

scaffolds

Update on Pest Management
and Crop Development

F R U I T J O U R N A L

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PROJECTIONS

FAKE WINTER
(Art Agnello,
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❖❖ During the first week in January, I was in La Crosse, WI for an apple growers' meeting, and although temperatures in Geneva were having trouble getting below freezing, those in La Crosse never got above the single digits during my visit, which I chose to take as a sign that we would eventually attain a similar weather pattern in NY. One of my hosts, grateful for the cold because he was an avid ice fisherman, described how much he enjoyed consulting the time-temperature clock he had recently bought, one of those that uses a probe mounted on the back porch and projects the readings as a dull red display on the bedroom ceiling. This way, he explained, he could determine whether it was worth getting up at 5 AM to go out and sit on the ice, or whether it would be 'too warm'. Being fond of gadgets, I prevailed on him to take me to the electronics store in town where he had gotten it, and I bought one to bring home for my own amusement. Naturally, I didn't have ice fishing in mind, but figured I might get some vague satisfaction from being able to tell how frigid it was outside before even getting up in the morning.

Naturally, the temperatures in Geneva for the rest of January were disappointingly mild (average high of 35.2°F), and February was even worse – more like April (41.1°F), so my ability to preview the temperature while still half asleep came off as less than exciting, and I consoled myself with the anticipation of another



early and pleasant spring. Then, of course, March did what it usually does, assailing us with destructive winds and freak snow storms, making a fiction of our (and Punxatawney Phil's) vain expectations for a predictable transition to spring. The extended forecast calls for highs in the 40s and 50s for the next two weeks, but I'm not sure whether to trust an electronic black box any more than an oversized rodent that crawls out of its burrow to sniff the air when it should be peacefully slumbering while it still has the chance.

Targeted Emails

Scaffolds will continue to be available via email and online this year. As always, we ask subscribers to inform us of any address changes, so that we don't need to guess whether error messages are originating from a Nigerian prince or a Russian oligarch.

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UPCOMING PEST EVENTS

Scaffolds is sent as a pdf file via email each Monday afternoon. For those desiring a more screen-friendly format than the double column we currently use, I can send an unformatted plain text version to anyone who requests it, in addition to (or in place of) the pdf. There is also a web version available, which should be up and ready for viewing at the same time as the emailed pdf is sent. Scaffolds can be found online at: <http://www.scaffolds.entomology.cornell.edu/>. Please make a note of this address in any bookmarks you may maintain that point to Scaffolds.

Also, we will post a version of Scaffolds online that is formatted to be more easily read on smartphones and other mobile devices. Look for "ScaffoldsMD for Mobile Devices" under the current link to the PDF version.

As always, we are happy to consider contributions (particularly from N.Y. sources) in the form of articles on topics in any of the fruit crop protection or crop production areas, as well as N.Y. field observations, trap data, etc. Our preferred deadline for such dispatches is 2 p.m. on Monday.



drought of 2016, especially in western NY. In the 10 years I've been at Cornell, 2016 was the first season where apple scab failed to develop (at expected levels) in the research orchards in Geneva. Only 16% of the Empire fruit on untreated trees in my high-inoculum block developed apple scab lesions in 2016, compared with 86% of the fruit in 2015. Even in my research blocks, the potential ascospore dose (PAD), which I calculated last fall, was low enough to suggest that fungicide applications at the beginning of the season, up to tight cluster, could be skipped in 2017 in those blocks. Although the 2016 drought was worse in western NY than the Hudson Valley and Lake Champlain regions, orchard inoculum throughout the state may be low enough to allow for a reduced apple scab management program this spring. At the same time, 2016 was a devastating season for fire blight, and a silver/green tip application of copper for reducing fire blight inoculum should still be practiced. Such an application will also impact overwintering apple scab in buds and protect against any early season infections.

