



Vermont Apple IPM News

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Summary of Stage of 2006 Bud Development:

Date	UVM HRC South Burlington Chittenden Co. Elev. 71 M	Shoreham Addison Co. Elev. 107 M	South Hero Grand Isle Co. Elev. 54M	Dummerston Windham Co. Elev. 171 M
4/01	Dormant / Slight Swelling	Dormant Silver Tip (4/05)	Dormant	Early Silver Tip
4/10	Silver Tip	.	Silver Tip	Green Tip (4/13)
4/17	Green Tip (GT) 4/13 Half-Inch Green (HIG) 4/19	GT 4/13 HIG 4/19	GT 4/14	GT 4/13 1/4" GT 4/17
4/24	Early Tight Cluster (TC)	TC 4/27	HIG 4/19	Early Tight Cluster (TC)
5/01	TC 4/27	Pink 5/04	TC	Pink 4/29
5/08	Pink 5/05 King Bloom 5/08 Full Bloom 5/10	King Bloom 5/05 Full Bloom 5/06	Pink 5/06 First Bloom 5/11	King Bloom 5/06 Full Bloom 5/08
5/15	Petal Fall 5/19	Petal Fall (PF) 5/13	Full Bloom 5/15 95% Petal Fall 5/19 100% Petal Fall 5/20	Petal Fall 5/19

Disease Management Update

Fire Blight — The weather we have had since May 27 is fire blight weather !! IF any straggling blossoms were present on May 27, the MARYBLYT™ fire blight model, using Skybit weather estimates, indicates that all the criteria for infection would have been met in the Dummerston area and there would be a high risk of infection at the other three sites listed above (i.e., three out of the four criteria for infection would have been met). At the UVM HRC and Shoreham, it is predicted that all criteria for infection would have been met on May 28 assuming any blossoms were present; South Hero was at a high risk for infection on May 28. By Monday, May 29, it was predicted that infection would have occurred at all sites if blossoms were present and conditions would be favorable for infection through at least June 2. Again, this assumes

bloom and rain. Blossom blight symptoms might begin to show up potentially as early as June 5 so it would be good to observe any trees that had late bloom for fire blight symptoms early next week. It is important to cut out fire blight strikes as soon as possible particularly on young trees. If possible, make cuts 8-12 inches or more below visible symptoms on a dry, sunny day. Make cuts into wood that is at least 2 years old. Do not cut back to the next healthy limb or spur but leave at least a 4-5 inch “ugly stub” which should be removed during the dormant period when the temperature is too cold for the fire blight bacteria to multiple.

Apple Scab - As you can see in the chart below, it is estimated that all of the monitored sites have reached 900 DD from Green Tip. Conservatively, it is assumed that the final ascospores will be released in the next daytime rain of at least 0.1 inch and if the temperature is at least 50 F during the wetting period. However, it will take at least 9-10 days (or more at cooler temperatures) from the last infection period of the primary scab season for any lesions to develop — so it will take more time to determine how successful your scab management program has been. Note that in cooler areas of the state, ascospore maturity will lag behind that indicated below.

Cedar Apple Rust - - Small, bright yellow/orange lesions have been observed on non-sprayed susceptible cultivars indicating that infection did take place during previous wet weather. Fortunately, the disease does not increase during the rest of the season.

Disease Symptoms to Watch:

Powdery Mildew - both the primary infection sites (i.e., mildew-covered shoots that developed from buds where the fungus overwintered) and secondary lesions may be present now in orchards

Blossom End Rots - because of the wet weather during bloom we may see more blossom end rots this year on McIntosh, Paulared and Delicious.

Moldy Core - wet weather during bloom is favorable for the fungi that cause this disease; infection may cause the fruit to redden prematurely in early July or August.

2006 Degree Day Accumulation for Apple Scab Ascospore Maturity

2006 Estimated Degree-Day Accumulation (Base 32F, from McIntosh Green Tip) for Selected Sites				
	UVM HRC South Burlington Chittenden Co. Elev. 71 M	Shoreham Addison Co. Elev. 107 M	South Hero Grand Isle Co. Elev. 54M	Dummerston Windham Co. Elev. 171 M
Date	04/13 (GT)	04/13 (GT)	04/13 (GT)	04/14(GT)
5/20	759	757	748	756
5/28	951	949	942	957



Leaf spots observed this week

Leaf Spots - The picture above was taken on Tuesday on a non-sprayed tree at the UVM Hort. Res. Center. There are various causes of leaf spots. The following is an article written by Dr. Dave Rosenberger which just appeared in the *Scaffolds Fruit Journal* on May 30, 2006 which covers some of the causes of early season leaf spots.

“Leaf spots on fruit trees are caused by a wide variety of pathogens and abiotic factors. Most growers can identify typical leaf lesions caused by apple scab, cedar apple rust, powdery mildew, and cherry leaf spot. However, when leaves develop small, nondescript brown leaf spots or small shot holes, even experienced plant pathologists often have difficulty identifying the causes.

