Cornell University
Cooperative Extension

Eastern NY Commercial Horticulture Program

Vol. 1 Issue 4
April 17, 2013

Tree Fruit News

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Regional Updates*:

North Country—Clinton, Essex, northern Warren and Washington counties

Tree phenology: Apple=silver tip

Current growing degree days 1/1/13 to 4/16/13

	Base 43°F*	Base 50°F*
Chazy	54.2	6.9
South Hero, VT	56.2	6.6
Burlington, VT	77.5	15.1
Shoreham, VT	75.9	18.0

Pest focus—scab and fire blight on apples

Capital District—Albany, Fulton, Montgomery, Rensselaer, Saratoga, Schenectady, Schoharie, southern Warren and Washington counties

Tree phenology: Apple=green tip; pear, peach, cherry, plum=swollen bud

Current growing degree days 1/1/13 to 4/16/13

	Base 43°F*	Base 50°F*
Granville	85.9	24.4
North Easton	104.5	29.2
Clifton Park	80.9	19.5
Guilderland	92.9	22.8

Pest focus—scab and fire blight on apples; bacterial canker on apricot and cherry, pear psylla adult activity

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Mid-Hudson Valley—Columbia, Dutchess, Greene, Orange, Sullivan and Ulster counties

Tree phenology: Apple=1/4" to 1/2" green; pear, peach, plum=swollen bud; cherry, apricot=swollen bud to bud burst

Current growing degree days 1/1/13 to 4/16/13

	Base 43°F*	Base 50°F*
Hudson	103.7	30.5
Highland	152.1	56.4
Marlboro	139.2	47.6
Montgomery	150.1	56.2

Pest focus—scab, mites and scale on apples; bacterial canker on apricot and cherry; brown rot on stone fruit; pear psylla adult activity

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Coming Events

Coming Events: Range (normal ± std deviation)	Base 43°F*	Base 50°F*
McIntosh green tip	95—147	36—62
Pear psylla adults active	31—91	8—34
Pear psylla egglaying	40—126	11—53

**All degree day data presented are BE (Baskerviile-Emin) calculations. Previous 2013 newsletter editions reported standard degree day data and not BE.*

Considerations for Early "Worm" Management in Eastern New York Apples

By Peter Jentsch, Cornell Dept. Entomology. Adapted by Kevin Iungerman ENYCH

Many species comprise the GFW complex, including the speckled green fruitworm, the widestriped green fruitworm, and the humped green fruitworm. Larvae feed on pome fruit foliage, flowering parts and developing fruit. Larvae will be found inside rolled leaves or clusters in early feeding.

Despite predictable arrival and trap captures, GFW damage can be sporadic year to year. In northern regions of the Champlain Valley and throughout the mid-Hudson, GFW can be a severe pest on early developing apples. In years of heavy infestation as much as 10% fruit injury can occur. Greater information on this insect complex can be found in Chapman and Lienk's "Green Fruitworms" in the 1974 NYSAES Food & Life Sciences Bulletin No. 50 at [http://fls.cals.cornell.edu/OCRPDF/50a.pdf].

A. Speckled green Fruitworm, *Othosia hibisci* (Guenee)

B. Humped green fruitworm (*Amphipyra pyramidoides*)

C. Widestriped green Fruitworm (*Lithophane antennata*)

D. Bailey green fruitworm (*Lithophane baileyi*) Grote

E. Fourlined green Fruitworm (*Himela interactata*) Morrison

Full-grown larvae of the green fruitworm complex (watercolor paintings by J.A. Keplinger). Adapted from Chapman P. J. And Lienk S. E. Green Fruitworms. New York's Food And Life Sciences Bulletin No. 50, Entomology (Geneva) #6. October 1974 _

Speckled Green Fruitworm.
Courtesy of University Southern Utah, utahpests.usu.edu

Other emerging pest species follow GFW in the pre-bloom period: the redbanded leafroller, the spotted tentiform leafminer, the oriental fruit moth, the lesser appleworm, the codling moth; and the overwintered larvae of the obliquebanded leafrolle; this last, the OBLR, forms with the GFW the greatest pre-bloom through bloom (and shortly after) pome fruit risk.

