

## Tyfu Cymru: Technical Advice Sheet

### Christmas Tree Needle Diseases

#### Needle Diseases

Consumers are looking for Christmas trees with uniform branches with thick needle cover that make attractive display pieces. The impact of foliar diseases can be seen over several seasons (impacting both past and current season's needles) 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, labour and management costs to prevent risks to the wider plantation also need to be considered.

#### 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, this has now been found in plantations across the UK. Initial symptoms will be discoloration 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 winter months prior to harvest, or can overwinter to be shed the following season. Missing needles will be seen first on innermost lower branches and spread upwards throughout the canopy. Trees that are stressed are likely to develop symptoms more rapidly. RNC can be confirmed by inspection of recently shed needles with the use of 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.



Rhizosphaera Symptoms on needles infected in the previous 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 in the early season when needles are in flush). It is also recommended that sprays are applied prior to rainfall in risk periods but this can be difficult to predict to avoid wastage. Careful monitoring of weather conditions (including local rainfall) can be useful in planning spray applications.

### Cultural Control of RNC

Management of RNC can benefit from a range of cultural controls. Plantations should not be established near existing conifers (including during propagation). Surface wetness is required for successful infection, so measures which promote air circulation and rapid drying can also reduce disease development. 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. Once there are visible symptoms prune out infected branches, ideally using secateurs that have been sterilised in 70% alcohol. Infected branches (and entire trees if widespread) should be removed to reduce the spore load (although some pressure will remain from fallen needles).



Young trees managed to promote airflow

### 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 show 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 needle underside, erupting in a more random fashion than with 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 made unmarketable, with needle shed leaving 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; high light stress followed by wet weather encourages infection, with trees in the UK seeing 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 also 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 the infection risk is low due to 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 plant material to avoid contamination. Pruning and weed management can improve airflow through the canopy, helping to dry leaves and prevent humidity building up. There is also strong potential for less susceptible varieties, with trials underway.



CSNN Necrosis



CSNN Needle Drop

### Puccinia Rust

While Puccinia rust has been more common on *Abies alba*, it is moving hosts into the Nordmann Fir and is starting to cause considerable damage on plantations. After overwintering on weeds, Puccinia will infect needles to produce yellow banding symptoms 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 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 Fire weed (*Chamerion angustifolium*), or Fuchsia. Spores blown from Willowherb can travel significant distances and quickly spread through whole plantations. High levels of spore release from Willowherb



Puccinia Rust

are often linked with the first significant rains in May, leading to infection of flushing needles (especially those in the paint brush 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

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 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 to be 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 speed 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 compared with other diseases. There is some suggestion that selecting for late-flushing varieties of Nordmann may also reduce disease pressure.



Rosebay Willowherb

### 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 risk factors. While chemical control options are available these are best used when conditions for infection are right. Awareness of risks, including delays between the infection and onset of symptoms, will help you to identify potential threats to your plantation, summarised below:

		I Infection		S Symptoms																												
		Disease infection & Symptoms																														
Disease :		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				
		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				

### Disclaimer

Every effort is made to ensure the accuracy of information and recommendations given in these notes. All applications of crop protection chemicals should be made in accordance with label recommendations, which should be consulted before spraying. Some of the pesticides mentioned in these notes may not be supported by label recommendations for their use on Christmas tree but are permissible via Extension of Authorisation for Minor Use (EAMU) in the UK under 'The Revised Long Term Arrangements For Extension Of Use (2002)'. In these cases, the use of the pesticide is at the risk of the user and Tyfu Cymru does not accept liability for any loss or damage caused by such use. The references to on-label approvals and EAMUs for use of pesticides in Christmas trees and are correct at the time of writing. These are subject to change and

approval may be withdrawn at any point. It is the grower's responsibility to check approvals before use of pesticides. If in doubt a grower should seek advice from a BASIS qualified advisor - this is available free of charge for eligible growers through the Tyfu Cymru program, please contact us to arrange an appointment – email/telephone advice is also available.