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Tree Fruit News

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Regional Updates*:

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

Tree phenology: Apple=post bloom

Current growing degree days 1/1/13 to 6/24/13	Base 43°F*	Base 50°F*
Chazy	1188	723
Peru	1170	729
South Hero, VT	1226	763
Willsboro, NY	1086	645
Shoreham, VT	1236	777

Pest focus—Apple: scab, mildew, codling moth, obliquebanded leafroller, San Jose scale.

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

Tree phenology: Apple, pear, peach, cherry, plum, apricot=post bloom

Current growing degree days 1/1/13 to 6/24/13	Base 43°F*	Base 50°F*
Granville	1179	732
North Easton	1308	822
Clifton Park	1228	767
Guilderland	1234	765

Pest focus—Apples: scab, mildew, sooty blotch, flyspeck, codling moth, obliquebanded leafroller, San Jose scale. Stone fruit: brown rot, oriental fruit moth, aphids. Pears: Fabraea leaf spot, pear psylla.

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

Tree phenology: Apple, pear, peach, plum, cherry, apricot=post bloom.

Current growing degree days 1/1/13 to 6/24/13	Base 43°F*	Base 50°F*
Hudson	1359	870
Highland	1434	905
Marlboro	1379	868
Montgomery	1383	877

Pest focus—Apples: scab, mildew, sooty blotch, flyspeck, codling moth, obliquebanded leafroller, 17-year cicada, San Jose scale, Japanese beetle. Stone fruit: brown rot, oriental fruit moth, aphids. Pears: Fabraea leaf spot, pear psylla.

Coming Events

Coming Events: Range (normal ± std deviation)	Base 43°F*	Base 50°F*
Obliquebanded leafroller summer larvae hatch	1038-1460	625-957
San Jose scale 1st generation crawlers present	1033-1215	619-757
Apple maggot 1st catch	1243-1663	791-1067
Pear psylla 2nd brood hatch	967-1185	584-750

**All degree day data presented are BE (Baskerviile-Emin) calculations.*

Broad Participation Launches Precision Thinning in a Difficult (Normal?) Year

By Kevin Iungerman, ENYCH

It has proven to be an extraordinarily difficult thinning season across much of Eastern New York. We flirted again with frosts and freeze during bloom and early set, and foraging opportunities for pollinizers were slim; the 10 inches of rain (or more) during our thinning "windows" raised anxieties further, as did temperatures reaching into the low 90's. Another season, another anomaly? Perhaps.

Candor prompts the truer assessment: ideal thinning conditions are rarely present; were it otherwise, long running thinning research and annual apprehensions about thinning would not exist. Good thinning conditions are not the rule and shifting climatic parameters portend increasingly volatile springs and dicey decision-making. It would be great to have a resilient analytic tool capable of better framing options at thinning time, the key crop load management phase. Precision Thinning may well be that unprecedented tool or at least its foundation.

At the Geneva Precision Orchard Management Workshop in March, and at follow-up broadcast sessions or local gatherings as Peru and our May thinning meetings, Dr. Terence Robinson covered Precision Thinning in greater depth, underscoring the economic argument for its adoption. With the help of grower cooperators in NY and the North Country, a fairly broad beta testing of the Precision Thinning approach was able to get underway. (It was broader still, with cooperators in NJ, PA, and MA, who came on board as cooperators.)

Precision thinning stands in stark contrast to anecdotal observations: it is based on considerable applied research that incorporates climate, plant growth responses, and weather modeling with real-time data integration (i.e. heat, solar data) and measured growth responses of representative cluster fruit over time. The process generates "actionable" information that growers can utilize each time they set forth to thin – or conversely, not to thin – depending on whether pre-targeted fruit-load percentage levels have been realized.

Robinson outlined the protocols for utilizing NEWA station carbohydrate model assessments with weather forecasts for timing initial and subsequent thinning applications and rate adjustments. Critically, subsequent thinning is guided by increases or cessations in fruit size in tagged indicator clusters.

