

**FIELD GUIDE TO
COMMON PESTS,
DISEASES, AND
OTHER DISORDERS
OF RADIATA PINE
IN NEW ZEALAND**

**Extract of pages 40–55
“OTHER DISORDERS”**

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Left: Curling of leading shoots caused by boron deficiency.



Below: Hedge-like growth distortion caused by boron deficiency.

BORON DEFICIENCY

- Reduced height growth and stem distortions may occur; in severe cases stunted bushy trees resemble artificial hedges.
- Symptoms occur during midsummer or later, when initially the shoot of the main leader dies followed by shoot death on the ends of upper branches. Leading shoots die rapidly and the stem curls to an inverted U or J shape. Years later shoots replace the affected leader and main branches.
- Branch tip dieback occurs more slowly with the bud being surrounded by dead or discoloured needles. Terminal needles are short and closely spaced and buds are coated with resin. White patches of dried resin occur on affected parts of the stem.
- Deficiency occurs in the South Island, especially areas of summer drought. Lower levels occur in the North Island.

Disorders with Similar Symptoms

- Diplodia leader dieback, Phomopsis disease, frost damage, herbicide damage.



Left: Pale green foliage typical of nitrogen deficiency.



Right: Short branching and thin crown caused by phosphorus deficiency.

NITROGEN DEFICIENCY / EXCESS

- Uniformly pale green to yellow foliage with short needles.
- There may be a tuft of longer green foliage on the leader.
- Trees are tall and slender with light branching.
- Likely to be a problem on sandy soils lacking organic matter, or anywhere topsoil has been displaced.
- Excess nitrogen may cause branch and stem distortions (speed wobbles).

PHOSPHORUS DEFICIENCY

- Trees are tall and spindly with light branching and poor needle retention.
- Needles are abnormally short, as are shoot terminals. On some trees needles are fused.
- In young trees yellow needle-tips are noticeable on current season's foliage from mid-summer, primarily in the lower crown.
- Found on "gumland" clays and podsolised sands in Northland, Coromandel, and the central North Island, pakihi soils in Westland, and shallow hill soils.



Above:
Needle-tip yellowing
caused by potassium
deficiency.



Right:
Symptoms of
magnesium
deficiency.



Lower right:
Needle loss and
upper mid-crown
yellowing
(UMCY) caused
by magnesium
deficiency.

POTASSIUM DEFICIENCY

- Needle-tip yellowing.
- Symptoms commonly occur in the lower part of the crown and intensify in late winter in the previous season's foliage.
- Likely to be a problem in "mineral belt" soils in Nelson and pakihi soils in Westland. Also occurs in podsolised sands in Northland, particularly where growth has been increased by nitrogen and phosphorus fertilisers.

MAGNESIUM DEFICIENCY / UPPER MID-CROWN YELLOWING (UMCY)

- Golden-yellow needle-tips in the upper crown. Symptoms develop in early summer in previous season's foliage. More severe in dry years or after pruning.
- Trees older than 10 years show the same symptoms and exhibit needle loss and twig dieback in the upper crown (UMCY).
- Generally occurs on pumice soils and in Nelson, Westland, and Southland.

Disorders with Similar Symptoms

- *Cyclaneusma* needle cast



Above: Branch twisting caused by copper deficiency.



Right: Needle yellowing caused by manganese deficiency.

Below: Distorted shoot growth caused by zinc deficiency.



COPPER DEFICIENCY

- Branches and leader become twisted, with a horizontal branch angle in mild cases.
- Can be a problem on coastal sands in Northland, on some pakihi soils, and on sites of low fertility where nitrogen and phosphorus have been applied.

Disorders with Similar Symptoms

- Wind damage causes twisting and bending in new growth in a constant direction.

MANGANESE DEFICIENCY

- Needles are very pale yellow, particularly in the spring flush of growth.
- Occurs on or near limestone outcrops or on nearby erosion areas.

ZINC DEFICIENCY

- Foliage becomes bronzed, with a rosette of buds around a retarded leader bud.
- Tree growth becomes stunted.
- Found at Cape Karikari near Kaitaia, but extremely rare.



Above: Wilting caused by frost.
Below: Shoot death caused by frost.



FROST DAMAGE

Damage

- Shoot death and wilting stems and needles. Severe frosts cause mortality.

