriental Fruit Moth	Plum Curculio	San Jose Scale	Spotted Tentiform Leafminer	Brown Marmo-rated Stink Bug	Native Stink Bugs, Tarnished Plant Bug	White Apple Leaf-Hopper	
Centaur WDG (oz)	16	–	–	–	–	–	–	++++ 34.5	–	–	–	–	12 h 14 d
Cormoran (fl oz)	15+4A	++++ 20.0-28.0	–	++++ 20.0-28.0	++++ 20.0-28.0	++++ 20.0-28.0	++ 20.0-28.0	+++ 20.0-28.0	++++ 20.0-28.0	++ 20.0-28.0	+++ 20.0-28.0	++++ 20.0-28.0	12 h 14 d
Danitol 2.4 EC (fl oz)	3A	–	–	+++ 16.0-21.3	++++ 16.0-21.3	++++ 16.0-21.3	++ 16.0-21.3	–	+++ 10.6-21.3	+++ 16-21.3	+++ 10.6-21.3	+++ 10.6-21.3	24 h 14 d
Declare (fl oz)	3A	+ 1.02-2.05	–	++ 1.02-2.05	++++ 1.02-2.05	++++ 1.02-2.05	++ 1.02-2.05	–	++++ 1.02-2.05	+++ 1.02-2.05	++++ 1.02-2.05	++++ 1.02-2.05	24 h 14 d
Delegate 25WG (oz)	5	–	–	++++ 4.5-7.0	++++ 4.5-7.0	++++ 4.5-7.0	+ 6.0-7.0	–	++++ 4.5-7.0	–	–	–	4 h 7 d
Diazinon 50W[8] (lb)	1B	–	++++ 2.0-3.0	+++ 2.0-3.0	++ 2.0-3.0	++ 2.0-3.0	+++ 2.0-3.0	+++ 2.0-3.0	+ 2.0-3.0	–	+++ 2.0-3.0	++ 2.0-3.0	96 h 21 d
Endigo ZC (fl oz)	3A+4A	+++ 5.0-6.0	–	+++ 5.0-6.0	–	++++ 5.0-6.0	+++ 5.0-6.0	–	++++ 5.0-6.0	++++ 6.0	++++ 5.0-6.0	++++ 5.0-6.0	24 h 35 d
Entrust SC (fl oz)	5	–	–	+++ 6.0-10.0	++++ 6.0-10.0	++++ 6.0-10.0	–	–	++ 6.0-10.0	–	–	–	4 h 7 d
Esteem 35WP (oz)	7C	–	–	+++ 4.0-5.0	–	+++ 4.0-5.0	–	++++ 4.0-5.0	+++ 3.0-5.0	–	–	–	12 h 45 d
Exirel (fl oz)	28	–	–	+++ 8.5-17.0	+++ 8.5-17.0	++++ 10.0-17.0	++ 13.5-20.0	–	+++ 8.5-17.0	–	–	+++ 8.5-17.0	12 h 3 d
Imidan 70W (lb)	1B	–	+ 2.5-3.0	++++ 2.5-3.0	+++ 2.5-3.0	++++ 2.5-3.0	+++ 2.5-3.0	–	+ 2.5-3.0	–	++ 2.5-3.0	–	4/14 d[10] 7 d
Intrepid 2F (fl oz)	18	–	–	+++[9] 16.0	++++ 8.0-16.0	+++[9] 12.0-16.0	–	–	+++ 8.0-12.0	–	–	–	12 h 14 d
Lambda-Cy (fl oz)	3A	–	–	++ 2.56-5.12	++++ 2.56-5.12	++++ 2.56-5.12	++ 2.56-5.12	–	++++ 2.56-5.12	+++ 2.56-5.12	++++ 2.56-5.12	+++ 2.56-5.12	24 h 21 d
Lannate LV (pt)	1A	+++ 2.0-3.0	+ 2.0-3.0	+++ 2.0-3.0	++++ 2.0-3.0	+++ 2.0-3.0	++ 2.0-3.0	–	+++ 2.0-3.0	++ 3.0	++++ 2.0-3.0	++ 2.0-3.0	72 h 14 d
Lannate SP (lb)	1A	+++ 0.5-1.0	+ 1.0	+++ 1.0	++++ 1.0	+++ 1.0	++ 1.0	–	+++ 1.0	++ 1.0	++++ 0.5-1.0	++ 1.0	72 h 14 d
Leverage 360 (fl oz)	3A+4A	++++ 2.4-2.8	–	+++ 2.4-2.8	+++ 2.4-2.8	+++ 2.4-2.8	++ 2.4-2.8	++ 2.4-2.8	++++ 2.4-2.8	+++ 2.4-2.8	+++ 2.4-2.8	++++ 2.4-2.8	12 h 7 d

First through Second Covers INSECT PESTS - continued next page

FIRST THROUGH SECOND COVERS **See also table: Miticides for Postbloom Use. Avoid killing bees on blooming ground cover.** **APPLES**

NOTE: Plum Curculio occurs mostly in Petal Fall through First and Second Covers.
Apple Maggot occurs mostly in Third through Seventh Covers.

