

## Field Identification Guide for Daño Foliar del Pino (DFP)

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Unusual symptoms on *Pinus radiata* foliage were first noted in Chile in 2003. At that time less than 100 ha were affected. By 2006, symptoms were noted over approximately 60,000 ha. Chilean researchers have carried out many studies on possible causes including looking for abiotic factors such as poor nutrition, solar radiation, ozone, and soil type, as well as pests and fungal pathogens. In October 2007, Mike Wingfield from FABI in South Africa announced that an undescribed species of *Phytophthora* had been isolated from symptomatic material growing in Chile.

The problem is named Daño Foliar del Pino (DFP), meaning damage to pine foliage. This guide describes symptoms characteristic of DFP. It is intended as a reference for forest health surveillance specialists and forest owners with an interest in forest health. If plants with suspicious symptoms are seen samples should be sent without delay to the Forest Health Reference Laboratory at Scion. Pathologists there are routinely testing all *Pinus radiata* material that is submitted with unusual symptoms for *Phytophthora* spp. Molecular identification techniques are employed in conjunction with examination of morphological features. It should be stressed that currently the association between disease and *Phytophthora* or any fungal pathogen has not been proved. DFP is likely to be of complex aetiology; interactions between DFP, pathogens, environment, and host are not yet well understood.

### Tree and foliage

From a distance, affected trees have a similar appearance to those affected by *Cyclaneusma* needle-cast. Foliage turns yellow, then gold and brown and one-year-old foliage is affected (Fig. 1). However, the resemblance ends there. Needles do not detach from branches as readily as those affected by *Cyclaneusma*. Often, symptoms start with a pale area at the base of the needle, accompanied by a black band (Fig. 2). In later stages this band appears somewhat transparent when held against a background of strong light. In early stages of symptom development the transparency is **not** apparent. The “black band” disease on conifers seen in New Zealand caused by *Trimmatostroma abietis* does not have transparent bands.

Fig. 1- young tree showing typical yellowing foliage.



Fig. 2- Black band and pale region on needles (early stage below, advanced right)



## Branches

Another distinctive feature of DNP is the formation of resin at the point of connection between the needle fascicle and the branch (Fig. 3). Cankers may be formed on young succulent tissue (Fig. 4), but not on old tissue or on branches of older trees. Often, but not always, a brown discoloration can be found in the cambium at the trace of a symptomatic needle.

Fig. 3 - Resin at base of needle.



Needles with DFP symptoms are more common on the underside of branches, as seen on Fig. 3. Needles showing typical *Cyclaneusma* needle cast symptoms of yellow/brown mottling and brown banding are also common (Fig. 5).

## General features

Trees of all ages are susceptible to disease, from seedlings to trees ready for harvest. In advanced stages of severe disease needles may wilt and then, over time, turn brown and grey. Trees can be severely defoliated but the new flush is unaffected. In New Zealand, it is expected that symptoms of this disease would peak in September/October. This timing coincides with maximum disease expression of *Cyclaneusma* needle cast, *Dothistroma* needle blight, UMCY, and PNB. Inspectors and forest staff should be especially wary of the possibility that symptoms of DFP may be masked by other foliar diseases.

In Chile, DFP is most severe on sites prone to prolonged periods of moisture through low cloud, mist, fog, or rain. In New Zealand inspectors should be especially vigilant on those sites with similar environments.

Fig. 4 - Typical canker on a young tree (note healthy foliage).



Fig. 5 - Brown stain in cambium at needle trace (below).



Pathologists at Scion are keeping in close communication with Servicio Agrícola Y Ganadero (SAG), the Government department responsible for protecting Chile's primary sector. Through this contact, we can maintain a watching brief on research developments and surveillance operations in Chile to better enable us to prepare for and react to a similar situation occurring in New Zealand.