

Canker and Leaf Spot of European Hornbeam

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In recent years, a pattern of diseased European hornbeam (*Carpinus betulus*) has been observed in landscapes across the northeastern and central United States. Affected trees exhibit damaging twig and branch cankers, resulting in dieback. Most trees also exhibit pale green to yellow leaf spots. The disease seems to affect fastigate forms and has drawn the attention and concern of homeowners, landscapers, and arborists. Diagnosticians and researchers at the Bartlett Tree Research Laboratories are working to characterize this previously undescribed disease and develop management options.

Investigation Timeline

Investigation formally began in September 2022 with a fastigate European hornbeam growing in a residential landscape in Westport, CT. Symptoms included branch cankers, defoliation, and dieback (Figure 1). A physical sample was submitted to our diagnostic facilities in Charlotte, NC. A fuzzy, whitish gray fungal growth was present in the bark cracks of cankers that had never been seen before (Figure 2).

Figure 1: European hornbeam exhibiting abnormal coloration, dieback and defoliation

Photo credit: Doug Williams, Sept 2022



Figure 2: Cankered branches with whitish gray fungal growth in the bark cracks

Photo credit: Lorraine Graney, Sept 2022



After approximately one year of examining hornbeam samples, we identified the fungus likely causing the canker and yellow leaf spot symptoms, as well as the whitish gray fungus found in diseased bark crevices. This process involved numerous culture isolations from symptomatic samples received at the Diagnostic Lab. Several different fungi were identified using

molecular DNA analysis, but only one captured our interest as the potential causal agent of the symptoms—a slow-growing fungus in the genus *Sphaerulina*. The fuzzy, whitish gray fungus was identified as a member of the genus *Hansfordia* and two distinct species, *H. pulvinata* and *H. pruni* have been confirmed using DNA analysis. Interestingly, *H. pulvinata* is documented in scientific literature as a mycoparasite (a fungus that obtains nutrition by parasitizing other fungi). The role of *Hansfordia* relating to canker development is yet to be determined.

At this point, our attention is focused on the suspected pathogen *Sphaerulina*, but we continue to document findings of *Hansfordia*. A review of scientific literature on the genus *Sphaerulina* revealed species that cause leaf spots on a wide range of plants and only a few species causing cankers on a limited number of hosts. Extensive literature searches have not revealed the genus *Sphaerulina* causing leaf spots or cankers on European hornbeam. Presumably, this represents an undescribed host/pathogen relationship; however, old records in Europe of closely related fungi causing similar leaf spots of *Carpinus* species are still being investigated.

Current Distribution and Affected Hosts

As of May 2025, we have confirmed *Sphaerulina* from trees growing in Ohio, Connecticut, New York, New Jersey, Pennsylvania, Massachusetts, and Illinois. Most confirmed samples were from upright fastigate forms of European hornbeam such as *Carpinus betulus* ‘Fastigiata’. This is the most popular and readily available cultivar. To date, *Sphaerulina* has not been confirmed as a pathogen causing disease on American hornbeam (*Carpinus caroliniana*). However, it and other *Carpinus* species should be monitored as potential hosts.

When reviewing historical diagnostic records, we believe our first record of this disease came from a European hornbeam sample collected in July 2019 from Dublin, OH. Microscopic images revealed

Figure 3: Chlorotic leaf spots on first known case

Photo credit: Brian Moody and Lorraine Graney, July 2019



characteristic leaf spots and spores from this sample matched those of DNA confirmed samples (Figure 3). Based on Google imagery, the affected European hornbeam trees from Dublin, OH were planted around 2014. The origin and prior condition of the trees is unknown.

Disease Cycle: Current Theory

- In early spring, infection of expanding leaves occurs from spores released from fungal fruiting bodies that developed on buds killed during the previous season. Spores are dispersed by rain and wind.
- Later in spring, randomly scattered or clustered yellowish green irregular shaped leaf spots appear (Figure 4). Spores continue to be released from fruiting bodies formed on infected leaf and branch tissue and infect new buds. Spores may be released through June during periods of rain. After that, spore production is thought to be minimal.
- The fungus grows slowly from buds into twigs and may eventually enter branch tissue causing canker and dieback disease symptoms.
- Canker expansion into trunk tissue has been recently confirmed from a bark sample; it remains to be seen if other pathogens are involved.

Ongoing Monitoring

Management programs are being designed based on what is currently known of the pathogen and theorized life cycle. Field trials over the next several years will be informative, although removal of severely declining European hornbeam may be necessary. In the meantime, scouting and monitoring should be conducted according to the following guidelines:

- Look for twigs retaining dead leaves. Follow the dead twigs to the point of attachment on the branch and look for developing canker symptoms. Cracking and swelling can usually be observed.
- Look at fully expanded leaves for the presence of yellowish green irregular shaped leaf spots.
- Monitor declining European hornbeam, especially fastigate forms planted as a screen. Note the dieback in the upper canopy (Figure 5).
- Dieback does not always start at the top. Some trees have been observed with declining branches in the middle canopy and live foliage remaining on upper and lower branches.
- Because the fungal structures of *Hansfordia* are easy to see, this can aid in locating branch cankers in the field. Its presence serves as an indicator of the causal fungus, *Sphaerulina*. Not every canker will have *Hansfordia* growth.

Figure 4: Chlorotic leaf spots on first known case

Photo credit: Brian Moody and Lorraine Graney, July 2019



Figure 5: Significant thinning and dieback of a fastigate hornbeam hedge

Photo credit: Fred Hoffman, May 2024



The bottom line: This is an emerging disease that has not yet been fully described and published, although we are working towards that goal. Our current research is focused on confirming the species of *Sphaerulina* as the causal agent of the observed disease symptoms according to Koch's postulates. We are also conducting research on management options in landscapes where the disease is present. Please contact your Bartlett Arborist Representative to learn about the ongoing research and management strategies.



Founded in 1926, The Bartlett Tree Research Laboratories is the research wing of Bartlett Tree Experts. Scientists here develop guidelines for all of the Company's services. The Lab also houses a state-of-the-art plant diagnostic clinic and provides vital technical support to Bartlett arborists and field staff for the benefit of our clients.