Forest Research

Pine pitch canker

Field Guide

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EUROPEAN COOPERATION
IN SCIENCE AND TECHNOLOGY

COST Action FP1406 PINESTRENGTH

Pine pitch canker symptoms and further information

Pitch canker, also known as pitch pine or pine pitch canker, is a serious canker disease of pines (*Pinus* spp.) and Douglas fir (*Pseudotsuga menziesii*). It is caused by the fungus *Fusarium circinatum* (formerly *Gibberella circinata*). The disease affects trees in plantations, gardens, parks and nurseries.

Symptoms of pine pitch canker

These will include some (if not all) of the following:

1 Young plants and seedlings (see page 3)

Infected seedlings usually show damping off symptoms: the needles turn red, brown or chlorotic and die from the base up. The entire seedling may die. In some cases, affected seedlings may show brown discolouration on roots and the lower part of stems, or 'shepherd's crook' symptoms. However, seedling infection can also be asymptomatic.

2 Mature trees (see pages 4–9)

Yellowing of the needles, which turn red in time and finally drop, and dieback of the shoots from the tip, occasionally producing 'shepherd's crook' symptoms. Multiple branch tip dieback, a result of repeated infections, may lead to significant crown dieback. Cankers might appear on the shoots, on the main branches and even on the trunk, associated with conspicuous resin exudate (pitch) in response to fungal infection. The cankers can cause varying levels of trunk deformation (see page 8) and can eventually girdle branches and even trunks.

