Christmas Tree Needle Diseases

FACTSHEET

Consumers are looking for Christmas trees with uniform branches and thick needle coverage that make attractive display pieces. The impact of foliar diseases can be seen over several seasons (both past and current) with symptoms progressing from discolouration and necrosis to complete loss, leaving bare stems. While several factors can lead to needle loss, a number of foliar diseases can be a significant cause if left unmanaged. Common foliar diseases and control options are summarised below. Discolouration or loss of needles, even on a limited number of branches, can make a tree unmarketable and increase labour and management costs. Disease must be identified quickly and appropriately managed to prevent risks to the wider plantation.

RHIZOSPHAERA NEEDLE CAST

Rhizosphaera needle cast (RNC) is caused by the fungus Rhizosphaera kalkhoffii and can infect a range of species including blue, white and Norway spruce, and the Nordmann Fir. The disease is relatively new to the UK and first became problematic in 2017. Whilst originally limited to the wetter Western parts of England and Wales, it has now been found in plantations across the UK. Initial symptoms are discolouration of older needles, turning golden brown, then purple over the summer. Browning will be seen 8-15 months after infection, and symptoms can be sporadic across the tree - although Nordmanns can shed needles whilst still green. Needle loss can occur the year of infection, during the winter months prior to harvest, or can overwinter to be shed the following season. Missing needles will be seen first on the innermost lower branches and spread upwards throughout the canopy. Trees that are stressed are likely to develop symptoms more rapidly.

Rhizosphaera Symptoms on needles infected in the previous season.

RNC can be confirmed by inspection of recently shed needles with a 10x hand lens: small, regular black dots >0.1mm in rows can be seen on the underside of the needle. Emerging needles are infected in spring or early summer when the weather is humid, and temperatures are around 20-25°C. Spores from old needles are spread into the canopy by rain splash. However, for new infections to occur, a level of surface moisture within the canopy is required. The disease will then develop over the season.

CHEMICAL CONTROL OF RNC

Whilst chlorothalonil and copper fungicides are no longer permitted, some chemical control options are available. Dithane 945 (mancozeb) is still permitted (EAMU 2652/15) and Amistar (azoxystrobin) is also available under EAMU (3388/18). However, it can be difficult to achieve good coverage of trees (especially early in the season when needles are flush). It is also recommended that sprays are applied before rainfall in risk periods but this can be difficult to predict.

CULTURAL CONTROL OF RNC

RNC can be managed using a range of cultural controls.

Young trees managed to promote airflow.

Plantations should not be established near existing conifers (including during propagation). As surface moisture is required for successful infection, measures promoting air circulation and rapid drying can reduce disease risk. Increased tree spacing, pruning of lower branches and shearing branches to lower canopy density can promote drying. Control of brush and weeds around trees can also promote air movement to limit surface moisture.

Inspect new stock for symptoms and examine plantations regularly throughout the year to detect early signs of infection. If symptoms are detected, prune out infected branches using secateurs sterilised in 70% alcohol. Infected branches (and entire trees, if widespread) should be removed to reduce spore load (although some pressure will remain from fallen needles).

CURRENT SEASON NEEDLE NECROSIS

Current season needle necrosis (CSNN) has been a serious foliar disorder of Nordmann Fir in Europe and North America for the last 20 – 30 years, caused by Sydowia polyspora. Symptoms may appear on current season foliage between May and December, with needles shed by the end of autumn, although some may be retained into the following year. Close inspection of infected needles will show brown necrotic tips with a distinctive dark brown band between the necrotic tissue and living green tissue further down. Either a few needles or whole branch lengths can brown and then be left bare, but CSNN is typically found on the middle section of the tree (compared with the base in Rhizosphaera).

CSNN symptoms

Examination with a 10x hand lens will show black spore bodies of irregular size on the underside of the needle in a more irregular fashion than RNC. Onset can be variable, commonly impacting around 10% of trees, sporadically across a plantation. In severe infestations, up to 40% of trees can be rendered unmarketable as needle shed leaves bare branches (although some trees can be asymptomatic).

