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Early season disease management in 2021.

Winter finally arrived in mid-January and we had record snow deficit until early to mid-February, which brought snowstorms, but we didn't have consistent snow cover as was commonplace five to ten years ago. At the Cornell Hudson Valley Research Laboratory in Highland the median date for green tip on McIntosh is March 31st, but can vary by 14 days in either direction. Apple Scab ascospore maturity is very closely tied to the emergence of green tip. The Champlain Valley traditionally runs two weeks later than the southern Hudson Valley but weather can vary significantly between the two regions. While we've had some bursts of warm weather and in the coming week, there are cooler days forecasted, which could slow tree development. Overall, the season will be upon us shortly, and we need to consider early season management for apple scab.

Inoculum reduction recommendations in 2021.

Given the dry 2020 season, taking steps to reduce orchard floor leaf litter and fruit drops may greatly reduce the inoculum for apple scab, other foliar diseases like Marssonina leaf spot, and fruit rot disease. As soon as it is possible to safely get a tractor in the orchard, remove any remaining fruit drops and pruned shoots left on the floor from winter pruning that may contain bitter rot or black rot inoculum. If apple scab leaf inoculum reduction was practiced in the fall with flail mowing or urea sprays, it won't be necessary to practice inoculum reduction this

spring. Even if the planting is in green tip, inoculum reduction may still provide some benefit by reducing inoculum pressure by tight cluster or pink, when tissues are at their greatest susceptibility to apple scab.

The two best options for inoculum reduction are to apply the urea to leaf litter or use a flail mower to shred leaves. These practices hasten decomposition of the In the case of flail mowing, leaves should be first swept or raked from underneath the canopy into row middles as most of the apple scab inoculum is present on litter under the trees. Subsequently, go over the row middles with the flail mower set to scalp the sod. If urea is used, apply 40 lbs. of feed grade urea per acre in 100 gallons of water to the herbicide strip. Dolomitic lime applied at a rate of 2.5 tons per acre can be used in place of urea. Of the various options, applying urea is the simplest approach, but take care to flush the sprayer pumps with water afterwards since the urea is caustic and can corrode a pump over time. As suggested above, the use of orchard floor urea may also reduce inoculum of other diseases (e.g. Marssonina blight, Bitter rot, and Black rot) as it hastens decomposition of leaf litter, fruit drops and pruned shoot that harbor the pathogens causing foliar diseases, cankers, and summer fruit rots.

Delayed-Dormant copper for fire blight inoculum reduction.

The warm weather at and following petal fall in 2020 left much of NY and New England devastated by fire blight. There will likely be an excessive number of cankers in affected orchard. However, a “delayed-dormant” application of copper at silver tip will help reduce inoculum of fire blight in cankers and apple scab in buds. Given the recent cold weather, overwintering fire blight cankers are still dormant, and these high inoculum fire blight research orchards show no sign of oozing. As the weather begins to warm (> 60°F) in the coming weeks,

fire blight cankers could begin to ooze, be on the lookout for these. It's important to note that cold weather will not kill fire blight bacteria overwintering in cankers. The bacteria will remain viable at low (< 32F) temperatures. By the time we reach bud break, cankers could be oozing. To reduce fire blight inoculum and further reduce early season apple scab inoculum, make a "delayed dormant" silver-tip application of a high (>15%) metallic copper equivalent (MCE) copper fungicide (e.g. Badge, Kocide, Cuprofix). The early season may prove to be dry, and it might be easy to make this application if the rainfall trends continue. Even at green tip, it is generally still safe to apply high MCE copper products. In the Geneva research orchards, our second fungicide application at ¼" green is still often copper.

Early season apple scab management.

Once green tip is past, it's advisable to start applying protectant fungicides for apple scab, timed according to infection events predicted by weather conditions. One of the most popular protectant fungicide programs consists of a tank mix of Captan with Mancozeb at half maximal rates for each product (e.g. Captan 80 at 2.5lbs/A & Mancozeb 3lbs/A). The combination is referred as "Captozeb" in the vernacular sense and has excellent residual (Mancozeb) and redistribution (Captan) properties, but has little to no post-infection activity, and must be applied before rains. Re-application is warranted when unprotected tissues emerge 7 days later or when considerable rainfall (> 1") occurs.

For any fungicide application, it is advisable to use the NEWA apple scab forecasting system (<http://newa.cornell.edu/>) or other disease forecasting services to identify predicted ascospore releases and potential infection events to improve application timing. When practical,

one should apply fungicides prior to predicted large releases of ascospores (> 15% discharge) during weather conditions conducive to infection (Figure 1).