INSECT PEST		Green Apple Aphid	Woolly Apple Aphid	Codling Moth	Leaf-rollers	Oriental Fruit Moth	Plum Curculio	San Jose Scale	Spotted Tentiform Leafminer	Brown Marmo-rated Stink Bug	Native Stink Bugs, Tarnished Plant Bug	White Apple Leaf-Hopper	
Madex HP (fl oz)	31	–	–	++++[13] 0.5-3.0	–	++++[13] 0.5-3.0	–	–	–	–	–	–	4 h 0 d
Minecto Pro (fl oz)	6 + 28			+++ 8.0-12.0	–	++++ 8.0-12.0	++ 10.0-12.0	–	+++ 8.0-12.0				12 h 28 d
Movento (fl oz)	23	++++ 6.0-9.0	+++ 6.0-9.0	–	–	–	–	++++ 8.0-9.0	–	–	–	–	24 h 7 d
Mustang Maxx (fl oz)	3A	+++ 1.28-4.0	–	+ 1.28-4.0	++++ 1.28-4.0	++++ 1.28-4.0	+ 1.28-4.0	–	+ 1.28-4.0	+++ 4.0	++++ 1.28-4.0	++++ 1.28-4.0	12 h 14 d
Proclaim (oz)	6	–	–	++ 4.8	++++ 3.2-4.8	++ 4.8	–	–	+++ 3.2-4.8	–	+++ 3.2-4.8	+++ 3.2-4.8	48 h 14 d
Rimon 0.83EC (fl oz)	15	–	+ 20.0-30.0	++++[9] 20.0-30.0	++++ 20.0-30.0	++++[9] 20.0-30.0	–	–	++++ 20.0-30.0	–	–	–	12 h 14 d
Sivanto Prime (fl oz)	4D	++++ 10.5-14.0	–	–	–	–	–	++++ 10.5-14.0	++++ 10.5-14.0	–	–	++++ 10.5-14.0	4 h 14 d
Tombstone (fl oz)	3A	–	–	++ 2.0-2.4	++++ 2.4-2.8	++ 2.0-2.4	++ 2.4-2.8	–	++++ 2.0-2.4	–	++++ 2.0-2.4	+++ 1.4-2.0	12 h 7 d
Transform WG[11] (fl oz)	4C	++++ 1.5-2.75	–	–	–	–	–	+++[11] 2.75	–	-	++ 1.5-2.75	++++ 1.5-2.75	24 h 7 d
Venerate XC[12] (qt)	UNB	–	–	–	–	+++ 1.0-2.0	–	+++[12] 1.0-2.0	–	+++ 1.0-2.0	+++ 1.0-2.0	–	4 h 0 d
Voliam Flexi WG (oz)	4A+28	++++ 6.0-7.0	–	++ 4.0-7.0	++++ 4.0-7.0	++++ 4.0-7.0	+++ 6.0-7.0	–	+++ 4.0-7.0	+++ 7.0	+++ 6.0-7.0	++++ 4.0-7.0	12 h 35 d
Warrior II[1] (fl oz)	3A	–	–	++ 1.28-2.56	++++ 1.28-2.56	++++ 1.28-2.56	++ 1.28-2.56	–	++++ 1.28-2.56	+++ 1.28-2.56	++++ 1.28-2.56	+++ 1.28-2.56	24 h 21 d

[1] When noted, generic products are available. [2] ++++ =excellent, +++ = good, ++ = fair, + = poor, – = ineffective or not rated. [3] Rates are in amount of formulated product per acre, unless otherwise noted. REI=Restricted Entry Interval. PHI=Preharvest Interval. [4] 35 day PHI for use rates greater than 2.75 oz/A; 14 day PHI for rates equal to or less than 2.75 oz/A. [5] For best results, apply with at least 1.0 gal of horticultural oil/A within 10 days of petal-fall. Other silicone-based penetrants may be substituted but may not be as effective. [6] Control of Spotted Tentiform Leafminer with Avaunt goes to"+++" with the addition of 0.5% spray oil. [7] Efficacy is better for first brood. [8] Only 2 applications allowed per year: 1) A maximum of one may be a dormant application, and 2) A maximum of one may be an in season foliar application. [9] Special timing: Apply Rimon at 75-100 Degree Days (DD) after bio-fix (usually late petal-fall); Apply Intrepid at 150 DD; Typical timing for most other products is 250 Degree Days (DD) after bio-fix. [10] Imidan REI 4 d for farm labor, but 14 d for u-pick operations. [11] Transform WG applied to San Jose Scale crawler stage. [12] If using Venerate to control Scale insects, make two applications 7 days apart starting a week after crawler emergence. [13] Madex HP should be reapplied 5-7 days after first application.