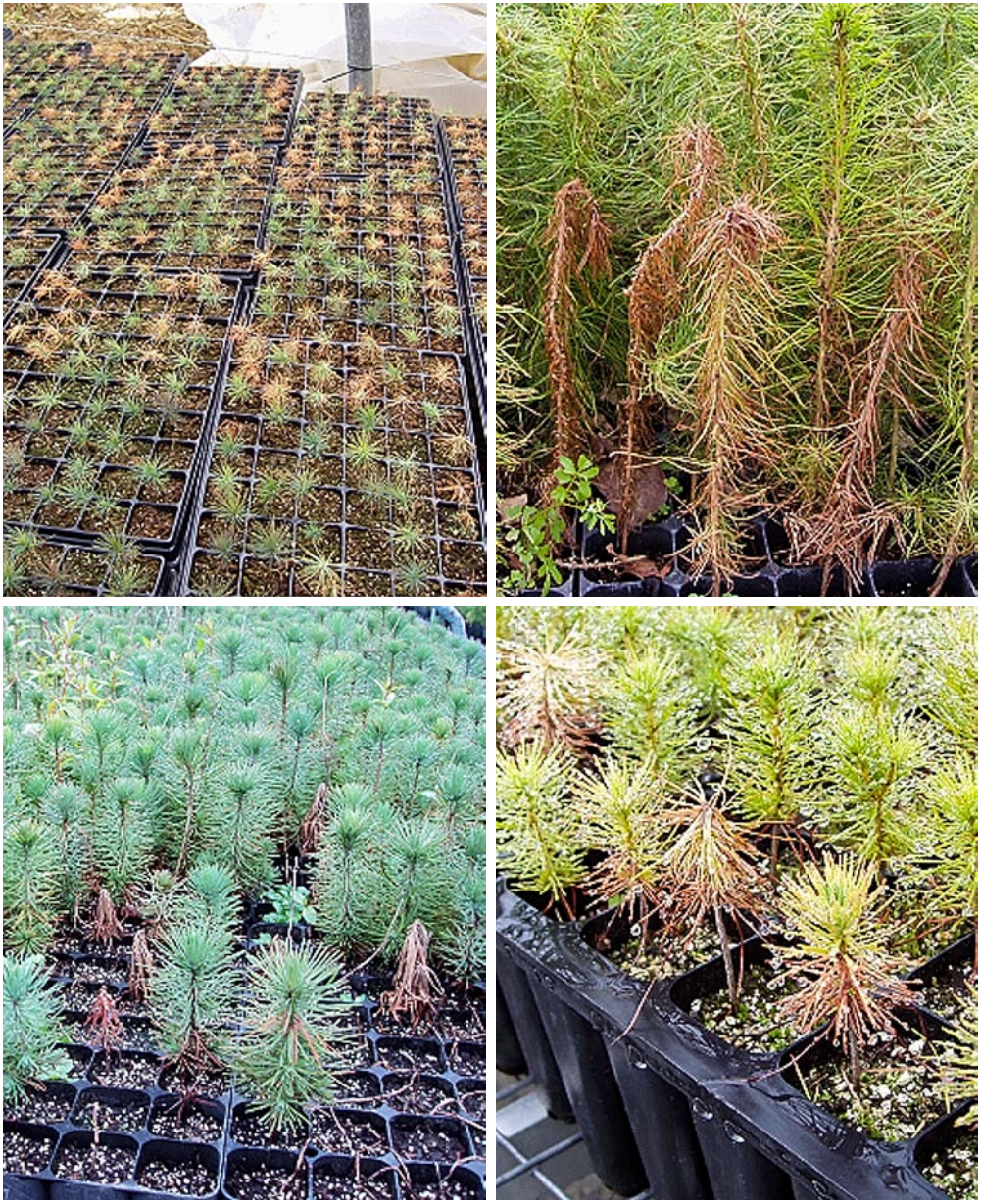
3 Female cones

Female cones may also become affected and abort before reaching full size.

4 Roots

Brown discoloration and disintegration of the cortex – similar to symptoms caused by other root rot pathogens. Infection originating in the roots may result in above-ground symptoms if the pathogen girdles the stem, causing yellowing of the foliage. Resin-soaked tissue may then be observed after removal of the bark on the lower part of the stem.

Some pathogens cause symptoms indistinguishable or extremely similar to *F. circinatum* and laboratory analysis should always be carried out to confirm the presence of the pathogen.



Pine pitch canker on *Pinus radiata* seedlings.

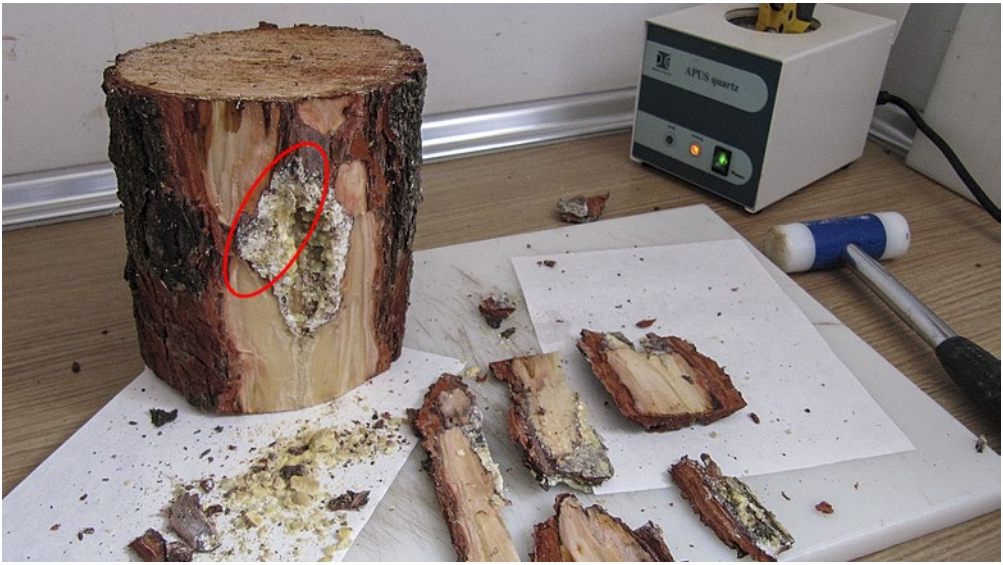
Dieback of shoots (*Pinus radiata*).

Dieback of shoots (*Pinus radiata*).

Resin bleeding on the stem of *Pinus radiata*.

Resin bleeding on the stem of *Pinus radiata*.

Cross sections of main stem showing varying severity of trunk deformation from mild (top) to severe (bottom).



