

Fall Scab Inoculum Reduction Strategies for Problem Orchards

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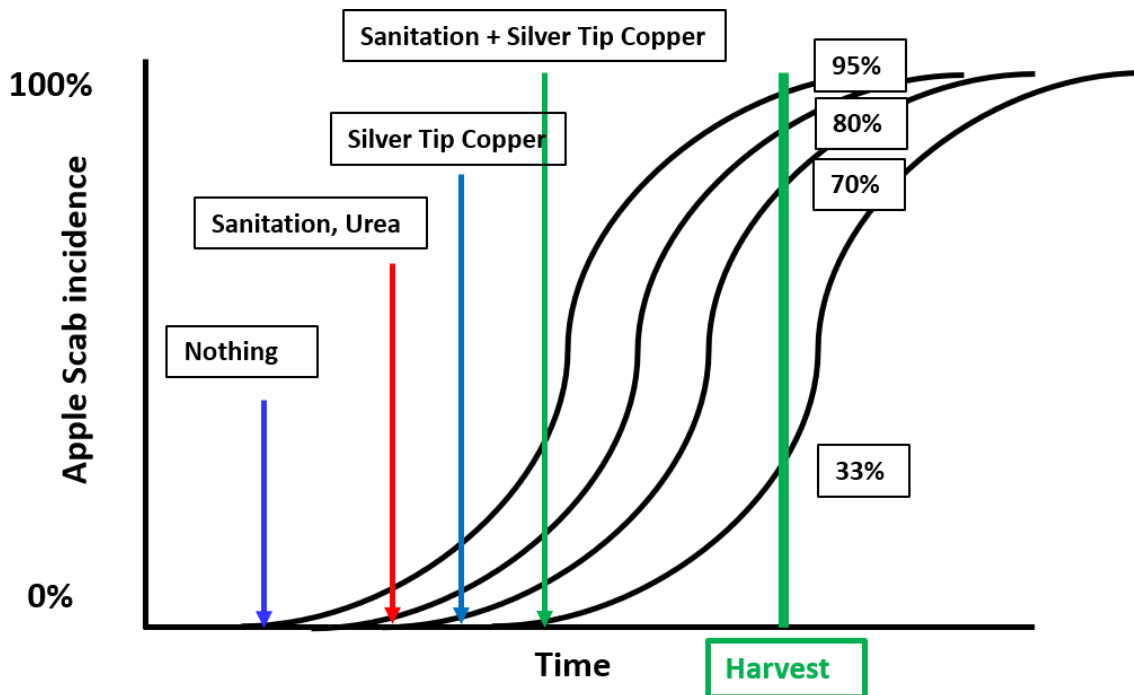
Click Through Statement: **Get your 2022 apple scab management off to a good start with fall urea applications and good orchard sanitation practices now.**

While scab was relatively light in 2021 throughout much of the Eastern NY region, there may be some problem blocks here and there that would benefit from inoculum reduction strategies this fall. The objective of inoculum reduction is to eliminate a large proportion of the ascospores that would otherwise be produced in overwintering leaves. Fungicides applied next spring will be more effective when applied in these reduced inoculum orchards. Inoculum reduction strategies have no value in orchards that did not have apple scab last year. Thus, the need for inoculum reduction must be assessed on a block-by-block basis, and in some cases may be needed only for scab-susceptible cultivars within a block. Ascospore reduction strategies will be beneficial for treated blocks even if the neighboring block is not treated, because studies have shown that effects of ascospore dissemination from large inoculum sources are usually visible only on those trees located within 100 feet of the inoculum source (Gomez et al., 2007; MacHardy, 1996).

Four approaches for inoculum reduction have proven effective in controlled studies in commercial orchards:

- a. Urea sprays (40 lb urea/A) applied to fallen leaves in autumn or spring (Sutton et al., 2000).
- b. Shredding of leaf litter with a flail mower (Sutton et al., 2000).
- c. Application of dolomitic lime (2.5 ton/A) over fallen leaves in autumn (Spotts et al., 1997).
- d. Removing leaf litter by raking, sweeping, or vacuuming leaves and removing them from the orchard (Gomez et al., 2007).

None of these approaches will eliminate 100% of the ascospores, but any one of them can reduce inoculum production by **80% or more**.



