

Apple IPM for Beginners



Cornell University
Cooperative Extension

Powdery Mildew

Time of Concern

Tight cluster until shoots stop growing



Tight cluster



Terminal bud set

Damage



Figure 1. Mildew is growing out on shoot from overwintering infection of the vegetative bud last season. Photo: K. Cox, Cornell Univ.



Figure 2. Mildew growing out from overwintering infection of the flower bud last season. Photo: K. Cox, Cornell Univ.

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Pest Cycle

Powdery mildew (PM) is a fungal disease that appears as a white, powdery growth on leaves, and may distort shoot growth. The fungus survives from one season to the next by overwintering in infected buds—buds which will not produce fruit. Many infected buds die over winter if low temperatures go below -15°F, so PM tends to be worse after a mild winter. As these buds grow in the spring they develop the symptoms of infected shoots as in Figures 1 and 2. The optimal infection time for powdery mildew starts at tight cluster when PM infected blossom clusters and vegetative shoots begin to produce white powdery spores. The spores are windblown to new, healthy leaves while they are still growing and expanding, as in Figure 3. These new infections result in yellow spots developing on the upper surface of the leaves and begin to produce more white powdery spores on the undersurface. Eventually, these curling, drying leaves can't contribute to the tree's nutrition.

Powdery mildew fungus can infect new leaves when the temperature is between 50-77°F and the relative humidity is 70% or greater, especially in the nighttime and early morning hours. Rain is not necessary to cause infection; in fact, free water on the leaves prevents the spores from infecting the leaves, resulting in less powdery mildew during rainy seasons. When terminal buds set on shoots and there are no longer newly expanding leaves, new powdery mildew infections will stop. If PM is left unchecked in the tree, fruit will also become infected resulting in a "netted" appearance or russet on the skin of the apple shown in Figure 4.

Damage, Continued



Figure 3. Mildew infection during the summer spreading to new leaves. Photo: K. Cox, Cornell Univ.



Figure 4. Mildew infection of fruit resulting in netted appearance of skin.

IPM Steps for Beginners

1. Plant cultivars resistant to powdery mildew. Pay careful attention to susceptible varieties such as Cortland, Crispin, Gala, Ginger Gold, Honeycrisp, Jonagold, Idared, Paulared, Rome, Sansa, and NY-1.
2. Powdery mildew overwinters in apple buds. When scouting during tight cluster to pink, small orchardists can pick off infected shoots to remove inoculum, then start spraying for PM (add to scab sprays) on a 7-10 day schedule until terminal buds set at the end of the growing shoots in mid-summer.
3. Add sprayable sulfur to your pest control sprays when PM is a concern. Start at tight cluster and continue every 7 days if you see infected shoots, or if PM was a problem in years past. Caution: sulfur shouldn't be used during extremely hot weather as it can cause burning of the leaves and fruit when temperatures are above 80°F. Don't use sulfur 7-10 days before or after an oil application.
4. Stylet or other horticultural oil is another option for mildew control at 1% (1 gallon per 100 gallon solution). Use in cover sprays 2 weeks apart while leaves are still expanding. To avoid leaf and fruit burning, do not use if also applying captan or sulfur for other disease management in summer sprays.

Ready for More Precision?

Other fungicides effective for control can be applied on a 7-14 day interval starting no later than pink bud and continuing until terminal buds set. Good spray coverage is essential for effectiveness of fungicides. Many growers are experiencing reduced effectiveness of many fungicides due to fungicide resistance in mildew. For other product options, refer to the most current version of *Cornell Pest Management Guidelines for Commercial Tree fruit Production*. See the *Choosing Sprays* fact sheet in the Orchard IPM for Beginners series.