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DISEASES

OUTSIDE INHIBITORS

2017 APPLE SCAB MANAGEMENT & FUNGICIDE UPDATE FOR NY

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Early season apple scab management in 2017

❖❖ Snow is still in the orchards, but it will melt soon and green tip is just around the corner. The snow melt will make spraying at green tip more difficult, but we may not need to be so concerned about making early season applications for apple scab, considering the

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As soon as the weather begins to warm (>60°F), fire blight cankers could begin to ooze, and an application of a high MCE (>15% metallic copper equivalent) copper fungicide (e.g., Badge, Kocide, Cuprofix) should be applied as soon as it is possible to get into the orchard. But for apple scab, between low inoculum carryover from 2016 and the initial protection at silver to green tip for fire blight, the next 1–2 fungicide applications could be skipped. However, there are several situations where the early season applications may be important: 1) If the early season is cool and wet, early fungicide applications should be made as soon as the orchards can be entered. 2) If an application has been skipped and an infection event has occurred, do NOT skip any further applications. 3) If an orchard had a high level of inoculum in fall or is adjacent to an abandoned orchard, fungicide applications should NOT be skipped.

Inoculum reduction is an inexpensive means of protecting against apple scab, especially if apple scab was found on leaves or fruit in the fall or if you're planning to skip early season fungicide applications. If inoculum reduction was practiced in the fall, it is NOT necessary to repeat inoculum reduction measures in the spring. For spring inoculum reduction this year, it will be important to do it as soon as the last snow melts and tractors can enter the orchard from silver to late green tip. The two best options for inoculum reduction are to shred leaves with a flail mower or treat the leaf litter with an application of urea. In the case of flail mowing, the leaves need to be swept or raked from underneath the canopy into row middles. Subsequently, the row middles should be mowed with the flail mower set to scalp the sod. If applications of urea are used, applications should be made at 40 lbs of feed grade urea per acre in 100 gallons of water. Dolomitic lime can be used instead, but it should be applied at rate of 2.5 tons per acre. Of the

two options, applying urea is the typically the simplest approach, but take care to rinse the sprayer with water afterwards, since the urea is caustic and can wear out a sprayer pump over time.

Key fungicides for 2017

Fungicide selection for the management of apple scab and other fungal diseases is complicated by fungicide resistance, pre-mix products of multiple fungicides, an abundance of new chemistries in one fungicide Group, and the potential for injurious tank mix combinations during thinning. In recent years, control failures due to fungicide resistance in *Venturia inaequalis* (the apple scab pathogen) appear to have subsided due to widespread use of multi-site protectants and inclusion of the succinate dehydrogenase inhibitors (SDHI; Group 7) in the fungicide rotation with other chemistries. Although there have been concerns that populations of *V. inaequalis* in NY have resistance to QoI (Group 11) and DMI (Group 3) fungicides, including these fungicides in rotation for the season will allow one to 1) capitalize on their high level of activity against powdery mildew and summer diseases, and 2) reduce resistance selection for the new SHDI (Group 7) fungicides.

The paradigm of marketing pre-mix fungicides appears to be waning as more single-fungicide products are coming to market. However, several pre-mix products have recently become labeled for use in NY, with several likely in development. For each new fungicide product, the use of low-volume applications combined with the complexity of tank mixes during thinning, and incompatibilities with existing products will continue to present issues. Below, I present an update on new fungicide products and perspectives on the use of existing products.

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Available fungicides

Dodine (Syllit)