Green fruitworm adults are moths of the night-flying noctuid insects. Flight coincides with apple bud development, peaks at tight cluster, and is completed by the pink stage. The forewings of these moths are grayish-pink and bear 2 purplish near-center gray spots outlined by a thin pale border; hind wings are lighter in color, and wingspread is about 1.5".

At the half-inch green stage of apple, GFW females begin ovipositing 1-2 white eggs on twigs and developing leaves at a given location, but several hundred eggs overall from late March to about mid-May in the Hudson Valley. Eggs are about 3/8" in diameter, 3/16" in length, have a grayish tinge, and ridges radiating from the center; shortly before hatch, eggs takes on a mottled appearance.

GFW larvae pass through 6 growth stages (instars) beginning as grayish-green larvae with brown heads and thoracic shields and ending at maturity with light green bodies and heads, and body lengths of about 1.5". Multiple narrow white stripes will be seen running

(Continued on page 3)

(Continued from page 2)
along the top of the larvae with a more pronounced wider white line along each side. The areas between striping are speckled white. (See accompanying photo).

Peak GFW populations come during bloom and larvae will continue feeding on developing fruit and foliage about 2 weeks past petal fall; they then drop to the ground, pupate in the soil, and overwinter to emerge the following spring as adults. GFW (and OBLR) damaged fruit remaining on trees will have shallow and deeply indented corky scars at harvest.

Adult pheromone trap captures can establish GFW presence and first flight. Larval scouting should begin shortly after tight cluster. While NY has no established damage threshold, cue neighboring Massachusetts' threshold guide of 1 larva or feeding scar per tree to apply protectants. Where history exists of economic GFW fruit injury, management efforts should focus on the tight cluster to pink stages to target the pre-bloom Lepidoptera complex. High density, high-value apple varieties ought to carry a more conservative threshold trigger.

Both the GFW complex and OBLR have resistance or reduced susceptibility to most of the organophosphates - though not chlorpyrifos (Lorsban, IRAC Class 1B), which as a pre-bloom foliar ap, also controls San Jose scale. Asana, Ambush/Pounce, Baythroid, Danitol, Warrior, and pyrethroids in IRAC Class 3, tend to have the highest efficacy under cooler temperatures (<72°F). Generally, larvae metabolize / detoxify pyrethroids more effectively as temperature increases; OPs, carbamates and newer chemistries tend to be less susceptible to this process.

Among reduced-risk pesticide options, the B.t. products such as Biobit, Dipel, Javelin, and MVP (IRAC Class 11A) are very effective against OBLR and GFW and have a low impact on beneficial mites. These can be applied through bloom at multiple 5-7 day applications intervals and lower labeled rates optimize control. Intrepid (methoxyfenozide, IRAC Class 18A) is very effective against the larvae too; it imitates the natural hormones causing accelerated molting. Intrepid is quite safe to birds, fish, and most beneficial insects. Proclaim (emamectin benzoate, IRAC Class 6), an avermectin insecticide related to Agri-Mek, is also excellent against the GFW, with low impact on beneficial mites. (If European red mite has emerged, applying Proclaim, with a penetrating adjuvant will reduce ERM populations.)

Fruitworm injury fruitlet.
Courtesy Ontario Ministry of Agriculture

The use of Altacor (chlorantraniliprole), Belt (flubendiamide) (both IRAC Class 28), Delegate (spinetoram) and Entrust (spinosad) (both IRAC Class 5), have been used successfully to deter surface feeding and internal Lep activity, but these are usually reserved for use until the onset of the summer OBLR generation larval hatch, to excellent results in NY State.