SECOND COVER						APPLES
DISEASE		**Apple Scab**	**Bitter Rot**	**Black and White Rots**		
Product and Formulation[1]	**FRAC Code**	**Product Efficacy Rating[2] and Rate/A[3]**				**REI PHI**
PROTECTANT FUNGICIDES[4]						
Captan 80WDG (lb)	M4	+++ 2.5-5.0	+++ 2.5-5.0	+++ 2.5-5.0		24 h 0 d
Mancozeb 75DF[6] (lb)	M3	+++ 3.0	+++ 3.0	++ 3.0		24 h 77 d
Polyram 80DF[6] (lb)	M3	+++ 3.0	+++ 3.0	++ 3.0		24 h 77 d
Ziram 76DF (lb)	M3	++ 6.0	++ 6.0	– 6.0		48 h 14 d
RESISTANCE RISK FUNGICIDES						
Aprovia (fl oz)	7	++++ 5.5-7.0	++ 5.5-7.0	+++ 5.5-7.0		12 h 30 d
Cevya (fl oz)	3	++++ 4.0-5.0	+ 4.0-5.0	–		12 h 0 d
Flint Extra 4.05SC (fl oz)	11	++++ 2.5-2.9	++ 2.9	++ 1.5[7]		12 h 14 d
Fontelis 1.67SC (fl oz)	7	+++ 16.0-20.0	++ 16.0-20.0	++ 16.0-20.0		12 h 28 d
Indar 2F (fl oz)	3	++++ 6.0-8.0	–	–		12 h 14 d
Inspire Super 2.82EW (fl oz)	3 + 9	++++ 12.0	–	+++ 12.0		12 h 14 d
Luna Sensation 4.2SC (fl oz)	7 + 11	+++ 4.0-5.8	+++ 4.0-5.8	++++ 4.0-5.8		12 h 14 d
Luna Tranquility 4.16SC (fl oz)	7 + 9	++ 11.2-16.0	+++ 11.2-16.0	+++ 11.2-16.0		12 h 72 d
Merivon 4.18SC (fl oz)	7 + 11	++++ 4.0-5.5	+++ 4.0-5.5	++++ 4.0-5.5		12 h 0 d
Miravis (fl oz)	7	++++ 3.4	+ 3.4	–		12 h 30 d
Omega 500F (fl oz)	29	++ 10-13.8	++ 10-13.8	++ 10-13.8		12 h 28 d
Pristine 38WG (oz)	7 + 11	+++ 14.5-18.5	+++ 14.5-18.5	++++ 14.5-18.5		12 h 0 d
Procure 50WS (oz)	3	++++ 8.0-16.0	–	–		12 h 14 d
ProPhyt[8] (pt)	33	+++ 3.0-4.0	+ 3.0-4.0	+++ 3.0-4.0		4 h 0 d
Rally 40WSP (oz)	3	+++ 5.0-8.0	–	–		24 h 14 d
Scala 5SC (fl oz)	9	+++ 7.0-10.0	–	–		12 h 72 d
Sercadis (fl oz)	7	+++ 3.5-4.5	+ 3.5-4.5	–		12 h 0 d
Sovran 50WG (oz)	11	++++ 3.2-6.4	++ 4.0-6.4	+++ 4.0-6.4		12 h 30 d
Topguard (fl oz)	3	++++ 13.0	–	–		12 h 14 d

*Second Cover DISEASE **Resistance Risk Fungicides**- continued next page*

*Second Cover DISEASE **Resistance Risk Fungicides** - continued*

SECOND COVER						APPLES
DISEASE		**Apple Scab**	**Bitter Rot**	**Black and White Rots**		
RESISTANCE RISK FUNGICIDES[4]						
Topsin M WSB (lb)	1	++++ 0.75-1.0	–	+++ 0.75-1.0		48 h 1 d
Vangard 75WG (oz)	9	+++ 3.0-5.0	–	–		12 h 0 d

[1] Combine or alternate protectant fungicides and resistance risk fungicides. Use half rate of protectant fungicides when using in combination. Use full rate listed under fruit rots if using in combination. [2] ++++ =excellent, +++ = good, ++ = fair, + = poor, – = ineffective or not rated. [3] Rates are in amount of formulated product per acre, unless otherwise noted. REI=Restricted Entry Interval. PHI=Preharvest Interval. [4] Generic products and/or alternate formulations available. [5] Do not apply Ferbam for late cover sprays, residues may affect finish. [6] EBDC fungicides can only be used with extended schedule (half rate). [7] Tank mix with Captan, see label.). [8] Other available phosponate materials are Aliette, Phostrol, Rampart, etc…

SECOND COVER INSECT PESTS: See First through Second Covers Insects

THIRD AND FOURTH COVERS — APPLES

DISEASE		**Apple Scab**	**Bitter Rot**	**Black and White Rots**	**Sooty Blotch and Flyspeck**	
Product and Formulation[1]	**FRAC Code**	**Product Efficacy Rating[2] and Rate/A[3]**				**REI PHI**
PROTECTANT FUNGICIDES[4]						
Captan 80WDG[5] (lb)	M4	+++ 2.5-5.0	+++ 2.5-5.0	+++ 2.5-5.0	+++ / ++ 2.5-5.0	24 h 0 d
Mancozeb 75DF[7] (lb)	M3	+++ 3.0	+++ 3.0	++ 3.0	++ 3.0	24 h 77 d
Polyram 80DF[7] (lb)	M3	+++ 3.0	+++ 3.0	++ 3.0	++ 3.0	24 h 77 d
Ziram 76DF[5] (lb)	M3	++ 6.0	++ 6.0	– 6.0	+++ / ++ 6.0	48 h 14 d
RESISTANCE RISK FUNGICIDES						
Aprovia (fl oz)	7	++++ 5.5-7.0	++ 5.5-7.0	+++ 5.5-7.0	+++ / ++++ 5.5-7.0	12 h 30 d
Cevya (fl oz)	3	++++ 4.0-5.0	+ 4.0-5.0	–	++++ 4.0-5.0	12 h 0 d
Flint Extra 4.05SC (fl oz)	11	++++ 2.5-2.9	++ 2.9	++ 1.5[8]	+++ 2.5-2.9	12 h 14 d
Fontelis 1.67SC (fl oz)	7	+++ 16.0-20.0	++ 16.0-20.0	++ 16.0-20.0	+ / - 16.0-20.0	12 h 28 d
Inspire Super 2.82EW (fl oz)	3 + 9	++++ 12.0	–	+++ 12.0	++++ / ++++ 12.0	12 h 14 d
Luna Sensation 4.2SC (fl oz)	7 + 11	+++ 4.0-5.8	+++ 4.0-5.8	++++ 4.0-5.8	+++ / ++++ 4.0-5.8	12 h 14 d
Luna Tranquility 4.16SC (fl oz)	7 + 9	++ 11.2-16.0	+++ 11.2-16.0	+++ 11.2-16.0	++ / ++++ 11.2-16.0	12 h 72 d
Merivon 4.18SC (fl oz)	7 + 11	++++ 4.0-5.5	+++ 4.0-5.5	++++ 4.0-5.5	++++ / ++++ 4.0-5.5	12 h 0 d