Sampling of the live-dead junction (i.e. the lesion edge, circled) is critical for efficient diagnosis.

Copious production of resin under the bark of a diseased tree.

Table: Damaging agents with similar symptoms to *Fusarium circinatum*

Agent	Symptoms
Other *Fusarium* species (e.g. *F. proliferatum*, *F. oxysporum*, *F. verticillioides*)	Seedlings affected • Symptoms (pre, post and late damping off) indistinguishable from *F. circinatum*, except for the aggressiveness of the isolates. • Laboratory diagnosis needed. Trees affected • Frequently isolated from pine twigs and stems. However, no severe damage has been recorded. Symptoms are easily confused with *Diplodia* spp. • Laboratory diagnosis needed.
Damping off agents including: *Phytophthora* spp., *Pythium* spp., *Botrytis* spp., *Rhizoctonia* spp., etc.	Seedlings affected • Seedlings may fail to emerge (pre-emergence damping off). • Seedlings collapse, sometimes mycelium is visible on affected needles and shoots (see bottom, page 13). • Laboratory diagnosis needed.
Shoot and canker pathogens: *Diplodia sapinea*, *Gremmeniella abietina* (*Brunchorstia pinea*), *Ramichloridium pini*, *Crumenulopsis sororia*, *Cenangium ferruginosum*, *Caliciopsis pinea*	Trees and occasionally seedlings/recently planted trees affected • *Diplodia sapinea* and *Gremmeniella abietina* (*Brunchorstia pinea*) on *Pinus* spp. and *Pseudotsuga menziesii*. *Ramichloridium pini* on *Pinus contorta*. *Crumenulopsis sororia*, *Cenangium ferruginosum* and *Caliciopsis pinea* on *Pinus* spp. • *Diplodia sapinea* infection affects current year's growth. Shoots may fail to elongate fully, die and curl. Needles turn red-brown at first, later grey. Resin bleeding may be present on infected shoots (see page 12). • *Gremmeniella abietina* (*Brunchorstia pinea*) infection kills one-year-old shoots. Initial symptoms are needles that turn brown and die back from the base to the tip. Resin exudations are common and cankers can be formed on older stems. The underlying wood may be stained green to yellow (see page 14). • *Ramichloridium pini* causes death of terminal buds and yellowing and eventually browning of previous year's needles. Needles die back from base to tip. Dead needles may be retained making the damage very conspicuous (see top, page 13). • *Crumenulopsis sororia* causes resinous cankers and death of one-year-old shoots, often scattered in the lower crown. Resinous lesions can also be present on larger branches. The underlying wood may be stained dark blue to black. • *Cenangium ferruginosum* causes cankers on lower branches. Dieback is usually only a problem on stressed trees. • *Caliciopsis pinea* produces cankers with profuse resin bleeding on thin-barked areas of trees (see page 15). Small hair-like fruiting structures can sometimes be seen (see inset, page 15). • Laboratory diagnosis is needed as symptoms alone cannot be relied upon for confirmation of the causal agent.