CSNN is spread by rain splash or contact, although latent infections can be brought in on propagated plants. Infection is promoted by high humidity and surface moisture, and young soft needle flushes are more susceptible – especially as bud brushes will hold water. Summer storms can be particularly problematic as stress followed by wet weather encourages infection. Trees in the UK have previously experienced chlorotic needle bands on new shoots 3 – 14 days after thunderstorms and hot sun in May. Stress caused by butt and skirt pruning may also trigger symptoms from a latent infection or increase infection susceptibility.

CONTROL OPTIONS FOR CSNN

The withdrawal of chlorothalonil and copper fungicides has restricted CSNN control options, although Amistar (azoxystrobin) is available under EAMU (3388/18). Applications can be planned based on needle flushing, although this risks excessive applications if made when infection risk is low in dry weather. Cultural control can be highly effective, particularly by reducing sources of inoculation and avoiding conditions where infection can take hold using the same approaches discussed above for RNC. It is important to inspect newly propagated plants to avoid contamination. Pruning and weed management can improve airflow through the canopy, helping to dry leaves and prevent humidity from building up. There is also potential for less susceptible tree varieties.

CSNN necrosis

CSNN needle drop

PUCCINIA RUST

Puccinia rust

While Puccinia rust has been more common on Abies alba, it has moved into the Nordmann Fir and started to cause considerable damage. After overwintering on weeds, Puccinia will infect needles to produce yellow banding in late spring or early summer. On closer inspection, this will also show light-yellow spore bodies protruding from stomata on the lower needle surfaces. As the infection continues, needles will shrivel and fall in late summer. This leads to large parts of the current season's branches being left bare. This disease is caused by the fungus Pucciniastrum epilobii which infects different hosts at different stages of its lifecycle. It completes its lifecycle on Rosebay Willowherb, otherwise known as ire weed (Chamerion angustifolium), or Fucshia. Spores blown from Willowherb can travel significant distances and quickly spread through whole plantations. High levels of spore release from Willowherb are often linked with the first significant rains in May, leading to infection of flushing needles (especially those in the paintbrush stage) where bud-scales have dropped and needles are starting to expand. Moisture is required for successful germination, so later flushes may escape infection.

CONTROLLING PUCCINIA

Rosebay Willowherb

Amistar (azoxystrobin) can also be used for rust control under EAMU (3388/18) and Signum (boscalid + pyraclostrobin) is available as a protectant (EAMU 2141/12). However, chemical control can be problematic due to difficulties in achieving spray coverage – especially when needles are in flush. Applications should be considered in May, before likely windows of spore release, following rain. The most effective control is likely through cultural methods – particularly through control of Willowherb as an alternate host in the plantation, including pathways, hedging and adjacent woodland. Similar to RCN and CSNN, surface moisture is required for infection so improving airflow to improve tree drying will reduce infection. However, unlike RCN and CSNN, shed needles cannot provide an infection source for the same tree or other Abies species (it must alternate with Willowherb). Therefore, sanitation measures are not as important in comparison. There is a suggestion that selecting late-flushing varieties of Nordmann may also reduce disease pressure.

SUMMARY

A range of similar, but subtly different, foliar diseases can impact Christmas tree plantations. Careful management of both the crop and growing area can be useful in controlling disease risk. While chemical control options are available, these are best used when conditions for infection are right. Awareness of risks, including delays between infection and onset of symptoms, will help you to identify potential threats to your plantation, summarised below:

I Infection S Symptoms

Disease infection & Symptoms

	Jan	Feb	Mar	April	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	May
Disease :	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Rust					I	I																					
Rust					S	S	S	S	S																		
CSNN					I	I																					
CSNN					S	S	S	S	S	S	S	S	S														
Rhizosphaera					I	I	I	I	I																		
Rhizosphaera											S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S

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