*Third and Fourth Covers DISEASE **Resistance Risk Fungicdes** - continued next page*

*Third and Fourth Covers DISEASE **Resistance Risk Fungicdes** - continued*

THIRD AND FOURTH COVERS						APPLES
DISEASE		**Apple Scab**	**Bitter Rot**	**Black and White Rots**	**Sooty Blotch and Flyspeck**	
RESISTANCE RISK FUNGICIDES						
Miravis (fl oz)	7	++++ 3.4	+ 3.4	–	–	12 h 30 d
Omega 500F (fl oz)	29	++ 10-13.8	++ 10-13.8	++ 10-13.8	+++ / ++++ 10-13.8	12 h 28 d
Pristine 38WG (oz)	7 + 11	+++ 14.5-18.5	+++ 14.5-18.5	++++ 14.5-18.5	++ / ++ 14.5-18.5	12 h 0 d
Procure 50WS (oz)	3	++++ 8.0-16.0	–	–	–	12 h 14 d
ProPhyt[9] (pt)	33	+++ 3.0-4.0	+ 3.0-4.0	+++ 3.0-4.0	+++ / ++ 3.0-4.0	4 h 0 d
Rally 40WSP (oz)	3	+++ 5.0-8.0	–	–	–	24 h 14 d
Scala 5SC (fl oz)	9	+++ 7.0-10.0	–	–	–	12 h 72 d
Sercadis (fl oz)	7	+++ 3.5-4.5	+ 3.5-4.5	–	+++ / +++ 3.5-4.5	12 h 0 d
Sovran 50WG (oz)	11	++++ 3.2-6.4	++ 4.0-6.4	+++ 4.0-6.4	++++ 4.0-6.4	12 h 30 d
Topguard (fl oz)	3	++++ 13.0	–	–	–	12 h 14 d
Topsin M WSB (lb)	1	++++ 0.75-1.0	–	+++ 0.75-1.0	++++ 0.75-1.0	48 h 1 d
Vangard 75WG (oz)	9	+++ 3.0-5.0	–	–	–	12 h 0 d

[1] Combine or alternate protectant fungicides and resistance risk fungicides. Use half rate of protectant fungicides when using in combination. Use full rate listed under fruit rots and Brook's Spot if using in combination. [2] ++++ =excellent, +++ = good, ++ = fair, + = poor, – = ineffective or not rated. [3] Rates are in amount of formulated product per acre, unless otherwise noted. REI=Restricted Entry Interval. PHI=Preharvest Interval. [4] Generic products and/or alternate formulations available. [5] Can usually be applied at reduced rates during the summer. [6] Do not apply Ferbam for late cover sprays, residues may affect finish. [7] EBDC fungicides can only be used with extended schedule (half rate). [8] Tank mix with Captan, see label.). [9] Other available phosponate materials are Aliette, Phostrol, Rampart, etc…

THIRD AND FOURTH COVERS INSECT PESTS: See Third through Seventh Covers Insects

FIFTH, SIXTH, AND SEVENTH COVERS						APPLES
DISEASE		**Apple Scab**	**Bitter Rot**	**Black and White Rots**	**Sooty Blotch and Flyspeck**	
Product and Formulation[1]	**FRAC Code**	**Product Efficacy Rating[2] and Rate/A[3]**				**REI PHI**
PROTECTANT FUNGICIDES						
Captan 80WDG[4,5] (lb)	M4	+++ 2.5-5.0	+++ 2.5-5.0	+++ 2.5-5.0	+++ / ++ 2.5-5.0	24 h 0 d
Ziram 76DF[5] (lb)	M3	++ 6.0	++ 6.0	– 6.0	+++ / ++ 6.0	48 h 14 d

*Fifth, Sixth, and Seventh Covers DISEASE **Resistance Risk Fungicides** next page*