In jointly managing overwintering OBLR larvae and GFW early in the season we need to keep in mind later OBLR seasonal management. Insecticide resistance development depends on volume and frequency of insecticide use and inherent species characteristics. Accordingly, the model for insecticide resistance management (IRM) is to *use a single insecticide class for a single generation of insect pest.* An IRM program against OBLR, as example, would use effective insecticides listed above (X, Y, Z) in three different IRAC classes (A, B, C) seasonally:

- Insecticide X (Class A): 1 application @ TC-Pink for GFW, or PF for OBLR, RBLR, LAW, OFM larvae.
- Insecticide Y (Class B): 2 applications @ 14d

(Continued on page 4)

(Continued from page 3)

interval; first emergence of 1st brood OBLR larvae.

- Insecticide Z (Class C): 1 application @ first emergence of 2nd brood OBLR larvae, if needed.

Given the historic failures the apple industry has experienced in managing the leafroller and internal worm complex, it behooves us to implement programs to maintain the effectiveness of these excellent IPM tools and beginning this early in the season.

Source: First Flight: Considerations For Early "Worm" Management In NY Apples, Peter Jentsch, Cornell Dept. Entomology. SCAFFOLDS Fruit Journal, V22, N1, March 25, 2013

Fruitworm damage to apple.
Courtesy Ontario Ministry of Agriculture

Fungicide Resistance Complicates Apple Mildew Control Programs

By David A. Rosenberger, Cornell Dept. Plant Pathology. Adapted by K. Iungerman ENYCH

Apple powdery mildew looms as an ever-larger production risk because the DMI fungicides are losing control effectiveness in many orchards, and in some cases, also the strobilurins. Typically, most mildew control failures result from one or more of the following four situations:

- The use of fungicides that have lost effectiveness due to fungicide resistance;
- Beginning mildew control programs too late in the season;
- Stretching scab spray intervals during dry periods; or
- Failing to achieve good spray coverage.

The powdery mildew fungus, overwinters in infected buds. Though easily overlooked in spring, signs of powdery mildew growth from infected fruit buds becomes evident at about tight cluster (Figure 1) and in terminal shoot buds somewhat later, often during late bloom as growth accelerates, producing completely colonized "flag shoots". (Figure 2) Inoculum from primary infections subsequently spreads to other leaves and causes secondary infections (Figure 3) launching a cycle that continues until no new leaf tissue is produced, about early to midsummer.

Unlike most fungal spores, which require water for germination, powdery mildew spores can germinate and infect tissue whenever relative humidity is between 70 and 100 percent with temperatures between 50 and 80°F. Rain actually deters mildew by washing spores away and slowing spore germination. Because mildew thrives in dry weather, infections can be more severe in years with little or no rain between tight cluster and second cover. Under such conditions, mildew sprays may still be required though there is little risk from apple scab.

Figure 1. Overwintering mildew on a stunted fruit bud cluster shown on the right compared to a healthy bud on the left (same tree). *Scaffolds April 8, 2013 V22 N3*

No evidence exists that mildew can cause fruit russet <u>after</u> first cover, and mildew-caused russet is uncommon (Figure 4) but foliage does need to be protected until terminal growth ceases in order to break the disease cycle of secondary infection of new leaves and new buds and carryover to the following year. The presence of flag shoots does not in itself indicate that current fungicide applications are failing, so long as secondary infections are being blocked and are not spreading.

At their outset 25 years ago, the DMI fungicides (Rally, Procure, Indar, Inspire Super, and Topguard) were exceptionally effective against powdery mildew; over time, many mildew populations gradually become less

(Continued on page 5)

(Continued from page 4)

sensitive. In 2010 this shift was apparent as problems developed in some NY orchards when growers switched from Rally or Vintage to Inspire Super, a slightly less-effective material for mildew than other DMI chemistries; that bit of difference allowed mildew to explode in orchards where the mildew population had already shifted toward DMI resistance.