Syllit (dodine) can be applied only in the early season, given that applications aren't allowed in apples after pink, according to the label. However, applications after bloom are still allowed on pears. There is a fear that applications of Syllit after pink may predispose selection for resistance or increase the chance of injury in complex tank mixes. It's been more than five years since we've detected dodine resistance in commercial plantings. We have found a few *V. inaequalis* isolates from research orchards that seem to be capable of growing in the presence of dodine in culture. However, the orchard populations from which these isolates were collected were fairly sensitive to Syllit, which still provided excellent control during the season of collection. In this regard, Syllit should be applied in combination with mancozeb and applied no more than twice. (The label now requires mixing with either mancozeb or captan, but mixing with captan increases the risk of phytotoxicity.) If there are heavy rains prior to pink, Syllit may be a good choice for high-inoculum orchards, as it has some post-infection utility, even in blocks in which the pathogen has shifted towards resistance. Since copper is often applied at silver/green tip to suppress fire blight inoculum, Syllit plus mancozeb could be applied from late green tip to tight cluster. If powdery mildew is a concern, Syllit may not be a good choice at tight cluster, as it has no activity against mildew. Syllit is not very effective on rust diseases, but including mancozeb as a tank-mix partner may help in orchards with light rust pressure.

Captan and Mancozeb

Combinations of mancozeb and captan applied on a 5–7-day schedule have been popular for the last few years. The contact fungicides are protectants and must be applied before rains, or at least before a Mills' infection period is completed after rains begin. (Sprays applied in the rain will have limited residual activity af-

ter the rains end.) Moreover, captan and mancozeb have little to no effect on powdery mildew and the 3 lb/A rate of mancozeb may not be effective against rust in high-inoculum orchards. As the season progresses to bloom and the tank mixes become complicated by the fact that growers need to manage insects, diseases, and crop load, captan should be used with caution because it is phytotoxic if absorbed into plant cells. Adjuvants, oils, and other tank mix partners that cause excessive wetting or enhance uptake will increase chances that captan will get through the cuticular layer of leaves and fruit. This is especially the case if applications are made under slow drying conditions in the early morning, in the late evening, or during a light rain. Although there haven't been as many reports of captan-related injury in recent years, I suggest that growers still curtail applications of captan at petal fall and first cover when the cuticles of apples leaves and fruit are not fully developed. This is especially critical if we have extended periods of cool cloudy weather during those growth stages. New fungicides formulated in organic carriers are being released faster than can be evaluated by extension scientists in the context of low-volume applications (<50 gal/A) common in modern high-density apple plantings, and we therefore do not know if any of them will have captan-compatibility problems. If mancozeb is to be selected over captan at this timing, it will be important to also avoid any prebloom applications of mancozeb or Polyram that exceed 3 lbs/A, to remain in compliance with labeling restrictions. If rates of mancozeb higher than 3 lbs/A are used at any time during the early season, the label will not allow post-bloom applications of mancozeb.

SDHI fungicides

There are several SDHI fungicide chemistries registered for apples and several more are forthcoming (Table 1). The SDHI fungicides are either marketed alone or pre-mixed

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Table 1. Features of current and forthcoming SDHI fungicide products.

Trade name (Manuf.)	Fungicide Chemistries (FRAC Group)	Disease efficacy	Registration Status (Restricted)	Use on Long Island
Fontellis (DuPont)	SDHI (7)	High: apple scab, Low to Moderate: Rust and Mildew	SLN	No
Merivon (BASF)	SDHI (7) + QoI (11)	High: apple scab, Moderately High: Rust and Mildew	Restricted Use	No
Sercadis (BASF)	SDHI (7) + QoI (11)	High: apple scab, Moderate: Mildew, Low: Rust	Restricted Use	No
Pristine (BASF)	SDHI (7) + QoI (11)	High: apple scab, Moderately High: Rust and Mildew	Not Restricted	Yes
Luna Tranquility (Bayer)	SDHI (7) + AP (9)	High: apple scab, Moderate: Mildew, Low: Rust	Restricted Use	No
Luna Sensation (Bayer)	SDHI (7) + QoI (11)	High: apple scab, Moderately High: Rust and Mildew	Restricted Use	No
Aprovia (Syngenta)	SDHI (7)	High: apple scab, Low to Moderate: Rust and Mildew	Outside NY	No

