PAD and Scab Inoculum Reduction: How to Save a Spray or Two

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Growers are often reluctant to try a new pest management technique because it is unfamiliar, and they do not feel confident in the details. It is a risk. In this article, we share some of our experience implementing the PAD and delayed spray approach. In it, we have tried to include the sort of detail that will make doing a PAD evaluation easier, in order to give growers more confidence in trying the delayed first spray approach.

First, and most important, DO NOT TRY TO DELAY THE FIRST FUNGICIDE APPLICATION IN A BLOCK WHERE THE PAD HAS NOT BEEN MEASURED ACCORDING TO THE SPECIFIC METHOD DESCRIBED HERE and in other publications. It is too easy to decide, on the basis of casual observations at harvest or the scab on fruit at packout that a block is "clean." In fact, it is very important to exam trees in a block systematically in order to get an accurate measurement of how much inoculum will be there in the spring. Scab can develop after harvest, particularly on trees in blocks with two to four or more sterol inhibitor (SI) fungicide sprays. On the other hand, a grower may decide on the basis of a couple of scabby leaves seen in passing that a block would not be a good candidate for delaying the first spray, but a systematic PAD count might show that the actual inoculum level for the block is low. So the first part in any delayed spray program is to do the PAD evaluation.

Second, not all blocks are appropriate for the PAD analysis and delayed spray approach. It should NOT be used in blocks of standard-sized trees or large semidwarf trees. Do NOT attempt it in blocks that are directly adjacent to unsprayed apple trees, wild crabapples, or poorly maintained commercial trees. Most scab spores do not travel very far, only about 100 feet from their source. If there is a source of inoculum within 100 feet of a block, it can start infections. A very low proportion of scab spores travel more than 100 feet, but if there is a major source of scab, such as an abandoned orchard, in the vicinity, it may produce enough inoculum to cause infections in blocks that are more than 100 feet away from it.

We recommend that you do not jump in and do the whole orchard right away, or select risky blocks. S tart small, and work up. Start with blocks having the following characteristics:

1. Had less scab than other blocks in the previous year.
2. Did not receive more than one SI fungicides the previous year.
3. Is relatively small, one to three acres. Break-up large blocks into smaller plots and do a PAD for each plot.

In later years, as a grower gains confidence in the PAD approach, block size can be increased.

It is also important to decide whether or not a flail chopper will be used to shred leaves, or urea will be applied to leaves, in order to reduce the number of scab spores in the block. These methods, leaf shredding or urea spraying, are a kind of sanitation; they clean up the scab inoculum.

We recommend that growers do orchard sanitation against scab regardless of the fungicide program that will be used. It reduces the risk of scab, and allows more room for error when using a conventional approach, that is no delay, with fungicide timing. It is simple. The fewer scab spores in the block, the lower the chance of primary scab. We recognize that sanitation is not always easy. Flail chopping has to be done in the late autumn, after leaf fall, or in the early spring before bud break. Urea is most effective if applied two to four weeks before bud break in the spring, with four weeks being preferable. This is a time when orchards may still be very wet and full of pruning brush.

Still, it is well worth the effort to use sanitation.

Done properly, sanitation significantly reduces the number of scab spores. Leaf chopping should try to cover as much of the orchard floor as possible. Ideally, this would include raking or blowing leaves from under trees into the alley, where they can be chopped. If this is done, it will reduce over-wintering scab inoculum by 80 to 90%. If removing leaves from under the trees is impossible, chopping in the alleys, that is, over about 75-80% of the orchard floor, will reduce the scab inoculum 55 to 60%.