Fortunately, the nondescript leaf spot diseases in the Northeastern United States rarely cause economic losses, even when their appearance temporarily disfigures the tree canopy. The fungi causing apple leaf spot diseases either do not have secondary cycles on leaves or they are easily controlled with fungicides and appear only when fungicide protection is disrupted by extended spring rain events. Abiotic leaf spots that develop shortly after petal fall are often attributable to agrichemical mixtures that have caused localized phytotoxicity.

Following are some of the most common causes of early season leaf spots and clues for determining their causes. The electronic version of this article, available at <http://www.nysaes.cornell.edu/ent/scaffolds/2006/>, includes color photographs that may be helpful in diagnosis. This article focuses on leaf spots that may appear in May, June, and July. Leaf spots with other causes and symptoms sometimes appear during August and September, but they will not be discussed here.

Frog-eye leaf spot, caused by *Botryosphaeria obtusa*, is the stereotypical leaf spot disease on apples. Frog-eye leaf spots are round, dark brown spots, 2-5 mm in diameter, with an almost black border and a tan center. Individual leaves may have a single spot or as many as 30 to 50 spots. Frog-eye can usually be differentiated from other kinds of leaf spots by its non-random distribution and its association with nearby inoculum sources. In sprayed orchards, frog-eye leaf spots are usually concentrated in the vicinity of mummified fruitlets that were

retained after fruit thinning. Fruitlet mummies can be colonized by *B. obtusa* and then provide inoculum for infecting the leaves the following season. Spores are dispersed by splashing rain between tight cluster and about second cover. Frog-eye is most common on apple cultivars such as Cortland, Northern Spy, and Honeycrisp, that retain many fruitlets after chemical thinning. However, all cultivars may retain thinned fruit in years when weather conditions fail to promote rapid abscission of thinned fruitlets.

Frog-eye leaf spot may cause premature drop of severely affected leaves, but most damage from frog-eye is cosmetic. The same fungus that causes frog-eye leaf spot also causes black rot fruit decay, but there is no evidence that leaf spots contribute to fruit infection. Instead, the inoculum for fruit infection comes from the same fruit mummies that provide the inoculum for leaf infection. Thus, frog-eye on leaves can be viewed as an indicator for conditions that may have favored infection of fruit, but the leaves themselves do not contribute directly to the development of black rot on fruit. Black rot infections in fruit may remain quiescent until fruit ripen because green fruit contain inhibitors that prevent fungal growth.

Most fungicides control frog-eye leaf spot, but the SI fungicides (Rubigan, Nova, Procure) and the 3 lb/A rates of mancozeb or Polyram are less effective than captan, Flint, and Sovran. Severity of leaf spotting around fruitlet mummies may be affected by the fungicide program that was used the previous season because fungicides used after thinning may prevent the fruitlets from becoming infected as they dry out during summer. However, the relationship between spray programs, colonization of retained fruitlets by *B. obtusa*, and inoculum levels within trees has not been documented for most of the fungicides currently available.

Rust-induced leaf spots develop when cedar apple rust and hawthorn rust infections are killed either by subsequent application of SI fungicides or by host incompatibility reactions. SI fungicides applied within 96 hr of the start of wetting periods will eliminate rust infections before they can cause visible damage to leaves. However, if SI fungicides are applied more than 4 days after infection, leaf cells invaded by the rust fungi will die even though the rust fungus is eradicated. These killed leaf cells result in small 1-2-mm diameter leaf spots that are tan or brown, sometimes with a tiny orange rust fleck in the center of the leaf spot. Similar lesions can appear on McIntosh, Empire, Liberty, and other rust-resistant cultivars if trees are subjected to high levels of rust inoculum in the absence of fungicide protection. On the rust-resistant cultivars, fungal development is arrested by the genetic resistance of the host rather than by fungicide activity, but the resulting leaf spots are similar.

Leaf cells killed by the initial phases of rust infections provide an entry point for other less-pathogenic leaf spot pathogens such as *Botryosphaeria*, *Alternaria*, or *Phomopsis* species. These fungi invade cells killed or damaged by failed rust infections and then move into adjacent healthy tissue, thereby enlarging the leaf spots until the individual lesions look like frog-eye leaf spots. Rust-induced leaf spots can be distinguished from frog-eye leaf spots because the former are uniformly distributed throughout tree canopies, whereas the latter are clustered near inoculum sources. Sometimes the original orange-yellow rust lesion

remains visible in the center of rust induced leaf spots, whereas frog-eye leaf spots never have such bright orange centers.

Other leaf spots resulting from fungus-fungicide interactions can develop when SI fungicides, strobilurin fungicides (Sovran, Flint, Pristine), or Topsin M are applied to leaves that contain incubating apple scab or mildew lesions. Scab spots that are arrested during the early part of the incubation period (roughly 5 to 8 days after infection) can produce "ghost lesions." Ghost lesions are indistinct pale spots 2-3 mm in diameter that develop where the scab fungus disrupted normal cell functions before the fungus was inactivated by the fungicide. The same fungicides applied just before scab lesions become visible can result in rusty, red-brown lesions that exhibit the usual size and shape of normal scab spots.