with another fungicide chemistry such as a QoI, AP (anilinopyrimidine), or DMI fungicide. The SDHI fungicides in general have a high level of activity against apple scab and a moderate to high level of activity against apple rust diseases and powdery mildew. The AP fungicides are typically more effective in colder weather, but even then have no activity against powdery mildew or apple rust. Hence, it would be best to apply pre-mix products with AP fungicides prior to bloom. The SDHI fungicide products with QoI mix partners are fairly effective against powdery mildew and rust diseases. Hence, these pre-mix products could be applied from bloom to first cover. Since the SDHI plus QoI pre-mix products also work well for summer diseases, using them at first cover and in the final pre-harvest cover would be advisable. While there are concerns about

QoI fungicide resistance in NY and New England, the performance of the SDHI plus QoI pre-mix products does not seem to be affected by the presence of QoI-resistant apple scab or powdery mildew. Regardless, one should include 3 lbs of mancozeb (a multi-site contact fungicide) with all of the SDHI fungicides in early season sprays to preserve the life span of the fungicide group. Mancozeb is preferable to captan given the aforementioned concerns regarding captan use at petal fall and 1st cover, but they can be combined with captan in summer sprays. Nevertheless, many of the SDHI fungicides are petroleum-based SC formulations, which could slightly enhance the uptake of captan under slow drying conditions. Hence, caution is warranted. Table 1 summarizes the various features of the current and forthcoming SDHI fungicide products.

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DMI fungicides

Resistance to the DMI fungicides (Rubigan, Rally, Indar, Rhyme, and Inspire Super) in apple scab is fairly widespread, and we believe that DMI resistance in apple powdery mildew may also be fairly widespread. Since it is extremely difficult to grow apple powdery mildew in culture, we cannot test for DMI resistance to this disease, and can only make inferences from commercial failures using the products and the need for higher rates in research trials. Indeed, resistance to this group of fungicides is rate-dependent and gradual, meaning that resistance may be overcome by higher product rates. The use of DMI chemistries with higher intrinsic activity, especially in orchards with only low to moderate disease pressure and/or on cultivars, are less susceptible to apple scab (i.e., more resistant than McIntosh). In the case of difenoconazole, a high-solubility DMI fungicide in the product Inspire Super, it appears that the apple scab pathogen has hit a metabolic ceiling for resistance (the point at which the level of resistance provided by the metabolic machinery of *V. inaequalis* that has shifted toward resistance cannot exceed the amount/potency of the fungicide applied at the upper end of the label rates). Simply put, if Inspire Super is applied at the highest labeled rate, the effective dose of difenoconazole is greater than what *V. inaequalis* can tolerate, even in populations with a high level of DMI resistance. Regardless of this phenomenon, DMI fungicides should still be used with extreme caution, and should not be relied upon for post-infection activity. Reliability of Inspire Super is especially questionable in cultivars that are highly susceptible to scab (e.g., McIntosh) located in blocks where there is a history of control failures with high solubility DMIs like Rubigan, or Rally. The newest formulation of flutriafol (Rhyme) did not produce a practical resistance observation in my 2016 research trials when applied at the labeled rate with Mancozeb at 3 lbs/A.

One of the more noticeable effects of DMI resistance is the failure of DMI fungicides to provide acceptable control of powdery mildew at rates that were historically effective. This is most commonly observed with the low-solubility DMI fungicides difenoconazole (Inspire Super) and fenbuconazole (Indar 2F). By comparison, the DMI fungicides myclobutanil (Rally) and flutriafol (Rhyme) are more effective against powdery mildew. The label for Rally has also changed over the years to allow higher rates (up to 10 oz/A). Whereas growers achieved excellent control of scab with 4 oz/A of Rally when this fungicide was first introduced, many growers are now using 5 or 6 or even 8 oz/A so as to get better control of mildew. However, using rates above 6 oz/A at petal fall and first cover may, at least under some circumstances, result in undesirable plant growth regulator effects, such as smaller length/diameter ratios (i.e., less "typy" fruit) and/or slightly decreased fruit thinning (Rosenberger et al. 2003). Regardless, if DMIs are used for powdery mildew control, it may be worthwhile to include a low rate of sulfur to compensate for the presence of DMI resistance. If summer temperatures exceed 85°F, applications of sulfur may be injurious to the crop.

