

‘Host of the month’ is a series of information sheets and blogs that highlight a tree host and their associated priority pests and diseases that are best seen and recorded in that month. For August we’re looking at pines (*Pinus* species) and Dothistroma needle blight.

Prior to the advent of the petroleum age conifer trees were the source of many useful volatile organic compounds, and Ponderosa pine (*P. ponderosa*) for example was found to be a rich source of turpentine. Unfortunately for resin distillers in mid-19th Century North America they failed to distinguish Ponderosa pine from its very similar cousin, Jeffrey pine (*P. jeffreyi*) which rather than turpentine contains high concentrations of unusually pure n-heptane. It was this highly volatile compound which led to a series of explosions at resin distilleries and also gives Jeffrey pine its other name, the gasoline tree. N-heptane from Jeffrey pine also played a critical role in the development of the Octane rating of Petrol, acting as the zero point for the scale.

Pines are the largest Genus of conifers with around 115 species and are part of the *Pinaceae* family along which also includes spruce (*Picea*), fir (*Abies*), cedar (*Cedrus*), larch (*Larix*), hemlock (*Tsuga*) and Douglas firs (*Pseudotsuga*). One of the defining characters of the family are the compound cones which are made up of woody scales paired with papery bracts, each scale bearing two seeds. In Pines each bract-scale pair is fused and indistinguishable whilst in species like Douglas fir (*Pseudotsuga menziesii*) they appear separate and distinct.

Like other *Pinaceae* the foliage of pines is needle-like, but uniquely it is borne in bundles of 2, 3 or 5 needles (fig. 2) with the sole exception of *Pinus monophylla*, which has single needles. The base of each needle bundle is wrapped in a papery sheath and this combined structure, known as a fascicle, is unique to pines. Needles generally remain on the tree for between three and five years before falling as a complete fascicle.



Figure 1: Pine resin oozing from a cut pine shoot (www.tcpermaculture.com)

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Figure 2: Left to right, fascicles of Scots pine (*P. sylvestris*), Radiata pine (*P. radiata*) and Macedonian pine (*P. peuce*).

In common with other *Pinaceae* pines bear separate male and female cones on the same tree, the male cones falling soon after releasing pollen. Following pollination the female cones ripen over two years, eventually opening to release the winged seeds.

In the UK we have one native species, Scots pine (*P. sylvestris*) which has the second widest range of any conifer, stretching from the west of Scotland to Kamchatka, and from central Spain to the Arctic circle - a range exceeded only by common juniper (*Juniperus communis*). Scots pine is ubiquitous across the UK but is considered truly native only to a few areas of the Scottish Highlands where it forms the dominant tree species of the once extensive Caledonian pine forest.

Pines are popular as a landscape tree, species such as the statuesque Monterey pine (*P. radiata*) and elegant Bhutan pine (*P. wallichiana*) are frequent in parks and large gardens, the former particularly in coastal areas. However, it is in forestry that the pines have excelled in the UK and three species have dominated: Scots pine, Corsican pine (*P. nigra* subsp. *laricio*), and Lodgepole pine (*Pinus contorta* subsp. *latifolia*). The table below gives some of the key differences between them.

Species	Needles	Needle length	Needle colour	Other features
Scots pine	2	2-8 cm	Glaucous	Broken needles with many white fibres. Flaky orange bark in the upper parts of the trunk and branches
Lodgepole pine	2	3-8 cm	Grassy green	Cones with spine tipped scales and persist on the tree for many years.
Corsican pine	2	8-18 cm	Dark green	Common in forestry plantations, needles less stiff than closely related Austrian pine..

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Priority pathogen - *Dothistroma* needle blight (DNB)

DNB is a disease of conifers caused by the fungus *Dothistroma septosporum* with pines being particularly susceptible. Until the late 1990's the disease was rarely seen in the UK and was primarily a problem on radiata pine in southern hemisphere countries like New Zealand. By 2006 it was found in 70% of the Corsican pine stands that were inspected in England, Scotland, and Wales but lodgepole pine (*P. contorta*) is also adversely affected and neither species is now planted to the same extent. Other affected species include Scots pine, Ponderosa pine (*P. ponderosa*) and Bishop pine (*P. muricata*) though the latter two are rare in the UK. The disease causes premature loss of needles older than one year and although trees can tolerate this, repeated and severe infections can gradually weaken the tree, reduce annual growth and eventually lead to death.

