2021 Disease Management Outlook for Apple Powdery Mildew

David Strickland & Kerik Cox
Cornell AgriTech
Section of Plant Pathology & Plant-Microbe Biology

The 2021 Season so Far…

Apple powdery mildew, a disease intricately linked to host phenological stage, may be of concern this year due to the mild winter we've experienced since November 2020. *Podosphaera leucotricha*, the causal agent of apple powdery mildew, overwinters within bud tissue. In cold winters, host buds die off when trees are exposed to sustained temperatures below -11.2°F (-24°C), reducing *P. leucotricha*'s ability to overwinter. However, according to the Northeast Regional Climate Center (nrcc.cornell.edu), the northeast US has experienced a warm winter, with average temperatures regionwide far above this "kill" threshold (Nov 2020: 43.1°F; Dec 2020: 31.2°F, Jan 2021: 27.1°F, Feb 2021: 24.9°F), indicating that *P. leucotricha* will probably have overwintered successfully.

With the onset of spring, trees will begin pushing buds and generating new tissues that *P. leucotricha* will colonize to establish primary infections (Fig. 1). A prolonged period of cooler days would help to slow tree growth, and subsequently, the start of powdery mildew symptoms. However, if April proves to be warm enough to significantly promote host growth, expect that powdery mildew primary infections will appear with greater frequency.

Warmer temperatures are not the only factor influencing whether powdery mildew will be present in the early season. Precipitation has an impact on powdery mildew disease incidence. The spores of *P. leucotricha* (called conidia) cannot colonize host tissues covered in free water, a major difference from the wetness requirements for other foliar apple fungal pathogens such as *Gymnosporangium juniperi-virginianae* (cedar apple rust) and *Venturia inaequalis* (apple scab).

In the early season, *P. leucotricha* conidia are produced from primary infections and spread by wind to colonize new tissues and form secondary infections (Fig. 2). These secondary infections will perpetuate secondary infections, producing exponentially increasing numbers of conidia for the remainder of the season, which are the focus of chemical management programs into the summer months.

Should the next month or so be particularly wet due to frequent rainfall, powdery mildew may not be of concern in this year's early season. However, we note here the importance of keeping a vigilant eye out for powdery mildew development in your orchards. Extended warm periods without rainfall, typically a boon to growers as apple scab (the primary foliar disease concern) is not developing quickly in these conditions, would be very conducive to powdery mildew disease development and spread.

Management Options for Powdery Mildew

Management of powdery mildew relies primarily on a fungicide program, as pruning visibly infected shoots of overwintered fungal mycelium (primary infections) is usually too labor intensive. In New York, powdery mildew is typically managed with the same fungicide program as apple scab since most NY springs are wet and cool, necessitating a focus on the latter disease. Should this spring prove to follow the above trend, expect that powdery mildew will be well managed with your current apple scab chemical management program. Should the weather this spring instead become unseasonably warm with little precipitation, do not ease up on your fungicide application programs if you have a historical prevalence of powdery mildew in your orchards.

A fungicide management program focused primarily on powdery mildew would start at tight cluster with applications of protectant fungicides such as sulfur or phosphorus acid. Note that for phosphorous acid-containing products listed for use in apple, such as Rampart, avoid application to plants treated with copper-based compounds at less than 20-day intervals to prevent phytotoxic effects. As bloom arrives, applications of single-site fungicides (e.g. Rhyme, Luna Sensation, Merivon) may be used to manage primary infections to reduce the amount of disease inoculum (conidia) that would otherwise spread elsewhere in the orchard. Alternating single-site fungicides with sulfur into the late spring/early summer months should provide adequate disease control. However, take care with sulfur applications during hot days (>85°F) as it may cause fruit russeting in warm wet conditions. Given concerns for fungicide resistance development, be sure to alternate fungicide modes of action when you select applications of single-site fungicides. Proper fungicide rotation will help maintain the efficacy of those limited commercial products registered for use in New York.. In 2020, we received no reports of powdery mildew control failures in conventionally managed orchards.

For growers interested in using organic-approved chemical management programs, there are several OMRI listed products registered for use in New York to combat apple powdery mildew. Consider products such as Microthiol Disperss, Serenade Opti, and Double Nickel LC. In our experimental trials we have observed Rampart to also be successful, but note that it is not OMRI listed. These products often perform well under scenarios of low disease pressure. Severe disease pressure may not be adequately controlled in your orchard solely with biopesticides, so remain vigilant.

Ongoing Research at Cornell AgriTech

Our research program continues to explore different products and novel application programs to best manage apple powdery mildew. In 2021, we are evaluating the efficacy of several conventional fungicides, as well as additional OMRI listed products to provide better information and commercial options to growers augmenting their disease management programs. We are also exploring application programs rotating conventional fungicides with biopesticides to harness the benefits of both chemistries. This work, supported by a NE SARE grant, will be made readily available in future communications, so stay tuned!

Conclusion

An effective early disease management program for powdery mildew will limit primary inoculum in the early season but stay vigilant for the signs of secondary disease spread. Extended warm periods without precipitation are of greatest concern, as relaxed fungicide programs during this time may allow powdery mildew to develop unchallenged. Apple scab is of course the primary concern in New York State, yet do not discount the trouble caused by an entrenched powdery mildew incursion in your orchard.

Figure 1. Primary infection of apple powdery mildew. Photo: K. Cox.

Figure 2. Secondary infection of apple powdery mildew. Photo: D. Strickland.