Summary

A strong disease management program with good fungicide resistance management would begin with an application of copper as soon as the orchard is driveable. This will manage early season infections while also helping to reduce other fungal and fire blight inoculum. Given the drought and low level of orchard inoculum in 2016, it may be possible to skip some of the early season fungicide applications. If there is a long wetting period in the early season, an application of Syllit plus mancozeb and/or an application of an SDHI fungicide plus mancozeb may be helpful. Later applications from petal fall to first cover could include two applications of SDHI plus QoI (Merivon or Luna

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Sensation) to manage a multitude of other fungal diseases that may begin as quiescent infections. It might also be advisable to use a DMI plus sulfur during petal fall and first cover for rust or powdery mildew, thereby saving the remaining SDHI or QoI applications in the form of Merivon or Luna Sensation for pre-harvest covers to manage any latent summer diseases like flyspeck, sooty blotch, and bitter rot. ❖❖

References

Rosenberger, D.A., Robinson, T.L., Schupp, J.R., Engle-Ahlers, C.A., and Meyer, F.W. 2003. Effect of steroldemethylation inhibiting fungicides on apple fruit set, fruit size, total yield, and gross returns. *HortScience* 38: 601–604.

CHEM BRIEFS

PRODUCT
REGISTRATION
UPDATE
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[Note: In September 2016, the Cornell PIMS website went inactive, and was replaced by the NYS DEC Pesticide Information Portal, their online pesticide registration database (<http://www.dec.ny.gov/nyspad/products>). This site is not as user-friendly as PIMS; when the page opens, the user must scroll to the bottom to access the search filter, which accepts product name, active ingredient, EPA number, registrant, etc. A search request returns all labeled uses of a product, including special labels such as 2(ee)s.]

Following is a list of the changes we are aware of to the insecticides available for use in NY tree fruit crops for the 2017 growing season; expect more to follow:

Cancelled

- Belt - On July 29, 2016, the EPA Appeals

Board upheld an earlier EPA decision to cancel registration for the Bayer insecticide flubendiamide, marketed as Belt, but continues to allow sales of existing stocks to growers, and permits growers to continue using the product consistent with label directions.

New Registrations

- Magister (fenazaquin, Gowan; EPA Reg. No. 10163-322) miticide registered for use against European red mite, twospotted spider mite, and plum nursery mite in cherries in NYS.

- Nealta (cyflumetofen, BASF; EPA Reg. No. 7969-339) is a new miticide that was labeled in May 2016 for the control of European red mite and twospotted spider mite in apples and pears.

- Besiege (lambda-cyhalothrin, chlorantraniliprole, Syngenta; EPA Reg. No. 100-1402) is exactly the same product as Voliam Xpress (but lower in price), which will be cancelled sometime over the next few years, to allow product in the market to be used up. All the crops on the Voliam Xpress label have been added to the Besiege label.

New 2(ee) label

The NYS DEC recently approved the following registration:

- Danitol (fenpropathrin, Valent; EPA Reg. No. 59639-35) against black stem borer in apples.

Users must have a copy of the 2(ee) recommendation in their possession at the time of use; this is available on the NYS DEC Pesticide Information Portal (see above).

Lors-ban?

- Lorsban (chlorpyrifos): No decision yet on revoking all tolerances. EPA conducted another comment period that ended January 17, 2017, seeking comments on revised human health and drinking water assessments and several April 2016 FIFRA Scientific Advisory continued...

Panel documents. EPA is reviewing these comments and preparing their final decision to meet a court-ordered deadline of March 31, 2017.