Agent	Symptoms
Needle pathogens: *Dothistroma* spp., *Cyclaneusma* spp., *Lophodermium* spp., *Lophodermella* spp.	Seedlings and trees affected • Do not cause shoot wilting or dieback but severe infections can affect all needles on a shoot; infection is often worse in the lower crown. • A wide range of *Pinus* spp. affected. • *Dothistroma* spp. cause dieback of needles from the point of infection towards the distal end, often leaving bases of needles green. Infection points typically reddish and contain small black fruit bodies. • *Cyclaneusma* spp. result in yellowish to tan-brown needles with 'trap-door' like fruit bodies. • Infection by *Lophodermium* spp. turns needles blotchy reddish or purplish brown. • *Lophodermella* spp. infection turns needles a mottled greyish-brown. Often very localised.
Insects: *Hylobius abietis,* *Otiorhynchus sulcatus*	Seedlings affected (damage to mature trees insignificant) • Both *Pinus* spp. and *Pseudotsuga menziesii* affected. • *Hylobius abietis* feeds on the bark of *Pinus* spp. and *Pseudotsuga menziesii* causing wilting, chlorosis and seedling mortality. Examination of the stem might reveal all bark removed, i.e. seedling ring-barked. Primarily a problem on restocked sites. • *Otiorhynchus sulcatus* larvae feed on roots of seedlings (particularly containerised plants) causing wilting, dieback and death.
Insects: *Tomicus piniperda,* bark beetles (e.g. *Ips* spp.)	Trees affected • *Pinus* spp. affected. • *Tomicus piniperda* damage results in shoot browning, wilting and dieback. Insects bore up the centre of current year shoots and the presence of dead, hollowed out shoots on the ground is diagnostic (see page 16). • Bark beetles can cause severe resin bleeding similar to that caused by *F. circinatum* (see page 17).
Abiotic damage: salt damage, nutrient deficiency, winter damage/injury, drought, injuries and pruning wounds, etc.	Seedlings and trees affected • Both *Pinus* spp. and *Pseudotsuga menziesii* affected. • Localised dead or damaged shoots with older needles still green. No fruit bodies (except from secondary infections). • Winter damage/winter injury common on exposed sites (particularly *P. contorta* and *P. sylvestris* shoots). In late winter/early spring needles progress from dull green to bronze and bright red-brown. Affected shoots fail to flush; damage may be one-sided on shoots. • Injuries and pruning wounds can cause copious resin exudation on some pine species.

Shoot disease and canker: *Diplodia sapinea*.

Shoot disease: *Ramichloridium pini*.

Damping off: *Botrytis* spp. on *Pinus sylvestris*.

Shoot disease: *Gremmeniella abietina*.

Canker pathogen: *Caliciopsis pinea*.

Insect damage: *Tomicus piniperda*.

Bark beetle attack causing resin bleeding.

Pine pitch canker sampling guidance

FOR SEEDLINGS – collect samples of **ENTIRE** plants, i.e. including roots. If in a tree nursery, inspect ALL stock from the same seedlot, and **ALL** susceptible species within the nursery.

For MATURE TREES – collect samples from all affected components (shoots, branches, main stem) where the disease is believed to be present. Ensure that the live–dead junction (i.e. the lesion's edge) is included in the sample taken (see page 9).

Put all samples in ziplock bags and securely seal. Label the bag with as many of the details below as possible.

For all samples please supply:

- Photos of the symptoms if possible.
- Full details of the location of affected tree(s) including the nursery or forest name, address and GPS coordinates of the affected trees.
- Contact details and name of the assessor/sampler.
- Date samples taken.
- Tree species.
- The age/planting year, or as much information as possible (e.g. mature or recent planting).
- For nursery samples also provide the seedlot number or other identifier; the number of beds or area of the same stock and information on the surrounding stock.

Please post samples on the day of collection or keep refrigerated overnight and send to:

Tree Health Diagnostic and Advisory Service,
Forest Research,
Alice Holt Lodge,
Farnham, Surrey, GU10 4LH.

Alternatively, submit a report via TreeAlert: http://treealert.forestry.gov.uk

For more information

- To find out more about pests and diseases in the UK:
  www.forestry.gov.uk/pestsanddiseases
- For help with pest and disease diagnosis and other tree health issues, contact the Forest Research Tree Health Diagnostic and Advisory Service:
  www.forestry.gov.uk/fr/ddas
- For specific information about pine pitch canker go to the UK Risk Register:
  https://secure.fera.defra.gov.uk/phiw/riskRegister/viewPestRisks.cfm?cslref=12365

Contacts and plant health authorities

- Forestry Commission (Plant Health)
  www.forestry.gov.uk/planthealth
- APHA (Animal and Plant Health Agency)
  www.gov.uk/government/organisations/animal-and-plant-health-agency
- Scottish Government (Plant Health)
  www.scotland.gov.uk/planthealth

For more information on pine pitch canker symptoms see:
www.cost.eu/COST_Actions/fps/FP1406
www.forestry.gov.uk/pitchcanker#pest
www.forestry.gov.uk/PDF/FCPH-PPC.pdf/$FILE/FCPH-PPC.pdf

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