Post-infection application of the SIs and strobilurins can also cause "burned out" mildew lesions on leaves. Mildew lesions arrested by fungicides can appear on the upper leaf surface as large chlorotic lesions with indistinct margins, or on the lower leaf surface as more sharply-defined red blotches. Portions of the leaf compromised by mildew may be more susceptible to subsequent invasion by secondary pathogens that may cause necrotic spots or larger irregular areas of leaf necrosis.

Alternaria leaf spot appears as brown spots similar in size to frog-eye leaf spots. *Alternaria* species can be isolated from leaf spots in many orchards, especially in late summer, but *Alternaria* leaf spot does not cause economic damage in the northeast. In most cases, *Alternaria* is a secondary invader of damaged leaf tissue. In North Carolina and Virginia, however, a severe form of leaf spotting known as Alternaria blotch spreads rapidly during summer and causes premature defoliation of affected trees. Delicious is particularly susceptible. The strain of *Alternaria mali* that causes defoliation in the southeast may be different from the common *Alternaria mali* present in northeastern orchards. None of our fungicides are very effective for preventing Alternaria leaf spot or Alternaria blotch."



Scab lesions on a non-sprayed McIntosh leaf at the UVM Hort. Res. Center this week.

Arthropod Management Update

Leafminers— Hope you are seeing what we are seeing — a very low LM population. We are finding it difficult to locate sap-feeding mines. Again, the following are the thresholds for 1st generation LM sap-feeding mines: McIntosh: 7 mines per 100 leaves; Non-McIntosh: 14 mines/100 leaves.

European Apple Sawfly— We are observing some fruit damage by the EAS in non-sprayed blocks. Below is a picture of relatively fresh egg-laying damage near the calyx end of a developing apple. Note that the larva has not started tunneling under the apple “skin” .



EAS damage

Codling Moth — In orchards where CM are a problem, optimal spray timing can be estimated by setting up pheromone traps during bloom. At the UVM Hort. Res. Center, we started trapping CM adults on May 17th (biofix). As of the morning of May 30th, 109 DD (base 50 F) had accumulated from the biofix. The biofix in the Shoreham area has been reported as May 25th and as of May 29th, 76 DD had accumulated. In orchards where one insecticide application is sufficient for management, optimal timing is at 360 DD after the biofix. If two treatments are needed, the first application should be applied at 250 DD, with the second application 3 weeks later. This week in our CM pheromone traps we had a big jump in trap captures indicating the moths are active !

White Apple Leafhopper - It is time to check your orchard for leafhoppers. So far, we have seen very few. Threshold for WAL: 25 nymphs/adults per 100 leaves. Observations should be made on 20 leaves/tree on 5 trees/block for WAL nymphs and adults.

Green Apple Aphids - This week was the first time we saw a few winged adults on young terminal growth. But, we also saw lady bug beetles so hopefully the predator populations will do a good job in managing this insect this year.

Obliquebanded Leafroller - This insect overwinters as a second or third instar larva in a hibernaculum under fragments of bark or in cracks or crotches on the tree. They become active in the spring and feed on bud clusters, flowers, and developing fruit. Most of the severe damage caused from the overwintering larva occurs after petal fall and sprays applied at this time prevent damage. At the UVM Hort. Res. Center we hung pheromone traps to monitor adult flight activity on May 22 and have not trapped any moths yet. The optimal time to begin to scout for second generation OBLR is about 600 DD (base 43F) after the beginning of the first gen. moth flight. We will keep you updated on DD accumulation.

Plum Curculio - This insect is actively egg-laying and scars on the fruit (and the insect itself) have been observed this week. We have been tracking Degree Day accumulation from Petal Fall at the four locations listed below in order to use the predictive model developed at Cornell. The DD model estimates when PC management sprays are no longer necessary to protect fruit from damage. At 308 DD (Base 50F) after Petal Fall, PC stop immigrating into orchards and 40% of ovipositioning is complete. It is thought that PC adults that are already in the orchard are being killed by insecticide residues and thus, further ovipositioning is curtailed. The model predicts that no additional sprays are necessary whenever the date of accumulation of 308 DD falls within 10-14 days after a previous spray. Below is the DD that have accumulated through May 28 as estimated by Skybit.

2006 Degree Day Accumulation for Plum Curculio Oviposition

[Timing Insecticide Sprays using a Predictive Model](#)

2006 Estimated Degree-Day Accumulation (Base 50F, from 95% McIntosh Petal Fall Date) for Selected Sites				
Date	UVM HRC South Burlington Chittenden Co. Elev. 71 M	Shoreham Addison Co. Elev. 107 M	South Hero Grand Isle Co. Elev. 54M	Dummerston Windham Co. Elev. 171 M
95% McIntosh Petal Fall Date	5/19	5/13	5/19	5/19
5/20	9	38	4	7
5/28	70	98	67	78

Miscellaneous Observation — Crinkled Leaves

The following is a picture of a “crinkled” leaf. This type of leaf was not hard to find this week and usually occurred on older cluster leaves. It is an indication of the occurrence of cold temperatures early in the season.



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