



Hornbeam (*Carpinus betulus*) decline

The European hornbeam (*Carpinus betulus*) is an ecologically significant tree species found in woodlands and widely cultivated in urban landscapes, hedges, topiary, and formal gardens.

Hornbeam decline is an escalating problem across Europe, caused by two fungal pathogens, *Anthostoma decipiens* and *Cryphonectria carpinicola*, which may infect trees either separately or simultaneously, leading to progressive decline. Infected trees commonly exhibit dieback, especially in the upper canopy, resulting in substantial foliage loss, and can die within a few years if heavily attacked.



Anthostoma decipiens

Background

The fungus *Anthostoma decipiens* causes dieback in European hornbeam, particularly in trees already stressed by hot and dry conditions. Since the 2000s, the damage caused by this pathogen has increased in several European countries. In cases where *Cryphonectria carpinicola* is also present, the infections tend to be more aggressive, leading to accelerated tree mortality.

The pathogen has two distinct fungal stages: *Cytospora decipiens* (asexual), which produces orange-red conidia (asexual spores), and *A. decipiens* (sexual), which forms black fruiting bodies that release ascospores (sexual spores).

Symptoms

- Large cankers with necrotic tissue, leading to cracks and lesions on the bark.
- Orange to deep red, resin-like clumps on trunks and main branches, produced by *C. decipiens* (Fig. 1).
- Black fruiting bodies with elongated appendages produced by *A. decipiens*, featuring a furrowed surface and a rounded shape when viewed from above (Fig. 2).



Fig 1. Red spore masses of *Cytospora decipiens* a) occurring of the trunk of infected trees, b) close-up of the fruiting bodies over dead tissue.



Fig 2. Black fruiting bodies of *Anthostoma decipiens* a) occurring of the trunk of infected trees, b) close-up of the fruiting bodies.

Cryphonectria carpinicola

Background

Cryphonectria carpinicola is a recently identified fungus, in 2021. The asexual stage of the fungus has been recorded in various European countries, while in Japan, the sexual stage has also been observed.

This species is considered a secondary pathogen, contributing to dieback on already stressed European hornbeams. It is frequently found in association with *Anthostoma decipiens*, both causing hornbeam decline. However *C. carpinicola* is considered to be less aggressive.

Symptoms

- Declining trees exhibit branch dieback and foliage loss (Fig. 3).
- Bark cankers that appear as visible areas of dead bark on the trunk (Fig. 4a) and branches (Fig. 4 b&c).
- Yellow-orange fungal tissue emerging through the bark (Fig. 5 a&b). Looking closer, the asexual spore-supporting structures, resembling orange tendrils, can be observed (Fig. 5c).



Fig 3. a,b) Hornbeam trees showing branch dieback.



Fig 4. Cankers caused by *Cryphonectria carpinicola* on hornbeam a) trunk and b,c) branches.



Fig 5. *C. carpinicola* a,b) fungal tissue breaking through the bark, c) orange tendrils that contain the asexual spores.