Absent resistance, older DMI fungicides control mildew by protecting new foliage and they eradicated incubating infections before these appeared on leaves, and they suppressed sporulation from older infections. Originally the DMI fungicides provided effective control of powdery mildew even when a first mildewcide was not applied until petal fall. No other mildew fungicide (including the new SDHI group) provides such a level of post-infection activity against mildew. Consequently, mildew programs must now be initiated earlier, beginning no later than tight cluster. Only then will new leaves be protected from secondary infections.

Figure 3. Secondary mildew infection on apple leaves, which often causes leaf edges to curl upward and to become distorted. *Courtesy Ontario Ministry of Agriculture*

Figure 2. Overwintered bud mildew colonized this terminal shoot, producing what is often called a "flag shoot" because of the white foliage. *Scaffolds April 8, 2013 V22 N3*

As powdery mildew resistance becomes more common, we will need to rotate fungicides with different modes of action within seasonal spray programs. To manage DMI-resistance in mildew, a non-DMI mildewcide should be included at half-inch green if sulfur will be the primary mildewcide <u>or</u> at tight cluster if a strobilurin (Flint, Sovran, Cabrio) will be used for mildew control. Mildew programs should be initiated before bloom even where DMI fungicides are still working so as to reduce selection pressure for DMI-resistant mildew.

The least expensive pre-bloom mildew control is to include 3 -5 lb of sulfur per acre in all scab sprays prior to bloom. (Except where oil is being applied at tight cluster or pink.) This low sulfur rate will suppress mildew and provide some scab control benefit, though higher rates of sulfur (e.g. 15 -20 lb/A) are required to control scab when sulfur is used alone. Sulfur can be especially useful when captan or captan-mancozeb mixtures are being used for scab control, as neither captan nor mancozeb will control mildew. (Note: Dodine, Vangard, and Scala also lack mildew activity).

An advantage of sulfur use is that mildew will not develop resistance to it; also, at pre-bloom timing, temperatures usually are low enough to be unconcerned about sulfur phytotoxicity. Sometimes, sulfur will burn leaves and even fruit if temperatures exceed 80 or 85 F in the three to five days after application. While Sulfur can also be used for mildew control in petal fall and cover sprays, these higher temperature risks are more likely to occur after bloom.

(Continued on page 6)

(Continued from page 5)

Sulfur fungicides formulated with bentonite clay generally offer better residual activity.

The strobilurins (Flint, Sovran, Cabrio) provide effective mildew protection if they are used in pre-bloom programs that include mildewcides, since the strobilurins do not appear to eradicate pre-existing infections (as the DMIs do). If no mildewcides are applied before petal fall, the stobilurins will provide sub-optimal mildew control if they are applied at petal fall.

Where Rally, Procure, Topguard, or Indar are still effective against mildew, they are especially useful immediately after bloom when they provide both post-infection and protectant activity against mildew and also rust diseases. If Inspire Super is to be used for scab control, it should probably be supplemented with sulfur at 3-5 lb/A to ensure mildew control during this critical period.

Figure 4. Mildew-caused fruit russet.
Courtesy of Keith Yoder, Virginia Tech http://www.arec.vaes.vt.edu/alson-h-smith/treefruit/pathology/research.html

As there is a constant supply of new, mildew-susceptible tissue while terminal leaves are growing from petal fall through second cover, this is a critical period to control mildew. If a lapse allows mildew to appear on terminal leaves in mid to late June it will be too late to implement effective control measures. Thus, mildew control must be integrated into scab sprays during the entire period from tight cluster through at least second cover. Mildew protection may be required through midsummer on non-bearing trees where terminal growth continues long after bearing trees have set terminal buds.