APPLES

Fifth, Sixth, and Seventh Covers DISEASE ***Resistance Risk Fungicides***

FIFTH, SIXTH, AND SEVENTH COVERS						APPLES
DISEASE		**Apple Scab**	**Bitter Rot**	**Black and White Rots**	**Sooty Blotch and Flyspeck**	
RESISTANCE RISK FUNGICIDES						
Aprovia (fl oz)	7	++++ 5.5-7.0	++ 5.5-7.0	+++ 5.5-7.0	+++ / ++++ 5.5-7.0	12 h 30 d
Cevya (fl oz)	3	++++ 4.0-5.0	+ 4.0-5.0	–	++++ 4.0-5.0	12 h 0 d
Flint Extra 4.05SC (fl oz)	11	++++ 2.5-2.9	++ 2.9	++ 1.5[8]	+++ 2.5-2.9	12 h 14 d
Fontelis 1.67SC (fl oz)	7	+++ 16.0-20.0	++ 16.0-20.0	++ 16.0-20.0	+ / - 16.0-20.0	12 h 28 d
Inspire Super 2.82EW (fl oz)	3 + 9	++++ 12.0	–	+++ 12.0	++++ / ++++ 12.0	12 h 14 d
Luna Sensation 4.2SC (fl oz)	7 + 11	+++ 4.0-5.8	+++ 4.0-5.8	++++ 4.0-5.8	+++ / ++++ 4.0-5.8	12 h 14 d
Merivon 4.18SC (fl oz)	7 + 11	++++ 4.0-5.5	+++ 4.0-5.5	++++ 4.0-5.5	++++ / ++++ 4.0-5.5	12 h 0 d
Miravis (fl oz)	7	++++ 3.4	+ 3.4	–	–	12 h 30 d
Omega 500F (fl oz)	29	++ 10-13.8	++ 13.8	++ 13.8	+++ / ++++ 10-13.8	12 h 28 d
Pristine 38WG (oz)	7 + 11	+++ 14.5-18.5	+++ 14.5-18.5	++++ 14.5-18.5	++ / ++ 14.5-18.5	12 h 0 d
Procure 50WS (oz)	3	++++ 8.0-16.0	–	–	–	12 h 14 d
ProPhyt[9] (pt)	33	+++ 3.0-4.0	+ 3.0-4.0	+++ 3.0-4.0	+++ / ++ 3.0-4.0	4 h 0 d
Rally 40WSP (oz)	3	++++ 5.0-8.0	–	–	–	24 h 14 d
Scala 5SC (fl oz)	9	+++ 7.0-10.0	–	–	–	12 h 72 d
Sercadis (fl oz)	7	+++ 3.5-4.5	+ 3.5-4.5	–	+++ / +++ 3.5-4.5	12 h 0 d
Sovran 50WG (oz)	11	++++ 3.2-6.4	++ 4.0-6.4	+++ 4.0-6.4	++++ 4.0-6.4	12 h 30 d
Topguard (fl oz)	3	++++ 13.0	–	–	–	12 h 14 d
Topsin M WSB (lb)	1	++++ 0.75-1.0	–	+++ 0.75-1.0	++++ 0.75-1.0	48 h 1 d
Vangard 75WG (oz)	9	+++ 3.0-5.0	–	–	–	12 h 0 d

[1] Combine or alternate protectant fungicides and resistance risk fungicides. Use half rate of protectant fungicides when using in combination. Use full rate listed under fruit rots and Brook's Spot if using in combination. [2] ++++ =excellent, +++ = good, ++ = fair, + = poor, – = ineffective or not rated. [3] Rates are in amount of formulated product per acre, unless otherwise noted. REI=Restricted Entry Interval. PHI=Preharvest Interval. [4] Generic products and/or alternate formulations available.). [5] Can usually be applied at reduced rates during the summer. [6] Do not apply Ferbam for late cover sprays, residues may affect finish. [7] EBDC fungicides can only be used with extended schedule (half rate). [8] Tank mix with Captan, see label. [9] Other available phosponate materials are Aliette, Phostrol, Rampart, etc…

FIFTH, SIXTH, AND SEVENTH COVERS INSECT PESTS: See Third through Seventh Covers Insects

THIRD THROUGH SEVENTH COVERS See also table: Miticides for Postbloom Use. Avoid killing bees on blooming ground cover. **APPLES**

NOTE: Plum Curculio occurs mostly in Petal Fall through First and Second Covers.
Apple Maggot occurs mostly in Third through Seventh Covers.

INSECT PEST		Green Apple Aphid	Woolly Apple Aphid	Apple Maggot	Codling Moth	Leaf-Rollers	Oriental Fruit Moth	San Jose Scale	Spotted Tentiform Leafminer	Brown Marmo-rated Stink Bug	Native Stink Bugs, Tarnished Plant Bug	White Apple Leaf-hopper	
Product and Formulation[1]	**IRAC Group**	**Product Efficacy Rating[2] and Rate/A[3]**											**REI PHI**
Actara 25WG[4] (oz)	4A	++++ 4.5-5.5	–	–	–	–	–	–	+++ 4.5-5.5	+++ 5.5	+++ 5.5	++++ 2.0-2.75	12 h 14/35 d[4]
Admire Pro - foliar (fl oz)	4A	++++ 1.4-2.8	–	–	–	–	–	+++ 2.8	++++ 2.8	+++ 2.8	–	++++ 1.4-2.8	12 h 7 d
Admire Pro - soil (fl oz)	4A	+++ 7.0-10.5	++ 7.0-10.5	–	–	–	–	–	–	–	–	++++ 7.0-10.5	12 h 21 d
Agri-Flex (fl oz)	6 + 4A	++++ 5.5-8.5	++++ 5.5-8.5	–	–	++ 5.5-8.5	–	–	+++ 5.5-8.5	–	–	++++ 5.5-8.5	12 h 35 d
Agri-Mek SC[1,5] (fl oz)	6	–	–	–	–	–	–	–	++++ 2.25-4.5	–	–	+++ 2.25-4.5	12 h 28 d
Altacor (oz)	28	–	–	+ 2.5-4.5	+++ 2.5-4.5	++++ 2.5-4.5	++++ 2.5-4.5	–	++++ 2.5-4.0	–	–	–	4 h 5 d
Apta/Bexar (fl oz)	21A	++++ 17.0-21.0	–	+++ 21.0-27.0	–	++ 21.0-27.0	–	–	–	–	–	++++ 14.0-21.0	12 h 14 d
Asana XL[1] (fl oz)	3A	–	–	+++ 10.0-14.0	+++ 4.8-8.0	++++ 4.8-8.0	++++ 4.8-8.0	–	++++ 6.0-14.0	++ 14.5	+++ 4.8-8.0	+++ 4.8-8.0	12 h 21 d
Assail 30SG (oz)	4A	++++ 2.5-4.0	–	++++ 8.0	+++ 5.0-8.0	–	+++ 5.0-8.0	+++ 8.0	++++ 2.5	++ 8.0	+++ 6.0-8.0	++++ 2.5-4.0	12 h 7 d
Avaunt (oz)	22	–	–	++ 6.0	+++ 5.0-6.0	+++ 5.0-6.0	++ 5.0-6.0	–	+(++)[6] 6.0	+ 6.0	+++ 5.0-6.0	+++ 6.0	12 h 14 d
***Bacillus thuringiensis* (lb)**	11	–	–	–	–	–	+++ 0.5-2.0	–	–	–	–	–	4 h 0 d
Baythroid XL (fl oz)	3A	++ 2.4-2.8	–	+++ 2.4-2.8	++ 2.0-2.4	++++ 2.4-2.8	++++ 2.0-2.4	–	++++ 2.0-2.4	+++ 2.4	++++ 2.0-2.4	+++ 1.4-2.0	12 h 7 d
Belay 2.13SC[7] (fl oz)	4A	++++ 4.0-6.0	–	+++ 6.0	++ 6.0-12.0	+ 6.0-12.0	++ 6.0-12.0	+++ 6.0	++++ 6.0	++++ 6.0-12.0	++++ 6.0-12.0	++++ 6.0	12 h 7 d
Besiege (fl oz)	3A+28	–	–	+++ 9.0-12.0	++ 6.0-12	++++ 6.0-12.0	++++ 6.0-12.0	–	+++ 9.0-12.0	+++ 9.0-12.0	++++ 6.0-12.0	+++ 9.0-12.0	24 h 21 d
Brigade/Bifenthrin 2EC (fl oz)	3A	–	–	–	–	–	–	–	–	++++ 2.6-12.8	+++ 2.6-12.8	–	12 h 14 d