Robinson Precision Thinning Recruitment, Peru, May 9, 2013.
Photo by K. Iungerman

Substantive rains beleaguered area project cooperators as they sought to select, tag, and measure representative cluster fruit. The following entry illustrates the interactive process between Robinson and a given grower cooperator, as one case example:

Thursday June 6. Cooperator. *Terence, for the test, we selected tall spindle Honeycrisp on NIC 29 rootstock at 1300 trees per acre. Assuming 800 bu. of 80 count apples, we came up with a target of 50 apples per tree. The original cluster count on the five representative trees is as follows:*

1) *88 clusters*
2) *123 clusters*
3) *163 clusters*
4) *93 clusters*
5) *142 clusters*

We applied a petal fall spray of 6 oz. NAA and 2 pts. of Sevin on Tues. May 28th when the fruitlets were approximately at 6mm. The spreadsheet is attached. The thinning weather has been awful. We're expecting at least 2 more days of rain so the next spray probably will not go on until Sunday, June 9. Look forward to hearing from you.

Robinson: *I entered your data into a fruit set calculation spreadsheet that is attached. Please use the spreadsheet for future measurements. As I see your current situation:*

Honeycrisp: The trees began the season with an average of 122 flower clusters or 610 potential

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fruits per tree. The combination of the pollination/fruit set conditions and the thinning sprays at petal fall has reduced fruit number per tree to 98 fruit per tree (16% set). However your target fruit number is only 50 fruits per tree so there are still about 48 excess fruits on each tree.

You could hand thin to reduce these down to 50 or you could chemically thin again. I suggest another spray on Sunday of 5ppm NAA + 1pt Sevin/100 gallons dilute TRV. The largest fruits are about 16.5mm and will be closer to 18mm by then. While very resistant to thinners the objective is to knock off some smaller fruits to get closer to the target fruit number of 50. (P.S. If you used a target of 60 fruits per tree that would equal 1000 bushels per acre if fruit size reached 80 count.)

Now, is this a subterfuge? I mean, is the Precision Thinning approach, and its quite specific guidance for action, really a more accurate approach? Or might hidden assumptions within the model framework fudge the difference between "fact-based" and "anecdotal"? Here, performance should tell. In the instance of our cooperator example, he was pretty pleased with the outcome (and seeing the results, so was I). Some touch-up hand thinning will be required but it will be relatively minor.

As to the underlying models, all new technology (I did liken this to beta testing) are likely to have glitches that come to light, which can then be tweaked – a corrective circumstance that is greatly aided by a broad network of cooperators. Potential differences arising out of locational place or simply chance will surface more readily with more replications. We saw this broad participant benefit in two instances this spring where timely corrective advice was provided to thinning group cooperators:

1) Jon Clements of Massachusetts found and fixed an error in an earlier version of the fruit set spreadsheet that used in the growth rate portion of the Precision Thinning modeling.
2) Dr. Allen Lakso of Cornell was able to discover the culprit programming errors in the Excel and web versions of the carbohydrate model running on the NEWA site (versus the prior Stella version). It was discovered that the model was indicating incorrect photosynthesis depression at high temperatures. The error came to light in the last week of May as temperatures went over 90. The model had been providing proper information at more moderate temperatures (up to low 80's) but on very hot days it was predicting a positive carb balance rather than the large carbon deficit it should have shown.

Representative Precision Thinning Tree with tagged Clusters, Peru. *Photo by K. Iungerman*

Over the next dormant season a post mortem review will be conduced of carb calculations and outcomes; where heat readings may have been at issue, NY participants will have back up measurements available to actually see the effects of thinning during or preceding heat events. While Precision Thinning does take additional focused time and effort in preparation and measurements, and the practices may yet be refined further, I think Precision Thinning represents some of the most exciting economically-focused applied research that is underway in apples, and involvement by growers is a real plus. In fact, this considerable grower involvement underscores a realization of the considerable dollar value potential these Precision Thinning practices represent for any commercial orchard regardless of size.

Note: This article was developed from shared private emails between Robinson, project cooperators, and myself.

The Captan Conundrum: Scab Control vs. Tank-Mix Phytotoxicity Issues

By Dave Rosenberger, Plant Pathology, Cornell's Hudson Valley Lab and Kevin Iungerman, ENYCH

Fig. 1: Leaf spotting on Golden Supreme. Hudson Valley. *Photo by D. Rosenberger*

Captan functions as a cornerstone apple fungicide precisely because it is very effective against apple scab and it controls summer fruit rots. Captan can prevent fruit scab even when foliar scab control is imperfect. Replicated fungicide tests, using lower-than-recommended Captan 50W rates of 3 lb/A (intentionally) usually provide superior scab control to mancozeb fungicides at that rate.