Ascospore Maturity Summary								
	Past	Past	Current	Ensuing 5 Days				
Date	4/29	4/30	5/1	5/2	5/3	5/4	5/5	5/6
Ascospore Maturity	71%	74%	78%	82%	85%	88%	90%	93%
Daily Ascospore Discharge	0%	3%	<1%	0%	16%	<1%	6%	<1%
Cumulative Ascospore Discharge	63%	66%	67%	67%	83%	83%	90%	90%

[Ascospore Maturity Graphs](#)

Infection Events Summary								
	Past	Past	Current	Ensuing 5 Days				
Date	4/29	4/30	5/1	5/2	5/3	5/4	5/5	5/6
Infection Events	Combined	Yes	No	No	Combined	Combined	Combined	Yes
Average Temp (F) for wet hours	39	45	-	53	52	53	54	52
Leaf Wetness (hours)	1	14	0	12	9	12	22	1
Hours ≥90% RH	0	11	2	13	23	14	22	10
Rain Amount	0.00	0.19	0.01	0.00	0.11	0.25	0.68	0.00

Download Time: 5/7/2019 23:00

Figure 1. Output from the NEWA apple scab disease forecasting tool for late May in the Hudson Valley. An ideal time for protecting the crop with a fungicide would be before the predicted ascospore discharge on 5/3. The date of 5/1 would also be an ideal time for selecting a product containing a single-site fungicide, which has post-infection activity. Such an application would also protect against the minor infection on 4/30 (3% ascospore discharge) and subsequent infections in early May.

As the season approaches bloom or if there is rain for several days after green tip, consider some of the products containing single-site fungicides (e.g. Luna Tranquility, Luna Sensation, Flint, Fontelis, Merivon, Syllit, Rally, Rhyme, Inspire Super, Miravis, Aprovia). Many of the products containing single-site fungicides will provide a broader range of activity

against other fungal pathogens like powdery mildew and fruit rots, which may cause latent infections at bloom, whereas the “Captzeb” combination does not. Given fungicide resistance concerns, it’s no longer recommended to apply products containing single-site fungicides for post-infection activity. Instead, think of making applications between infection periods. Use disease forecasting to identify periods where substantial ascospore release (> 15% discharge) has occurred and another infection period is predicted soon after. (Figure 1).

For example, apply your selected product containing a single-site fungicide(s) (with 3 lb/A mancozeb) for “next week’s” infection within 24-48 hours after the last infection period. It should protect against the next predicted infection and perhaps afford some curative activity if any germinating spores slipped through the fungicide coverage from the previous week. Of the products with single-site fungicides, dodine, sold as Syllit, will likely be your strongest performer for applications between infection periods. However, Syllit may only be applied twice before pink. Another option would be to use Aprovia, Miravis, Sercadis, Luna Tranquility, Cevya, or Inspire Super. The former three products are exceptionally effective on apple scab, while the latter two are also highly effective, and include an anilinopyrimidine (AP), which works best in the colder temperatures that often occur prior to bloom. As the season progresses into bloom, Luna Sensation or Merivon, which contain quinone outside inhibitor (QoI) fungicides, would be good choices for orchards planted along the lake where apple powdery mildew pressure can be high.

A new apple fungicide for 2021.

Interestingly, we have a new DMI fungicide Cevya from BASF. In field trials in Geneva, I’ve found it to be exceptional against apple scab (include that caused by DMI resistant *Venturia inaequalis*), powdery mildew, and even late season bitter rot at harvest. It is, unfortunately,

“Restricted-Use” in NY, not allowed on Long-Island, and not actually labeled for bitter rot.

Since you only can make three applications of Cevya at the 5 oz./A rate, I would save it for petal fall, first or second cover. At PF and 1st, tank mixes become complex with foliar nutrients, thinners, insecticides, and fungicides, and Captan can have numerous incompatibilities leading to injured fruit in wet weather. Replacing captan+ mancozeb with a material like Cevya (or the other fungicides recommended at bloom) + mancozeb or + sulfur would be less risky to fruit finish. Cevya’s 0-day PHI is a wonderful feature, and I’d save one spray for pre-harvest, noting it's excellent activity in some of our pre-harvest spray, post-harvest efficacy studies at Geneva.

Summary

A strong early disease management program should begin inoculum reduction with urea or flail mowing as soon as orchards can be entered. Make sure to sweeping the orchard to remove prunings and any remaining apple drops, which may harbor inoculum from many fungal pathogens prior to inoculum reduction. Follow inoculum reduction with an application of copper at bud break “silver tip” to early green tip. This application will help reduce overwintering apple scab and fire blight inoculum and protect against early-season apple scab infections. From green tip to bloom, a program of protectant fungicides centering around captan and mancozeb should be implemented to protect the developing fruit clusters. If there are prolonged wetting periods in the early season, an application that includes mancozeb along with either Aprovia, Miravis, Sercadis, Syllit, Luna Tranquility, or Inspire Super may be helpful. As we proceed toward bloom, additional applications of products with single-site fungicides (e.g. Luna Sensation, Merivon) may be needed to manage powdery mildew and other fungal diseases that may begin

as latent infections during bloom. Keep track of apple scab ascospore discharge and infection events predicted from local weather on the disease forecasting service of your choice.