Third through Seventh Covers INSECT PESTS - continued next page

THIRD THROUGH SEVENTH COVERS **See also table: Miticides for Postbloom Use. Avoid killing bees on blooming ground cover.** **APPLES**

NOTE: Plum Curculio occurs mostly in Petal Fall through First and Second Covers.
Apple Maggot occurs mostly in Third through Seventh Covers.

INSECT PEST		Green Apple Aphid	Woolly Apple Aphid	Apple Maggot	Codling Moth	Leaf-rollers	Oriental Fruit Moth	San Jose Scale	Spotted Tentiform Leafminer	Brown Marmo-rated Stink Bug	Native Stink Bugs, Tarnished Plant Bug	White Apple Leaf-hopper	
Centaur WDG (oz)	16	–	–	–	–	–	–	++++ 34.5	–	–	–	–	12 h 14 d
Cormoran (fl oz)	15+4A	++++ 20.0-28.0	–	++++ 20.0-28.0	++++ 20.0-28.0	++++ 20.0-28.0	++++ 20.0-28.0	+++ 20.0-28.0	++++ 20.0-28.0	++ 20.0-28.0	+++ 20.0-28.0	++++ 20.0-28.0	12 h 14 d
Danitol 2.4 EC (fl oz)	3A	–	–	+++ 16.0-21.3	+++ 16.0-21.3	++++ 16.0-21.3	++++ 16.0-21.3	–	+++ 10.6-21.3	+++ 16-21.3	+++ 10.6-21.3	+++ 10.6-21.3	24 h 14 d
Declare (fl oz)	3A	+ 1.02-2.05	–	++++ 1.02-2.05	++ 1.02-2.05	++++ 1.02-2.05	++++ 1.02-2.05	–	++++ 1.02-2.05	+++ 1.02-2.05	++++ 1.02-2.05	++++ 1.02-2.05	24 h 14 d
Delegate 25WG (oz)	5	–	–	++ 6.0-7.0	+++ 4.5-7.0	++++ 4.5-7.0	++++ 4.5-7.0	–	++++ 4.5-7.0	+ 4.5-7.0	–	–	4 h 7 d
Diazinon 50W[8] (lb)	1B	–	++++ 2.0-3.0	+++ 2.0-3.0	+++ 2.0-3.0	++ 2.0-3.0	++ 2.0-3.0	+++ 2.0-3.0	+ 2.0-3.0	–	+++ 2.0-3.0	++ 2.0-3.0	96 h 21 d
Endigo ZC (fl oz)	3A+4A	+++ 5.0-6.0	–	+++ 5.0-6.0	+++ 5.0-6.0	–	++++ 5.0-6.0	–	++++ 5.0-6.0	++++ 6.0	++++ 5.0-6.0	++++ 5.0-6.0	24 h 35 d
Entrust SC (fl oz)	5	–	–	++ 6.0-10.0	+++ 6.0-10.0	++++ 6.0-10.0	++++ 6.0-10.0	–	++ 6.0-10.0	–	–	–	4 h 7 d
Esteem 35WP (oz)	7C	–	–	–	+++ 4.0-5.0	–	–	++++ 4.0-5.0	+++ 3.0-5.0	–	–	–	12 h 45 d
Exirel (fl oz)	28	–	–	++ 13.5-20.0	+++ 8.5-17.0	+++ 8.5-17.0	++++ 10.0-17.0	–	+++ 8.5-17.0	–	–	+++ 8.5-17.0	12 h 3 d
Imidan 70W[10] (lb)	1B	+ 2.5-3.0	+ 2.5-3.0	++++ 2.5-3.0	++++ 2.5-3.0	+++ 2.5-3.0	++++ 2.5-3.0	–	+ 2.5-3.0	–	++ 2.5-3.0	+ 2.5-3.0	4/14 d 7 d
Intrepid 2F (fl oz)	18	–	–	–	+++[9] 16.0	++++ 8.0-16.0	+++[9] 12.0-16.0	–	+++ 8.0-12.0	–	–	–	12 h 14 d
Lambda-Cy (fl oz)	3A	+ 2.56-5.12	–	+++ 2.56-5.12	++ 2.56-5.12	++++ 2.56-5.12	++++ 2.56-5.12	–	++++ 2.56-5.12	+++ 2.56-5.12	++++ 2.56-5.12	+++ 2.56-5.12	24 h 21 d
Lannate LV (pt)	1A	++ 2.0-3.0	+ 2.0-3.0	++ 2.0-3.0	+++ 2.0-3.0	++++ 2.0-3.0	+++ 2.0-3.0	–	+++ 2.0-3.0	++ 3.0	++++ 2.0-3.0	+++ 2.0-3.0	72 h 14 d
Lannate SP (lb)	1A	++ 0.5-1.0	+ 1.0	++ 1.0	+++ 1.0	++++ 1.0	+++ 1.0	–	+++ 1.0	++ 1.0	++++ 0.5-1.0	+++ 1.0	72 h 14 d
Leverage 360 (fl oz)	3A+4A	++++ 2.4-2.8	–	+++ 2.4-2.8	+++ 2.4-2.8	+++ 2.4-2.8	+++ 2.4-2.8	++ 2.4-2.8	++++ 2.4-2.8	+++ 2.4-2.8	+++ 2.4-2.8	++++ 2.4-2.8	12 h 7 d