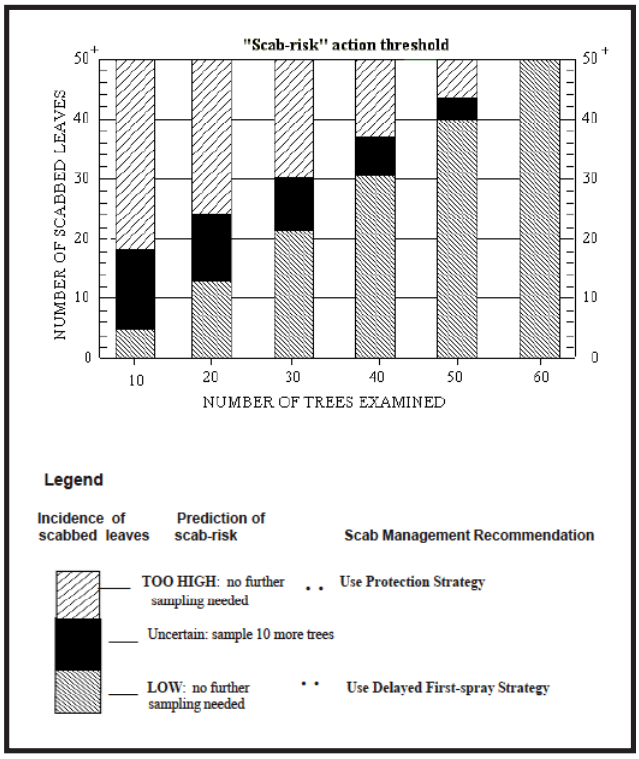
Urea is best applied in the spring, four weeks before bud break. Use agricultural grade urea, approximately 46% nitrogen, and mix a 5% solution in water. This is about 44 pounds per 100 gal. of water. Spray the ground surface at a rate of 100 gallons per acre. A boom sprayer is most effective, but an airblast sprayer with nozzles directed towards the ground will work. Spraying the surface of the leaves on the ground with urea will reduce spores by about 66%. Addition of nitrogen through these urea applications does not significantly contribute to nitrogen in trees. It is also good to apply lime at this time. It will have more time to get into the soil, will have some direct impact on the scab, and may increase earthworm activity on the scabby leaves.

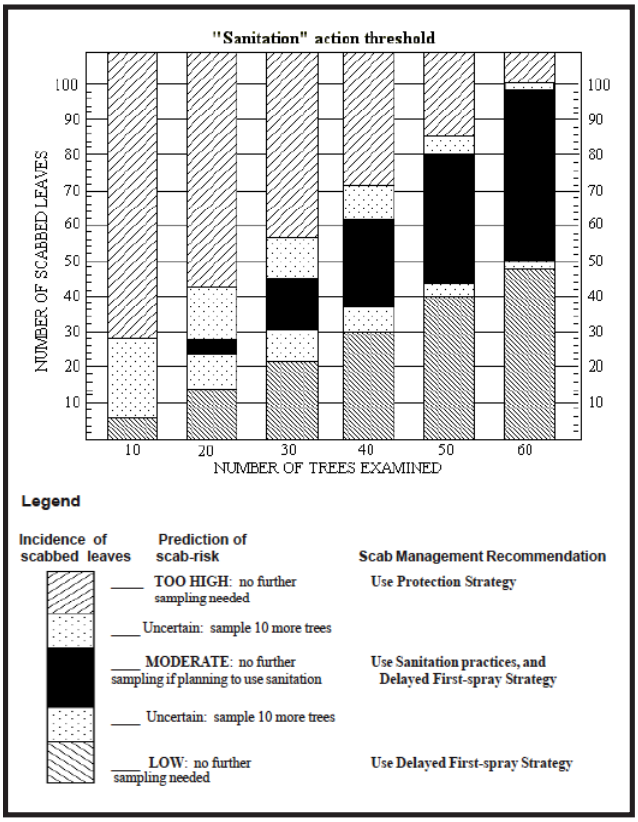
If it turns out to be too difficult to do the urea application this spring, a fall application to the leaves on the tree may be used, and has been even more effective than ground sprays. Growers have been concerned that addition of nitrogen at this time causes hardiness problems, but there is no evidence that this happens. In fact, applications of nitrogen at this level in the fall have been recommended as a way to improve nutrition in buds, allowing them to enter the next spring with less stress.