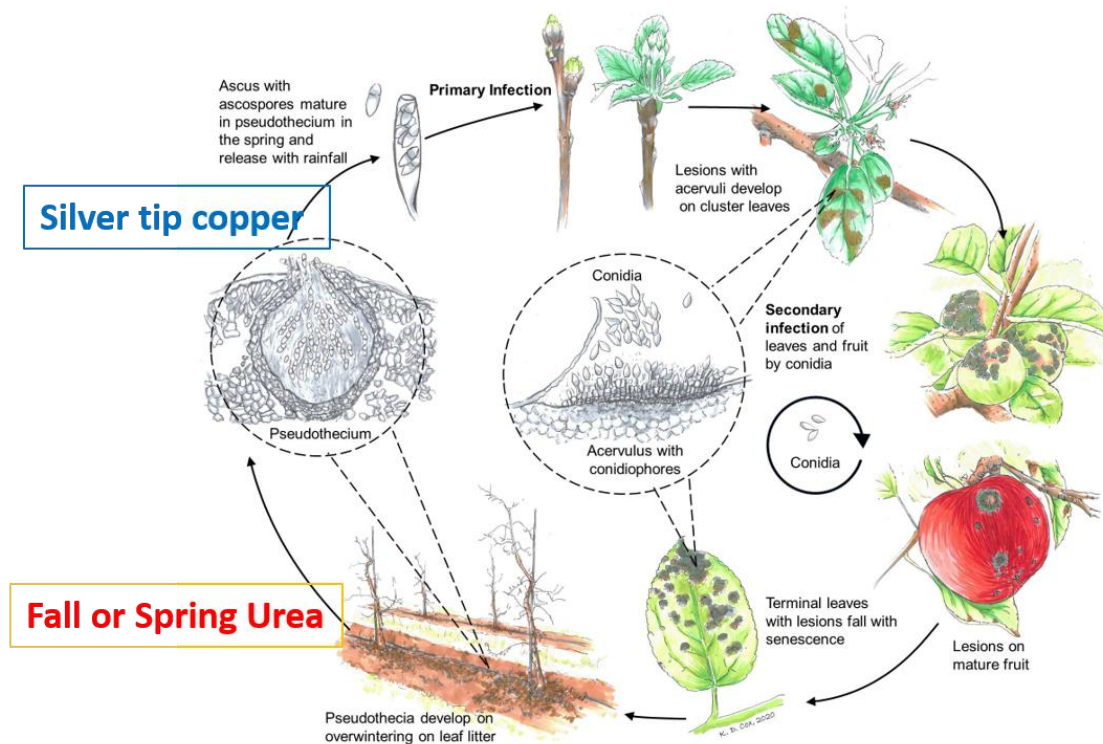
While fall sanitation and urea will not eliminate 100% of the overwintering ascospores on the orchard floor, they can reduce inoculum up to 80% or more. This helps to decrease scab incidence the following season, particularly when used alongside a silver tip copper application and well-timed spring fungicides in an integrated scab management program. Figure by K. Cox.

Urea applications to the orchard floor work by stimulating microbial breakdown of overwintering leaves. When using urea for inoculum reduction, each acre should be sprayed with 40 lbs of feed grade urea fertilizer dissolved in 100 gallons of water. It may be necessary to dissolve the urea prills in hot water before dumping them into a sprayer, because the prills may dissolve slowly in ice water pumped from a pond in late fall or early spring. Take care to flush the sprayer pumps with water afterwards since the urea is caustic and can corrode a pump over time. Applications as late as green tip can still reduce the numbers of ascospore available during peak discharge periods between tight cluster and bloom. 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 shoots that harbor the pathogens causing foliar diseases, cankers, and summer fruit rots.

In addition to orchard floor applications, urea can be applied to leaves still on the trees in late fall. However, this is less effective if the leaves do not fall off the trees within seven days, as the nitrogen will instead be taken up by the tree and will then be less available for leaf breakdown (Sundin and Irish-Brown, 2011).

Urea fertilizer contains 46% actual nitrogen in a highly soluble form. The portion of the urea spray that falls within the herbicide strip beneath the tree canopy (or inside the drip-line) will ultimately contribute somewhat to nitrogen fertilization of the trees whereas the portion of the spray that is applied to the sodded row middles will be utilized primarily by the ground cover. Nitrogen fertilizer rates may need to

be adjusted accordingly for orchards where urea is applied in spring. Using urea at less than 40 lb/A may have some effect on inoculum reduction, but benefits of lower rates of urea have not been adequately researched.



The apple scab life cycle. Urea applications and leaf shredding remove a large proportion of the primary inoculum by stimulating microbial breakdown of the overwintering leaves. Figure by K. Cox.

Please note that late season N applications to young trees have the potential to extend late season tree growth, and may hamper cold acclimation. Where the addition of nitrogen is undesirable for this and other horticultural reasons, leaf shredding with a flail mower may be a better option for reducing scab inoculum. Shredding leaf litter with a flail mower can reduce inoculum in several ways. First, it provides more “edges” in the leaf litter for invasion by the microflora that cause the leaves to decay. Second, if flail mowing is done in spring, the chopping action will result in re-orientation of most leaf pieces on the orchard floor and many ascospores will discharge into the soil rather than into the air. Effective leaf shredding can be accomplished only with a flail mower that is set so low that it nearly scalps the sod in the row middles. Effectiveness is also dependent on having a level orchard floor and on being able to shred most of the leaves beneath the tree canopy. This can be accomplished by raking or blowing the leaves into the row middles before mowing, or you can offset the mower to reach underneath the trees.



Shred leaves with a flail mower that is set so low that it nearly scalps the sod in the row middles. Offsetting the mower will allow you to shred as much of the leaves beneath the tree canopy as possible. Image by OMAFRA.

Dolomitic lime has not been widely tested as an inoculum reduction technique, but it was effective in Oregon when applied after leaf drop in autumn at 2.5 ton/A. Lime presumably works by raising the pH of fallen leaves so that they are suitable for invasion by bacteria and yeasts. Effectiveness of lime applied in springtime has not been evaluated, and effectiveness of autumn applications may also be reduced in areas where leaves remain frozen or covered with snow through most of the winter.

Leaf removal by raking or vacuuming leaves is being practiced in commercial orchards in Europe. Specialized equipment is required. This approach is more feasible for high-density manicured orchards than for older orchards with wide tree canopies. Removing leaves from orchards may be the most effective option for organic orchards because, if done carefully, it can reduce ascospore availability to almost zero.

Relevant Literature:

Gomez, C., Brun, L., Chauffour, D., DeLe Vallee, D. 2007. Effect of leaf litter management on scab development in an organic apple orchard. *Agriculture, Ecosystems and Environment* 118:249-255.

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Sundin, G., and A. Irish-Brown. 2011. Reduction of overwintering inoculum in orchards with apple scab. Michigan State University Extension. 22 October 2021.

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Sutton, D.K., Mac Hardy, W.E., and Lord, W.G. 2000. Effects of shredding or treating apple leaf litter with urea on ascospore dose of *Venturia inaequalis* and disease buildup. *Plant Dis.* 84:1319-1326.