

Climate change and tree diseases

How will canker pathogens be influenced by climate change?

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Canker-inducing pathogens kill the inner, living bark of trees resulting in poorer growth or mortality of affected individuals which limits their contribution to climate change mitigation.

Background

A changing climate is predicted to influence the impact of canker pathogens in several ways. The growth or spore release of many of these damaging agents may be enhanced and their hosts may become more vulnerable to infection due to physiological stress, especially drought. Milder winters may also increase the overwintering success of certain canker pathogens and extend their active periods, providing more opportunities for successive years of damage to trees. Damage by latent pathogens is also likely to become more common as their hosts suffer from more frequent and severe drought stress. Finally, climate change may affect tree health indirectly by altering the soil and tree microbiome, but the likely impact of such changes on canker diseases is not yet clear.

Canker diseases are common on both broadleaves and conifers but the degree of damage which they typically cause varies: examples capable of causing significant damage to UK broadleaved trees, and likely to increase in both incidence and severity as a result of predicted climate changes, are described below.

Sooty bark disease of sycamore

- In healthy sycamore (*Acer pseudoplatanus*), the fungus *Cryptostroma corticale* can exist in latent form in the sapwood without causing symptoms.

It only causes disease if host trees suffer drought or high temperature stress and symptoms typically develop in the year following a summer in which the mean temperature in one or more months equalled or exceeded 23°C.

- The most conspicuous external symptom is the killing of bark, with the cankers becoming sooty in appearance as spores of the pathogen are liberated. Premature crown wilt and leaf drop can also occur, and affected trees may eventually die with the fungus persisting on the dead stems and branches.
- Currently *C. corticale* is found mainly in south-east England but occurs as far north as Yorkshire. It is expected to spread further north into Scotland but to remain largely confined to eastern regions where droughts are likely to be most frequent.

Cankers caused by *Biscogniauxia* species

- Infections by fungi in the genus *Biscogniauxia* are often cryptic, with the development of damaging cankers on branches and stems frequently being associated with drought episodes and high summer temperatures.
- *Biscogniauxia mediterranea* is the causal agent of charcoal disease which mainly affects oaks in the Mediterranean region, although beech and sweet chestnut can also be infected. Only sporadically reported in south-east England to date, it is predicted to become more common in England, particularly in drought-prone regions.
- *Biscogniauxia nummularia* occurs over much of Britain as an early coloniser of dead branches on beech trees but has also been found to cause

strip cankers of many metres in length on beech stems following episodes of drought. So far, such cankers have primarily been recorded in southern England but reductions in summer rainfall in areas where the fungus is already established are likely to result in the disease becoming more widespread and severe.

Bacterial bleeding canker of horse chestnut

- The bacterium *Pseudomonas syringae* pv. *aesculi* is present throughout the UK on horse chestnut (*Aesculus hippocastanum*). Infections result in bleeding lesions exuding a rusty-coloured fluid, sunken cankers and bark cracks.
- The pathogen can affect trees of any age but individual horse chestnuts vary in their susceptibility to the disease.
- Since this pathogen thrives in cool, wet conditions, milder winters may aid its persistence. More frequent periods of strong winds, resulting in damage to foliage, twigs and branches, are likely to increase opportunities for infection via injured areas on trees, while wind-driven rain may increase opportunities for dispersal of the bacterium.

Sweet chestnut blight

- The fungus *Cryphonectria parasitica* causes a disease of sweet chestnut (*Castanea sativa*) which is often fatal.
- It infects through bark fissures and injuries, producing a canker which can rapidly girdle stems and branches; orange fruiting bodies appear on the bark overlying the canker while fan-like aggregations of fungal strands may be visible beneath infected bark. Above the cankered region on a stem or branch, leaves often wilt and turn brown. See ***Cryphonectria on sweet chestnut*** for images and further links.
- Many parts of southern Britain are likely to provide the warmer, drier climate conducive to *C. parasitica* infection. An increase in precipitation in spring may promote spore production by the pathogen and milder winters may prolong its survival.
- *C. parasitica* is a recent arrival in the UK and is a regulated organism. Please report any suspected cases through TreeAlert.

International trade

The increasing trade in live plants on a global scale presents a serious risk of accidental introduction of pathogens into the UK, particularly within soil and potting media but also on asymptomatic plants. Experience has shown that when the presence of a disease is first recognised in a particular country, the causal pathogen is often well established in the environment, which can make containment and eradication very difficult. With climate change, pathogens adapted to warmer environments, which previously might have failed to establish in the UK, may be more likely to encounter suitable conditions for their survival and reproduction in this country.



Orange fruiting bodies of *Cryphonectria parasitica* on the surface of a chestnut blight canker.

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