Third through Seventh Covers INSECT PESTS - continued next page

Third through Seventh Covers INSECT PESTS - continued

THIRD THROUGH SEVENTH COVERS **See also table: Miticides for Postbloom Use. Avoid killing bees on blooming ground cover.** **APPLES**

NOTE: Plum Curculio occurs mostly in Petal Fall through First and Second Covers.
Apple Maggot occurs mostly in Third through Seventh Covers.

INSECT PEST		Green Apple Aphid	Woolly Apple Aphid	Apple Maggot	Codling Moth	Leaf-rollers	Oriental Fruit Moth	San Jose Scale	Spotted Tentiform Leafminer	Brown Marmo-rated Stink Bug	Native Stink Bugs, Tarnished Plant Bug	White Apple Leaf-hopper	
Madex HP (fl oz)	31	–	–	–	++++[13] 0.5-3.0	–	++++[13] 0.5-3.0	–	–	–	–	–	4 h 0 d
Minecto Pro (fl oz)	6 + 28			S 10.0-12.0	+++ 8.0-12.0	-	++++ 8.0-12.0	–	+++ 8.0-12.0	–	–	–	12 h 28 d
Movento (fl oz)	23	++++ 6.0-9.0	+++ 6.0-9.0	–	–	–	–	++++ 8.0-9.0	–	–	–	–	24 h 7 d
Mustang Maxx (fl oz)	3A	+++ 1.28-4.0	–	+ 1.28-4.0	+ 1.28-4.0	++++ 1.28-4.0	++++ 1.28-4.0	–	+ 1.28-4.0	+++ 4.0	++++ 1.28-4.0	++++ 1.28-4.0	12 h 14 d
Proclaim (oz)	6	–	–	–	++ 4.8	++++ 3.2-4.8	++ 4.8	–	+++ 3.2-4.8	–	–	–	48 h 14 d
Rimon 0.83EC (fl oz)	15	–	+ 20.0-30.0	–	++++[9] 20.0-30.0	++++ 20.0-30.0	++++[9] 20.0-30.0	–	++++ 20.0-30.0	–	–	–	12 h 14 d
Sivanto Prime (fl oz)	4D	++++ 10.5-14.0	–	–	–	–	–	++ 10.5-14.0		–	–	++++ 10.5-14.0	4 h 14 d
Tombstone (fl oz)	3A	–	–	++++ 2.4-2.8	++ 2.0-2.4	++++ 2.4-2.8	+++ 2.0-2.4	–	++++ 2.0-2.4	+++ 2.4-2.8	++++ 2.0-2.4	+++ 1.4-2.0	12 h 7 d
Transform WG[11] (fl oz)	4C	++++ 1.5-2.75	–	–	–	–	–	+++[11] 2.75	–	–	++ 1.5-2.75	++++ 1.5-2.75	24 h 7 d
Verdepryn 100SL (fl oz)	28	–	–	–	+++ 5.5-11.0	++++ 5.5-11.0	++++ 5.5-11.0	–	+++ 5.5-11.0	–	+ 5.5-11.0	+++ 5.5-11.0	4 h 7 d
Venerate XC[12] (qt)	UNB	–	–	–	–	–	+++ 1.0-2.0	+++[12] 1.0-2.0	–	+++ 1.0-2.0	+++ 1.0-2.0	–	4 h 0 d
Voliam Flexi WG (oz)	4A+28	++++ 6.0-7.0	–	–	++ 4.0-7.0	++++ 4.0-7.0	++++ 4.0-7.0	–	+++ 4.0-7.0	+++ 7.0	+++ 6.0-7.0	++++ 4.0-7.0	12 h 35 d
Warrior II[1] (fl oz)	3A	+ 1.28-2.56	–	+++ 1.28-2.56	++ 1.28-2.56	++++ 1.28-2.56	++++ 1.28-2.56	–	++++ 1.28-2.56	+++ 1.28-2.56	++++ 1.28-2.56	+++ 1.28-2.56	24 h 21 d

