Future Threat: *Beech Leaf Disease*

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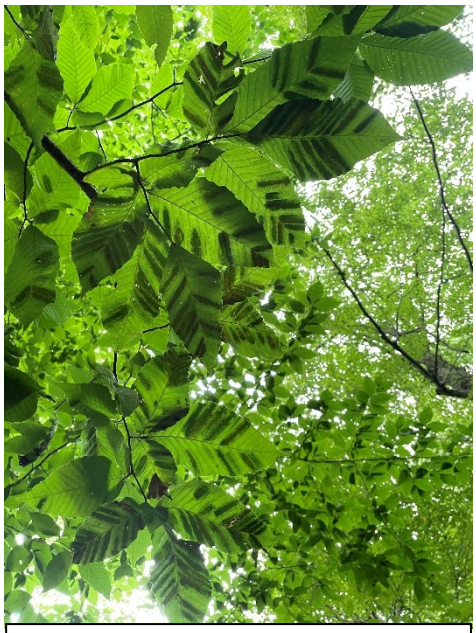
Summary: *Beech leaf disease caused by the nematode: Litylenchus crenatae mccannii* causes striping between the leaf veins; in severe cases foliage is deformed, chlorotic and significant canopy dieback is caused.

Common Names: Beech leaf disease (BLD)

Host: European, American, and Oriental Beech (*Fagus sylvatica, F. grandifolia*, *F. orientalis,*). Potential host: Chinese beech (*F. engleriana*) Mild symptoms on Japanese beech (*F. crenata)*. Further hosts are not yet known.

Beech leaf disease (BLD) is an emerging disease caused by a foliar-feeding nematode, or microscopic roundworm, known as *Litylenchus crenatae mccannii*. All cultivars of our native European beech as well as American beech are susceptible. Beech are ecologically important trees and are common feature trees in landscapes. Beech leaf disease was first observed in Ohio, USA in 2012. Since its initial detection, the disease has spread through much of Northeastern United States and into Ontario, Canada. The species was described initially on Japanese beech in Japan where it causes mild symptoms. In eastern North American, however, healthy beech trees have been observed dying within five to seven years from the onset of symptoms. The progression of BLD over time severely compromises tree health and often results in secondary pests and disease incidence.



Foliar symptoms of BLD. Photo: Dr. Matthew Borden (Bartlett Research Laboratory)

Symptoms:

Symptoms of BLD typically progress from the lower canopy upward but may be randomly scattered throughout the canopy. Early symptoms include distinct striping between the leaf veins and darkening and/or chlorosis of the infested area. From the top of the leaves, the interveinal discoloration may appear “cupped” or “puckered”.

After successive years of infestation, high numbers of nematodes causing damage within overwintering buds result in emerging new leaves that are increasingly deformed, chlorotic, and have a thickened, leathery texture. By this stage, the photosynthetic capacity of these damaged leaves is greatly reduced, and trees are unable to produce adequate amounts of carbohydrates. Bud death and twig dieback increases. The resulting lack of vigor and resources stresses the tree and predisposes it to other secondary invaders, such as insect borers, *Phytophthora*, and fungal cankers. Based on current knowledge, this nematode only infests leaf and bud tissue and has not been detected in woody tissues or roots.

Biology:

The causal agent of BLD is the foliar-feeding nematode *Litylenchus crenatae mccannii*. This nematode has an egg stage, several juvenile stages, and an adult stage where both male and female nematodes

are present. Late in the growing season, nematodes exit infested leaves and migrate to vegetative buds. Over the winter months, they feed and reproduce within the buds, inducing gall-like cell malformation between the leaf veins. Once the buds open in spring, BLD symptoms are immediately evident on infested leaves.

At leaf expansion, numerous nematodes and eggs may be dispersed by wind and rain splash. As the summer progresses, populations rapidly increase with activity peaking from late summer to early autumn. Nematodes move in shallow films of water (from irrigation or precipitation) on the surface of leaves and bark. In addition to wind-driven rain as a likely source of local spread, there have been reports of nematodes "hitching a ride" on arthropods (e.g. mites, insects). It is still unclear how the nematodes are moving long distances, but birds have been implicated and research is underway in the USA. Importation and movement of infected plant material may cause long distance spread and should be avoided.

Maybe Confused with:

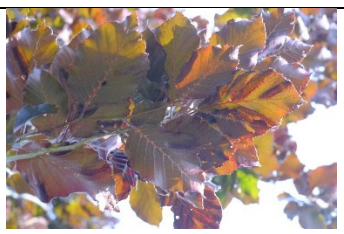
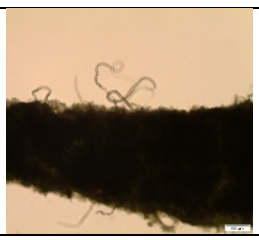
- Leaf Miners: Such as *Phyllonorycter*, these can be seen, if still present, within the leaf by holding the leaf up against a light source.
- Felt galls: caused by an Eriophyid gall mite (*Aceria nervisequa*) which causes leaf distortion and discoloration.
- Aphid feeding: foliage discoloration and a tattered appearance may be confused with BLD.
- Fungal leaf spot: *Petrakia liobae* a fungal leaf spot which may be incoming into the UK, also affects Hornbeam. Currently not in the UK but discovered in Switzerland in 2008 and subsequently found in Austria, Germany and Slovakia.

Management:

Outbreaks and suspected cases should be reported immediately via TreeAlert.

Effective management programs are available in the USA via use of specialist plant protection products applied to the canopy or as a root flare injection; however, in the UK these products are not licenced. Use of these products is only possible if new plant protection products are licenced within the UK.

As BLD can negatively impact mycorrhizal root associations, cultural treatments and soil care remain an important aspects of Beech health management. Other diseases, particularly *Phytophthora* root rot and canker are common secondary stressors. Some fertilisers known to promote the trees immune system have been shown to slow disease progression and severity of symptoms by enhancing resistance within the tree however, these are not expected to provide effective control alone.

			
Severely damaged leaf material	BLD on Fagus sylvatica 'purpurea'	BLD banding after several years of infection.	Nematodes observed microscopically from a leaf cross section
Photos taken by: Dr. Matthew Borden			