What's Bugging You?

Phenology of Slippery Bark and Common Foliar Diseases

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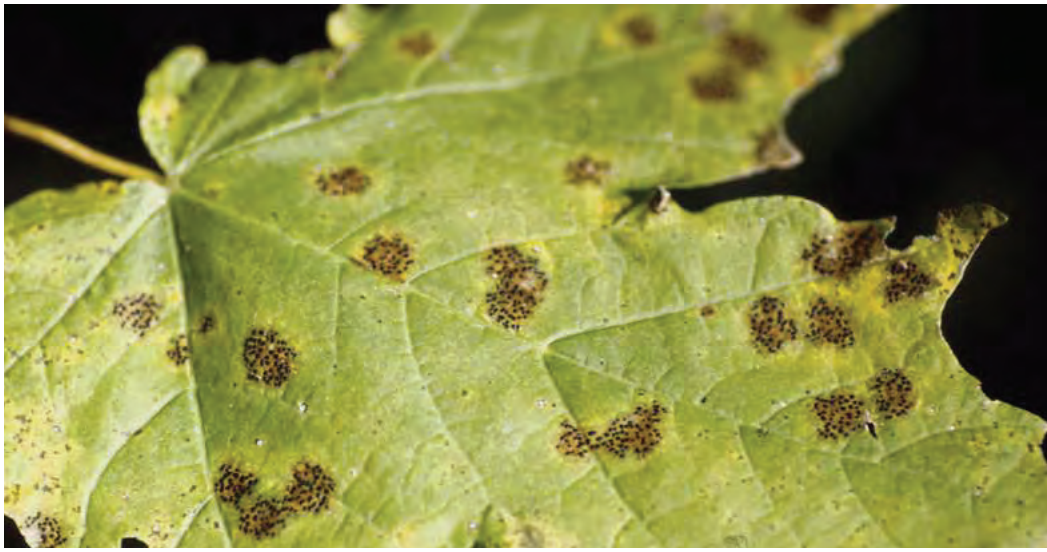
As mud season gives way to spring in New England, the pace of plant development quickens. We see that from the visual cues of plant phenology, the sequence and timing of biological events. The big early season events are upon us as the maple sap has run, buds swell, bud dormancy breaks, and leaves and flowers emerge. This is a good time for arborists to dust off their notebooks and record the calendar dates for phenological events. Trees don't know much about the Gregorian versus the Mayan calendar, but they are acutely aware of the sequence of events.

The phenology and the precise sequence are directed by the species genetic program and the external environment. The flower buds of red maple break dormancy well before the foliage emerges. Maple seeds can mature and germinate before the first foliar leaves are expanded. This accounts for the mass of red maple seedlings I pull during spring cleanup of flowerbeds. In contrast, coexisting red oak foliage is much later to emerge, with the flowers developing at about the same time. Red oak acorns mature the second season after flowering, allowing time for greater embryonic development.

Not as visible, but just as critical as leaf and flower production, is the onset of cell division by the vascular cambium, the tissue that divides and generates new xylem to the inside and new phloem to the outside. When fully differentiated (or mature), that xylem is wood. Mature phloem or "inner bark" is the main transport tissue for sugar and other essential biomolecules. During winter dormancy, the vascular cambium is only a few cells thick around the circumference of the woody stem, branches, and roots. During active cell division in the growing season, the vascular cambium increases in the number of undifferentiated cells, sometimes by a factor of at least two or three. The thick vascular

Tar spot, *Rhytisma punctatum* (Pers.) Fr. Sign—*Photo by Joseph O'Brien, USDA Forest Service*



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cambium supports active radial growth, but is especially vulnerable to "slipping" or mechanical injury. I've never really liked that term "slipping," because it sounds as if the parts could be slipped back in place, which is pretty unlikely. Even a glancing blow can shear the cells of the vascular cambium, resulting in tearing the inner bark away from the wood cylinder and rupturing the vascular cambium in the process. This is not always apparent at the time of injury and the killed face of the stem might be chalked up to sunscald, frost or something entirely unrelated to the actual injury. While the bark is slippery, keep heavy equipment from making contact with trees.

Anthracnose and Maple Tar Spot

Native pathogens take advantage of plant phenology. The two fungal pathogens that provoke the greatest number of distressed phone calls to my number are for oak anthracnose and maple tar spot. Both of these distinct diseases are caused by a small group of fungi. The severity of infection varies from one year to the next, but the anthracnose calls start in midsummer. I use the first appearance of tar spot to mark late summer, with autumn soon to follow. A large part of annual variation in severity is due to variable weather conditions during the time of leaf emergence.

The fungi that cause both diseases overwinter on fallen leaves and small cankers on attached branchlets. If early spring brings both warm and wet conditions, anthracnose spores will be produced as the leaves are just unfolding and before they develop a thick waxy surface or cuticle. As the spores germinate and infect unprotected tissue, leaves and shoots can rapidly wilt and die, presenting symptoms similar to those from frost injury. With slightly later infections, the fungus will grow in the leaf tissue, but without much symptom expression. However, by midsummer and at about the time of seasonal drought stress, leaf browning and even defoliation can occur. Still, most of that infection occurred much earlier in the growing season, we just didn't notice it! Because the anthracnose fungus can continue to produce spores during moist periods throughout the growing season, anthracnose inoculum is frequently present. Later infections, when leaves are fully expanded and mature, don't usually amount to more than small spots. The large, spreading scorch of anthracnose in late summer probably was due to early infections in the spring.

With tar spot, there is usually just a single period of infection by one or more species in the fungus genus *Rhytisma*. Again, spores are released from fungus fruiting bodies early in the growing season, and the leaves are infected as they emerge. If I really scout around, I can sometimes spot early infections as small, pale yellow spots in mid-to-late June, but no one ever calls me about them at that time. Come August, when the spots have enlarged and become thickened and deep black in color, the calls begin to come in. Depending on the species of *Rhytisma*, the spots are sometimes about the size of a nickel while other times the spots are small, about the size of coarsely ground pepper and again grouped into lesions about the diameter of a nickel.

This linkage of early spring injury and infection and disease development much later in the growing season presents a challenge for control. Minimizing mechanical impacts can reduce serious injury to tree stems. Proper sanitation can reduce the amount of overwintering inoculum and incidence of tar spot and anthracnose. A properly maintained notebook on day-to-day environmental conditions and phenological events can support both treatment recommendations of the arborist and client education on the linkage of current disease to environmental conditions early in development.