[1] When noted, generic products are available. [2] ++++ =excellent, +++ = good, ++ = fair, + = poor, – = ineffective or not rated. [3] Rates are in amount of formulated product per acre, unless otherwise noted. REI=Restricted Entry Interval. PHI=Preharvest Interval. [4] 35 day PHI for use rates greater than 2.75 oz/A; 14 day PHI for rates equal to or less than 2.75 oz/A. [5] For best results, apply with at least 1.0 gal of horticultural oil/A within 10 days of petal-fall. Other silicone-based penetrants may be substituted but may not be as effective. [6] Control of Spotted Tentiform Leafminer with Avaunt goes to"+++" with the addition of 0.5% spray oil. [7] Efficacy is better for first brood. [8] Only 2 applications allowed per year: 1) A maximum of one may be a dormant application, and 2) A maximum of one may be an in season foliar application. [9] Special timing: Apply Rimon at 75-100 Degree Days (DD) after bio-fix (usually late petal-fall); Apply Intrepid at 150 DD; Typical timing for most other products is 250 Degree Days (DD) after bio-fix. [10] Imidan REI 4 d for farm labor, but 14 d for u-pick operations. [11] Transform WG applied to San Jose Scale crawler stage. [12] If using Venerate to control Scale insects, make two applications 7 days apart starting a week after crawler emergence. [13] Madex HP should be reapplied 5-7 days after first application.

MITICIDES FOR POSTBLOOM USE						APPLES
MITE PEST		**Apple Rust Mite**	**European Red Mite**	**Two-Spotted Spider Mite**		
Product and Formulation[1]	**IRAC Group**	**Product Efficacy Rating[2] and Rate/A[3]**				**REI PHI**
Acramite 50WS[4] (lb)	20D	–	++++ 0.75-1.0	++++ 0.75-1.0		12 h 7 d
Agri-Flex[8] (fl oz) plus Adjuvant[6]	6 + 4A	++ 5.5-8.5	++++ 5.5-8.5	++++ 5.5-8.5		12 h 35 d
Agri-Mek 0.15EC[5] (fl oz) plus Adjuvant[6]	6	++ 2.25-4.25	++++ 2.25-4.25	++++ 2.25-4.25		12 h 28 d
Apollo SC[7] (fl oz)	10A	+ 2.0-8.0	++++ 2.0-8.0	++++ 2.0-8.0		12 h 10 d
Danitol 2.4EC (fl oz)	3A	+++ 16.0-21.3	+++ 16.0-21.3	+++ 16.0-21.3		24 h 14 d
Envidor 2SC (fl oz)	23	++++ 16.0-18.0	++++ 16.0-18.0	++++ 16.0-18.0		12 h 7 d
FujiMite/Portal 5EC[5] (pt)	21A	++ 1.0-2.0	++++ 1.0-2.0	++++ 1.0-2.0		12 h 14 d
Kanemite 15SC (oz)	20B	++++ 21.0-31.0	++++ 21.0-31.0	++++ 21.0-31.0		12 h 14 d
Nealta (fl oz)	25	++	++++ 13.7	++++ 13.7		12 h 7 d
Nexter 75WP (oz)	21	++++ 5.2-10.67	++++ 4.4-5.2	+++ 6.6-10.67		12 h 25 d
Onager EC (oz)	10A	–	++++ 12-24	++++ 12-24		12 h 28 d
Savey 50DF[7,9] (oz)	10A	–	++++ 3.0-6.0	++++ 3.0-6.0		12 h 28 d
Vendex 50WP (lb)	12B	+++ 1.0-2.0	+++ 1.0-2.0	+++ 1.0-2.0		48 h 14 d
Vydate 2L (pt)	1A	+ 2.0-4.0	+ 2.0-4.0	+ 2.0-4.0		48 h 14 d
Zeal (oz)	10B	–	++++ 2.0-3.0	++++ 2.0-3.0		12 h 14 d

[1] Do not use the same miticide "back-to-back"; rotate with a miticide having a different mode-of-action.
[2] ++++ =excellent, +++ = good, ++ = fair, + = poor, – = ineffective or not rated.
[3] Rates are in amount of formulated product per acre, unless otherwise noted. REI=Restricted Entry Interval. PHI=Preharvest Interval.
[4] Acramite requires spray water to be corrected for pH and hardness. See label.
[5] When noted, generic products are available.
[6] Apply while leaves are still tender, between petal-fall and first cover. For best results, use a minimum of 1.0 gal oil/A. Other silicone-based penetrants may be substituted, but efficacy may not be as good as adding oil.
[7] Do not rotate Apollo and Savey with each other.
[8] Agri-Flex is a pre-mix of Thiamethoxam (Actara) and Abamectin (Agri-Mek). Apply Agri-Flex at 1.5-2.0 oz/100 dilute, or 5.5-8.5 oz/100 for concentrate sprays. Dilute rate based on 400 GPA. See product label.
[9] Use low rate for European Red Mite; higher rates for Two-Spotted Spider Mite.

If you are having a medical emergency after using pesticides, always call 911 immediately.

POISON Help®

1-800-222-1222

In Case of an Accident

- Remove the person from exposure
- Get away from the treated or contaminated area immediately
- Remove contaminated clothing
- Wash with soap and clean water
- Call a physician and/or the National Poison Control Center (1-800-222-1222).
  Your call will be routed to your State Poison Control Center.
- Have the pesticide label with you!
- Be prepared to give the EPA registration number to the responding center/agency