Once a decision has been made regarding sanitation, and a block is selected, the PAD analysis needs to be done. It must be done before leaves start to drop, but following harvest, usually in late October. Start PAD counts in one corner or along a border row and pick a tree at random. If the trees are approximately 9-12 ft. tall, examine 10 shoots on the tree, and record the number of leaves with scab on each shoot. Look on upper and lower leaf surfaces, and look at shoots on all sections of the trees so that you get a good representation of what is there: inner, outer, upper, lower, and from all four quadrants of the canopy. Then move on to the next tree. To decide which tree is "the next tree", estimate how many trees are in the block, and divide by 10, because a total of 10 trees need to be evaluated. If there are about 400 trees in the block, choose a direction, and walk along counting trees until the fortieth is reached. Examine 10 shoots in that tree for scab. Continue on until 10 trees have been evaluated. Try to select trees in a pattern that covers the block, and make sure that at least one or two trees in the highest risk areas, such as corners near woods or low areas, are sampled. Try to sample about as many trees in the interior of the block as in the three border rows on the edges of the block.

If the trees are smaller than about nine feet, examine the same number of shoots, but look at more trees per block and fewer shoots per tree. For example, if you have six-foot trees, examine five shoots on twenty trees.

Next, total the number of scabbed leaves on the 100 shoots, and decide if further sampling is needed to predict the 'scab-risk" of the block of apples. To do this, special charts have been developed. Small ver-





sions of these charts are shown below, and larger versions are available as a Fact Sheet, and in the New England Tree Fruit Management Guide. Basically, if scab levels are either very low or very high, no further sampling is needed. But, if scab levels in a mid-range, then more samples need to be taken to improve the accuracy of the count. This is called sequential sampling, and it saves sampling time by limiting counts in areas where scab is obviously low enough to allow a delay the next year, or high enough that no delay will be possible. Only those blocks where that decision is not clear need to be sampled further.

Here are some examples. Grower Jones had 1 scabbed leaf on the 100 shoots of the 10 trees that we sampled in his block. He had decided that he would use a urea spray in the block, so he checked the chart for "Sanitation Action Threshold". One was "low" and no further sampling was needed. Jones would be able to delay his first fungicide application next year. It took about 20-25 minutes to assess.

Garcia counted leaves on 10 trees, and found 12 that had scab. He was not planning to use any sanitation method in the block, so he checked the "Scab-risk action threshold" chart. That said that he needed to sample more, because it was possible to determine whether risk was low or high. Garcia sampled an additional 10 trees, and found 16 more scabby leaves. He added the first 12 scabby leaves he had found earlier to these 16, for a total of 28 scabby leaves. He then checked the column for 20 trees examined. This told him that the block had a high level of scab, and that he should not use a delay. It took him about 40 minutes to do the whole job.

Garcia then wondered what might happen if he did chop his leaves or use urea. So he checked the "Sanitation" chart. That indicated that his scab level was moderate, and that if he did use sanitation, he could delay his first scab spray. So, Garcia chopped leaves in the fall, applied urea the next spring, and delayed his first scab spray to tight cluster.

In the next issue (Preliminary Observations Using PAD to Delay the First Apple Scab Fungicide Application), we will describe the results of our first tests using this method. The results have been positive, and show that with a relatively small investment of time in the PAD measurements, growers can have a much more accurate reading of the scab risk in a block. This approach can be combined with sanitation methods that reduce scab inoculum and allow growers to delay the first fungicide application to tight cluster, or until after three scab infection periods, whichever comes first. To many growers, saving one or two fungicide sprays may not be worth a significant increase in risk of scab. The issue needs further study, and we will continue to test the approach in small blocks, to determine whether risk really is significant in blocks that use PAD and sanitation to delay a spray, or, as it appears to this point, the risk is small to nonexistent.

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