Dealing with Pre-Mix Product Complexities

By Art Agnello, Cornell Dept. Entomology. Edited and Adapted by K. Iungerman, ENYCH

With increasing numbers of available insecticide products comes increasing complexity in management decisions. Choice has always involved weighing traditional factors such as efficacy, chemical class, pest spectrum, and impacts on non-target species, and of course, cost. More recently though, more considerations have shouldered in upon the decision process; add thought to pesticide resistance, mode of action, seasonal maximums and then, the combinations. As companies have begun marketing pre-mixes combining two (for the time being) different active ingredients, one needs to carefully compare the benefits vs. the drawbacks of going with a pre-mix as opposed to staying with a single-active ingredient (1x a.i.) product for a given spray.

Like most university extension entomologists, I have expressed concern at the proliferation of these pre-mixes in the marketplace; I feel growers are better off deciding for themselves what products should be mixed in their tanks, and when. I also think pre-mixed product combinations make it too easy to abuse the active ingredients by overusing them when both may not be strictly necessary. The practice promotes a higher risk of resistance development in the pest population, and it adds to the complexity of juggling rates to achieve equivalent levels of pest control; a spray of a pre-mix product containing A + B may not be the same as the amount of either A or B contained in their respective (1x a.i.) products. The added challenge of having to observe different seasonal maximum uses for each product is enough to start seeing double and inadvertently making errors.

(Continued on page 7)

(Continued from page 6)

Agrichemical companies like the pre-mixes from a sales point of view, and I have yet to see sound biological arguments win out against the forces of marketing; it's a sure bet that more of these products will be introduced as time goes on. While some university specialists have chosen to ignore the pre-mixes in their crop guidelines, this doesn't seem very realistic; the products do exist, and at times, they may be the optimal choice, so growers do use them.

So, for the time being, I have chosen to include them in the NY "Guidelines" prefacing each with the following advisory: "For best effectiveness and insecticide resistance management, the use of pre-mixes should be reserved for situations when multiple pest species are present and are appropriately matched to the combination of active ingredients and modes of action contained in the product." I hope this advice is taken seriously, because the long-term utility and effectiveness of these active ingredients depends on responsible stewardship. If we instead needless apply or overuse the premixes, no present convenience or economy will compensate for their accelerated and premature burnout.

Now to the quick: I am often as confused as anyone else when confronted with the choice between a pre-mix and the alternative (1x a.i.). I'm waiting for someone who is a lot more-clever to develop some sort of expert-system app that will take into account all of the aforementioned factors when making such a deliberation. I've made up the following table of "A.I. Equivalences", which, for the moment, might be of use in comparing the levels of actual insect control you might expect to achieve from different formulations of a given a.i. More details might have been included, but the main intent is to provide a basis of comparison for some of the more likely decisions that could be made.

Just to give an idea of how this table might be used, note that the amount of chlorantraniliprole a.i. in a high-rate application of Voliam Xpress (0.078 lb) is lower than a comparable application of Altacor (0.099 lb); also, you can see the difference in thiamethoxam a.i. between the use rates of Endigo (0.046-0.055 lb) and Actara (0.070-0.086 lb). Additionally, note that thiamethoxam is limited to a maximum seasonal total of 0.172 lb/A, regardless of the formulation, which can complicate mixing & matching of products during the season.

Many comparisons are possible, of course, and the information in this table is only a start, but it may help make things a bit simpler than trying to reference a bunch of individual labels. We'll see what we can do to improve on how this information is presented over time.

Source: Edited and adapted from "All in the Mix", Art Agnello, Scaffolds V22, N3, April 8, 2013.