Diagnostic Features

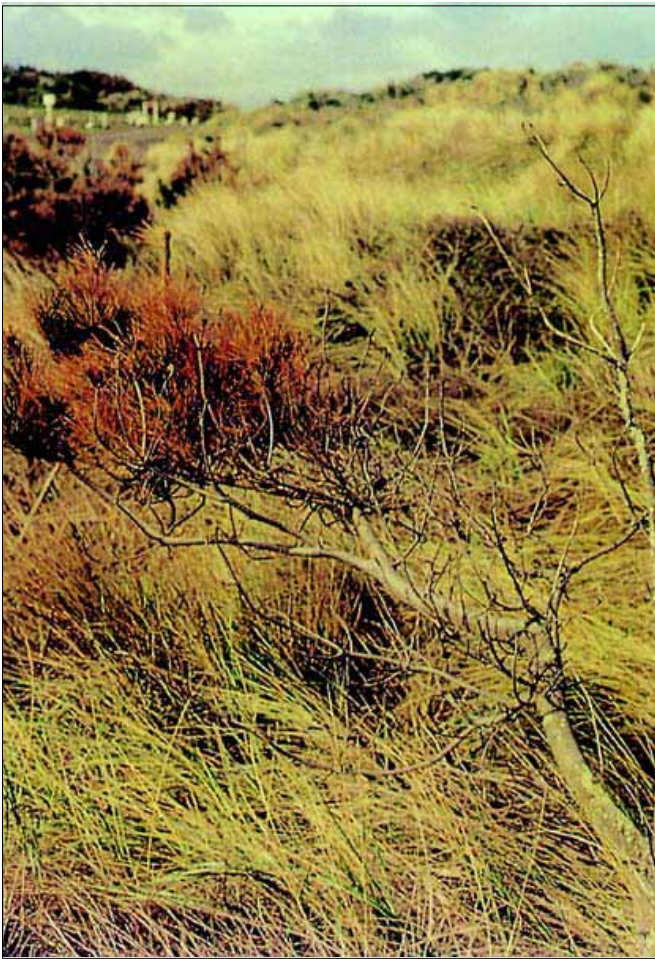
- Yellow bands across needles are equidistant from sheath.
- Slight frosts cause drooping needles and stems.
- Moderate frosts may cause up to 50% needle death around the lower part of the tree.
- Severe frosts cause red-brown discoloration 3–4 weeks afterwards and up to 90% needle damage.

Distribution

- Throughout New Zealand in areas where spring and early autumn frosts occur. (Warm periods cause trees to dehardening and they are therefore susceptible to unseasonal frosts.)

Disorders with Similar Symptoms

- Diplodia leader dieback, Phomopsis disease, boron deficiency, herbicide damage.



Damage caused by salt burn and wind.

WIND AND SALT DAMAGE

Damage and Diagnostic Features

- Red-brown banding on needles, especially on coastal side of tree.
- Symptoms reduced on inward-facing side of tree and trees away from shore. (Trees on high ground away from the shore can be exposed to off-sea winds).
- Deposition of salt causes more rapid and striking damage to foliage than wind alone.
- Wind causes severe stunting of trees adjacent to shore line.
- Growing apices of inland trees may bend after prolonged steady wind.

Distribution

- Wind damage occurs throughout New Zealand; salt damage is more severe on the west coast.

Disorders with Similar Symptoms

- Salt damage—
Dothistroma needle blight, herbicide damage.
- Wind damage—
Nitrogen excess (speed wobbles), copper deficiency, herbicide damage.



Left: Hail damage.
(Photo: Colin Barr,
MAF)

Below: Stem damaged
by lightning.



HAIL DAMAGE

Damage

- Branch and stem cankers, dieback, defoliation, debudding, cone damage, branch breakage. (Tree death may occur after fungal invasion of wounds—usually by *Sphaeropsis sapinea*).

Diagnostic Features

- Damage to side shoots often more severe than to leader.
- Lesion formation mainly on the upper side of twigs and on one side of the tree, depending upon wind direction.
- Twig sectioning shows all injuries occurred at the same time in the annual growth ring.

LIGHTNING DAMAGE

Damage and Diagnostic Features

- Mortality can occur in single trees, but more characteristically in groups of trees.
- Long scars, stripped bark, and scarring of the stem, often with grooves in the wood. Resin bleeding if bark is intact.
- A strip of dead bark running up the stem.



Above: Distortion and discoloration caused by picloram and triclopyr.

Below: Drift damage caused by glyphosate.

Bottom: Damage caused by metsulfuron.



HERBICIDE DAMAGE

Damage and Diagnostic Features

- Chemical drift may cause damage to numerous trees in the vicinity of a sprayed area.
- Damage and death of nearby weeds is normally observed between 3 and 6 weeks after application.
- Twisting and curling of shoots, stem elongation, and clubbing of tops indicate picloram and triclopyr.
- Reduced growth, reddish-brown needles in terminal shoot through to plant death, and/or pale new shoots and distorted needles, are all indicators of glyphosate.
- Cessation of terminal growth, death of the terminal shoot, or death of the entire plant indicate metsulfuron. The effect of metsulfuron develops more slowly than that of glyphosate. Metsulfuron remains active in soil and can damage newly planted seedlings for up to 6 weeks after spraying.

Disorders with Similar Symptoms

- Diplodia leader dieback, Phomopsis disease, boron deficiency, frost damage