Captan is a multi-site inhibitor fungicide. Practically speaking, apple scab fungi would need to undergo multiple simultaneous mutations to over-ride blocked development pathways and achieve resistance to captan, and while not impossible, it has not happened in the 60 years since the product's introduction. Uniquely, captan kills spores upon contact whereas many newer fungicides only kill fungi or arrest fungal growth after germ tubes emerge from viable spores.

Applied in combinations with other fungicides in protectant sprays, captan usually does 90% to 99% of the work. It reduces resistance selection pressures to the other fungicides in the mix. Tank mixes with other fungicides (e.g. dodine, benzimidazoles, DMIs, strobilurins, SDHIs) are used to expand the spectrum of disease control and/or to control/suppress small amounts of scab that may have escaped control by the last spray. (Note: Captan does not control powdery mildew or rust diseases).

Captan does have a dark side unfortunately: it is toxic to plant cells if it happens to penetrate the protective outer waxy cuticle layer and manages to enter into leaf or fruit tissue. Spray oils and spray adjuvants can facilitate captan movement through the cuticle by acting as penetrants. It takes time for cuticular waxes to develop on new leaves, and longer still under conditions of extensive cloudiness; this period of immaturity is when leaves are most susceptible to spray injury.

When any leaf cell is directly killed or injured by captan it can provide an entry site for other leaf spotting fungi (*Phomopsis, Alternaria,* and *Botryosphaeria), which* can then enlarge the spots. Injury may not be visible for 5 or 10 days, by which times any injured leaves may be 5 or 6 nodes below the growing points of the bourse and terminal shoots they are on.

Fig. 2: Leaf spotting on Mutsu. Hudson Valley. *Photo: D. Rosenberger*

Captan applied alone almost never causes leaf spotting on apples. Other products added in with captan can sometimes enhance foliar or fruit uptake and trigger phytotoxic responses. If injury is seen, it usually comes within three weeks of petal fall, a particularly vulnerable period marked by rapidly extending shoots and applications of insecticides, growth regulators, foliar nutrients, and spray adjuvants, as well as captan, at petal fall, first, and second cover timing. Injury risk rises with the increasing number of products.

In the week of June 10th, it became apparent that under some conditions, spray mixtures including Fontelis and captan were triggering unacceptable levels of leaf spotting or leaf edge burn in the Hudson Valley. (Fig. 1: Golden Supreme; Fig. 2: Mutsu).

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Because injuries always surfaced in orchard that included other materials along with captan-Frontelis mixes, it is difficult to cite Frontelis as a key causative agent of injury. Previously though, such mixtures had not shown noticeable injury. In Quebec, plant pathologist Vincent Philion noted severe damage on Spartan apple trees sprayed with a tank mix of Fontelis-captan-urea under slow drying conditions (Fig. 3). Urea in that mix may have exacerbated the captan damage although urea-captan combinations have been used without incident in the past.

Fig. 3. Leaf spotting on Spartan, Quebec.
Photo by V. Philion

What follows are summary observations concerning injury associated with Fontelis-captan mixtures, and represent contributions from Vincent Philion in Quebec and crop consultants Jeff Alicandro and Jim Eve in Wayne County, New York:

1. Thousands of acres of apples have been treated with combinations of Fontelis-plus-captan; damage has been noted on a very, very small percentage of the treated acreage.
2. Factors that seemed to increase the probability of injury were applications made under slow drying conditions (e.g., spraying at night) and applications that were made with low volumes of water (i.e., <100 gal/A).
3. Damage is primarily on leaves and is usually limited to a few leaves per terminal. In some cases, only occasional terminals show damage and the injury is very minor.
4. Cultivars vary in their susceptibility to damage, with the greatest damage being reported on Braeburn, Spartan (Acey Mac), Red Delicious, Empire, Gala, and Mutsu.
5. The unusually hot weather that prevailed throughout much of the northeast during the last few days of May might have contributed to the problem by favoring rapid terminal growth and/or by making trees more susceptible to damage via some other mechanism.