Please note that the 2017 Cornell Pest Management Guidelines for Commercial Tree Fruit Production is available from the Cornell Store, both in a printed book format as well as online once again; however, the online version is not free, but must be purchased (for \$41.00, the same price as the print version). There is also a bundle option, which provides both for 40% more than the cost of either version alone. If you do not receive the Tree Fruit Guidelines as part of your membership in a county-based CCE fruit program, visit <https://ipmguidelines.org/> for purchasing details.

Update from Kerik Cox

(Plant Pathology & Plant Microbe Biology, Geneva; kdc33@cornell.edu)

Luna fungicide family from Bayer Crop Science (Luna Sensation, Luna Tranquility, and Luna Experience) features the Group 7 SDHI fungicide fluopyram in combination with other fungicide chemistries. Luna Sensation is labeled on apples for control of apple scab, powdery mildew, and summer diseases. It is also labeled on stone fruit for several diseases including brown rot, cherry leaf spot, and peach scab. Luna Tranquility is labeled on apples for control of apple scab and powdery mildew. Luna Tranquility labeled on stone fruit for several diseases including brown rot, cherry powdery mildew, and peach scab. All of the products are considered restricted use pesticides, and none of the products are allowed for use on Long Island.

Sercadis from BASF contains the Group 7 SDHI fungicide fluxapyroxad, and is labeled on apples for control of apple scab, powdery mildew, and summer diseases. Sercadis is considered a restricted use pesticide, and is not allowed for use on Long Island.

Withdrawal of Vivando on Apples: Vivando, a Group U8 fungicide from BASF, is no longer registered for use on apples for control of powdery mildew. The registration was withdrawn due to variety-specific crop injury concerns.

Aprovia from Syngenta contains the Group 7 SDHI fungicide solatenol (benzovindiflupyr) and is labeled on apples for control of apple scab, powdery mildew, and summer diseases. It is NOT registered for use in NY, but is registered in for use in New England States and Pennsylvania.

Academy from Syngenta contains a mixture of the Group 3 fungicide difenoconazole and the Group 12 fungicide fludioxonil. It is labeled for control of post-harvest diseases including bitter rot and blue mold, and can be applied in bin drenches or in-line applications.

Scholar SC from Syngenta contains the Group 12 fungicide fludioxonil. It is labeled for control of post-harvest diseases including bitter rot and blue mold, and can be applied in bin drenches or in-line applications.

Actigard from Syngenta is a systemic acquired resistance inducer (Group 21). It is labeled in apples for suppression of fire blight and can be applied as foliar applications, canker treatment, and soil drenches.

Kudos from Fine America contains the plant growth regulator prohexadione calcium, labeled on apple for the control of vegetative growth and fire blight. ❖❖

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UPCOMING PEST EVENTS

	<u>43°F</u>	<u>50°F</u>
Current DD* accumulations (Geneva 1/1–3/27):	90.3	34.8
(Geneva 1/1–3/27/2016):	106.7	39.6
(Geneva "Normal"):	64.9	24.6
(Geneva 1/1-4/1, predicted):	105.9	36.5
(Highland 1/1–3/27/16):		

<u>Coming Events:</u>	<u>Ranges (Normal ±StDev):</u>	
Green fruitworm 1st catch	49-148	12-69
Pear psylla adults active	31-99	8-34
Pear psylla 1st oviposition	40-126	11-53
McIntosh silver tip	62-108	20-42
McIntosh green tip	98-144	37-63

*all DDs Baskerville-Emin, B.E.

PHENOLOGIES

Geneva:	<u>Current</u>	<u>4/1, Predicted</u>
Apple (McIntosh, Empire):	silver tip	green tip
Apple (Red Delicious):	silver tip	silver tip

NOTE: Every effort has been made to provide correct, complete and up-to-date pesticide recommendations. Nevertheless, changes in pesticide regulations occur constantly, and human errors are possible. These recommendations are not a substitute for pesticide labelling. Please read the label before applying any pesticide.

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