Active ingredient equivalents between pre-mix and single-a.i. insecticide products

Product	Labeled amt/Acre	a.i. # 1	lb a.i./applic	a.i. # 2	lb a.i./applic	Max seasonal use/A
Pre-mixes						
Voliam Xpress	6-12 fl oz	CTPL	0.039-0.078	l-CYH	0.0195-0.039	31 fl oz (0.2 lb CTPL)
Voliam Flexi	4-7 oz	CTPL	0.063-0.109	TMX	0.063-0.109	11 oz (0.172 lb of each)
Leverage	2.4-2.8 fl oz	IMID	0.038-0.044	b-CYF	0.019-0.022	2.8 fl oz (0.044 lb IMID)
Endigo	5-6 fl oz	TMX	0.046-0.055	l-CYH	0.034-0.041	19 fl oz (0.172 lb TMX)
Agriflex	5.5-8.5 fl oz	TMX	0.055-0.084	ABA	0.012-0.018	17 fl oz (0.169 lb TMX)
Single-a.i. products						
Altacor	2.5-4.5 oz	CTPL	0.055-0.099			9 oz (0.2 lb CTPL)
Actara	4.5-5.5 oz	TMX	0.070-0.086			11 oz (0.172 lb TMX)
Admire Pro	1.4-7.0 fl oz	IMID	0.05-0.25			14 fl oz (0.5 lb IMID)
Agri-Mek SC	2.25-4.25 fl oz	ABA	0.012-0.023			8.5 fl oz (0.047 lb ABA)

CTPL = chlorantraniliprole; IMID = imidacloprid; TMX = thiamethoxam; ABA = abamectin; l-CYH = lambda-cyhalothrin ; b-CYF = beta-cyfluthrin

Planting and Managing New Tall Spindle Blocks

By Mike Fargione, ENYCH

Cornell recommends growers plant apples at higher densities based on extensive research trials that have demonstrated maximum profitability when orchards are at about 1000 trees per acre. The Tall Spindle planting and training system meets the criteria for achieving these tree densities and is the recommended system in NY. This system is based on:

- Greater tree density and precocious dwarfing rootstocks that encourage greater early production.
- Providing a support system rather than growing one.
- Renewal pruning to replace vigorous wood with calm fruitful wood. Large limbs must be removed whenever they occur.
- Managing crop loads to prevent biennial bearing and uneven vigor.

Here are some simple rules to help you manage these higher density trees *in the planting year:*

- Whenever possible, plant healthy, well branched trees with 10-12 good feathers.
- Proper in-row spacing for the Tall Spindle System is 3-4' between trees depending on cultivar vigor.
- In the Hudson Valley, we recommend between-row spacing should be 12' (don't go any closer than 12'). You can stretch between-row spacing to 13' (even 14' if really necessary) on sloped sites. However, spacing wider than 12' may prove excessive if hedging and fruiting wall concepts being evaluated become standard practices in the future.
- Be sure the graft union ends up 6-8" above the ground after settling occurs. It is a mistake to plant these trees too deep. The exception to this may be NY1 which might benefit from being planted a bit deeper (we have no data on this).
- Never head the leader.
- At planting. remove large scaffold limbs if they are more than ½ the diameter of the leader where they attach to the leader.
- Remove all larger side branches from each scaffold limb; there should never be a fork in a side branch in young trees.
- Remove all branches that are too low to accommodate equipment or will end up in the herbicide spray.
- Water trees immediately after planting to settle soil around roots. This is particularly important this season since soils are dry. Initial watering with a starter fertilizer solution is beneficial.
- Install the support system and trickle irrigation immediately after planting (definitely within 1 month of planting). Tie up leader growth and apply water as needed.
- Sprinkle the equivalent of ¼ lb calcium nitrate around each tree once rain has settled the orchard soil. Don't band or pile fertilizer!
- You cannot neglect pest management in Tall Spindle plantings in the first season like we used to do on older style systems. Use a standard pest control program, particularly if you try and grow a few apples on the trees.
- You may be able to leave a couple of apples per tree to be harvested in the first season if you do everything correctly (proper planting depth, fertilization, early establishment of support and irrigation systems, excellent pest control, and so on). Otherwise, it is best to defruit the trees for the first year.

High Density Orchard Planting, Forrence Orchards. *Photo by K. Iungerman ENYCH*