Identification

The first symptoms of infection with DNB are to be found on older needles towards the base of the crown. Soon after infection they develop a yellow-tan banding which gradually turns rusty red-orange, hence one of the former names for DNB, red-band needle blight. As the infection builds the ends of the infected needles turn brown while the bases remain green (fig. 3). This becomes increasingly apparent as summer progresses and eventually black fruit bodies appear on affected needles (fig. 4) and release spores which are spread via moist, misty air or rain-splash. Finally infected needles are shed prematurely, giving rise to a characteristic 'Lions tail' appearance (fig. 4).



Figure 3: (L-R) Young pine tree with symptomatic needles in the lower crown, a characteristic orange-red band on a Scots pine needle, and infected Corsican pine needles – note the green needle bases.

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Figure 4: (left) DNB fruit body on an infected pine needle (UK Crown copyright, courtesy of FERA) and (right) 'lions tail' appearance of shoots on an infected tree (Rebecca Gosling, Woodland Trust).

Lookalikes

There are many pathogens which can affect pine needles, the ones described here are those which cause symptoms which may be mistaken for DNB. Identification is often only possible via the fruiting bodies (x10 hand lens essential) and sometimes only with microscopic examination of the spores.

Several *Lophodermium* species can infect pines in the UK. They tend to cause spotting rather than banding, the spots often with yellow margins. As the infection progresses the entire needle turns yellow and the dark-coloured rugby ball shaped fruit bodies appear (fig. 5).

Like DNB, *Cyclaneusma* affects only the older needles and in Scots pine initially causes light green spotting, the spots rapidly enlarging to form yellow bands. The bands continue to expand, eventually causing the whole needle to turn yellow. Brown bands then develop on the yellowed needles and eventually fruiting bodies covered by a pair of flaps of needle tissue akin to trap doors which open to allow spore liberation in damp conditions are produced (fig. 6). Finally, affected needles turn red-brown and are shed from the tree.

Lophodermella often only affects one needle of the pair and can initially present banding like that of DNB. Symptom progression is rapid and often just one needle per pair is affected in Scots pine (fig. 7). When fruit bodies appear they are long and thin in comparison to DNB and arranged in neat lines.

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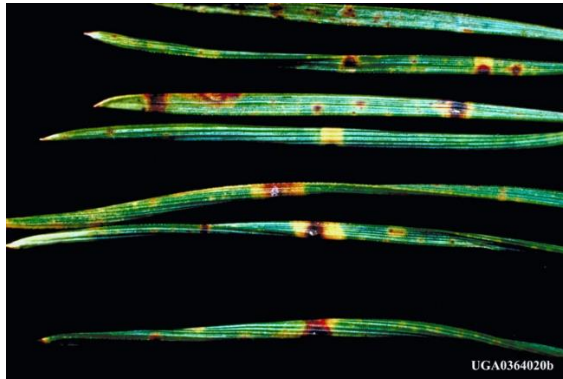


Figure 5: (Left) early stage *Lophodermium* symptoms on pine needles (USDA Forest Service, Bugwood.org) and (right) rugby ball-shaped fruit bodies (USDA Forest Service – North Central Research Station, USDA Forest Service, Bugwood.org)



Figure 6: (Left) *Cyclaneusma* symptoms on pine and (right) dead needles with 'trap door' fruit bodies (Joseph Obrien, USDA Forest Service, Bugwood.org).



Figure 7: Progression of *Lophodermella* infection on needles of Scots pine from early (left) to late stage (right).

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Ramichloridium pinii and *Brunchorstia pinea* affect whole shoots and not just the needles, in both cases the needles towards the tip of affected shoots rather than older needles on previous year's growth and the whole needle becomes straw-coloured (fig. 8).



Figure 8: Shoot diseases *Ramichloridium pinii* (left) and *Brunchorstia pinea* (right).

Pines are also prone to damage by a range of different insects including the Priority Pest **Pine processional moth**. This species is not yet found in the UK but is widespread in continental Europe. For more information check the [Observatree website](http://www.observatree.org.uk).

Reporting

Dothistroma needle blight is a priority pathogen in the UK so please report possible sightings via [TreeAlert](http://www.treealert.org.uk).

For more information and resources on Dothistroma needle blight check the [Observatree website](http://www.observatree.org.uk).

Matt Parratt, Forest Research, July 2024

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