Fig. 4. Leaf Spotting on Spartan, Clinton County. *Photo by K. Iungerman*

6. DuPont, the manufacturer of Fontelis, has run extensive private trials testing the safety of Fontelis-captan mixtures. It is impossible however, to duplicate all of the tank mixtures that apple growers will ultimately use, or all of the environmental factors that may prevail following commercialization. The discovery of occasional problems with Fontelis-captan mixtures is an unfortunate event that can occur in the process of new product commercialization. Fontelis will remain an important apple fungicide for controlling scab and rust, especially during the time period when it can be combined with mancozeb.

Sometimes unexpected consequences also surface with long-used spray combinations. One such instance is the recent situation of injury coming to light following the use of a captan-Syllit tank mix at a Clinton County, NY orchard. This orchard made spray applications on Sunday 5/26 and Monday 5/27 at two locations of either:

a. 30 lbs of captan 50w, 5 gals Manzate Flowable, 30 lbs sulfur, and 15 pints Syllit, or

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b. 30 lbs captan 50w, 30 lbs Manzate pro stick, and 15 pints Syllit.

Fig. 5. Damaged Spartan Fruit Clinton County.

Photo by K. Iungerman

Conditions similar to those of the Fontelis-captan situations prevailed: adverse weather, prolonged drying conditions, evening application, heat; and also (unfortunately – for pinpointing causation) the same addition of multiple materials into the tank mixes occurred. Both locations showed spray injury on Reds, Spartans, and Empires. Kevin Iungerman examined the block that presented the most severe injury. The symptoms seen (Fig. 4) were very similar to the Fontelis-captan examples and were of the same leaf ages, but there was also considerable fruit injury, including russet and splitting. (Fig. 5)

Iungerman took a small random sample of fruit from ten trees, 5 each of McIntosh and Spartan, for 50 fruit of each variety. He found 17 blemished Spartans and11 blemished McIntosh. Because the sample was quite small and included blemishes that might be overlooked on sorting lines, the cited injury counts may exaggerate actual injury level. However the Spartans clearly had the greater degree of injury per affected fruit than the McIntosh and all of the splits as well. Further fruit expansion may lead to more cracking or allow for secondary infections of injured areas. Curiously, despite finding injured McIntosh fruit, it was difficult to find foliar injury in the McIntosh trees unlike the adjacent Spartans.

Pesticides other than captan can also cause leaf spotting and/or leaf burn. Sulfur and liquid-lime sulfur can cause damage when applied ahead of hot weather and/or if mixed with or applied close to oil sprays. (Note sulfur's use and omission in the Clinton county examples, yet injury occurred irrespective. Sulfur was being used for mildew in areas of known fungicide resistance.) Last year, Topguard fungicide caused a leaf-edge burn when applied to Cortland trees in test plots at the Hudson Valley Lab that had recently been treated with streptomycin plus Regulaid. Topguard injury has reportedly been observed on Braeburn when sprays were applied with enough water to allow droplets to accumulate on leaf edges.

Fig. 6. Leaf spotting induced by rust.

Photo by V. Philion

It is important to note that some pathogens cause leaf spotting that is very similar to leaf spotting caused by captan injury. Rust-induced leaf spotting occurs when cedar apple rust spores germinate on apple cultivars that are resistant to rust (Fig. 6). Rust-induced leaf spotting can be differentiated from phytotoxicity spotting by the fact that rust-affected leaves usually show some bright yellow-orange pinpoint spots either at the center of lesions or at other locations on the leaves. Frog-eye leaf spot caused by *Botryosphaeria obtusa* can also cause severe leaf spotting, with most infections occurring below over-wintering fruitlet mummies that supplied the inoculum.

In summation, defining the exact cause of phytotoxicity on apple leaves is often very difficult. We know however, that special cautions are required when applying captan as it has a demonstrated record of causing phytotoxicity to leaves should oils, adjuvants, or carriers in other pesticides enable captan to penetrate into leaves.

Source: "The Captan Conundrum: Scab Control vs. Phytotoxicity", David A. Rosenberger, provided for Scaffolds publication and to Kevin Iungerman, et. al. for use, Mon, 10 Jun 2013; spray application information provided by the cited Clinton County grower; field observation notes and photos of Kevin Iungerman, June 19, 2013