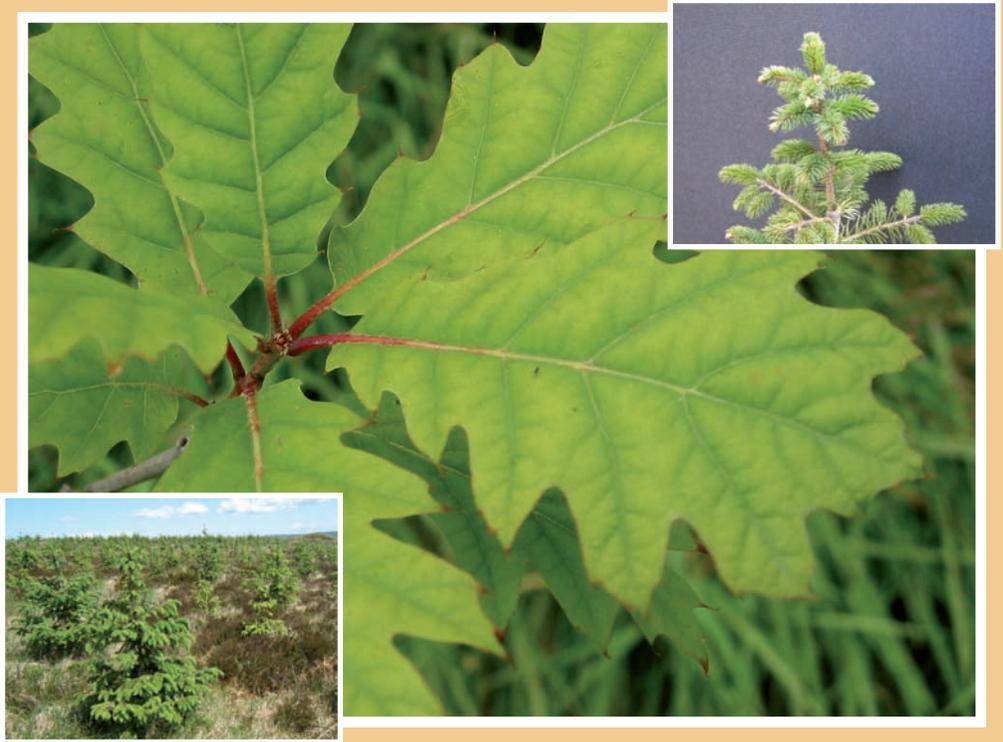


Farm Forestry Series No. 14

Nutrient Deficiencies in Forest Crops



NUTRIENT REQUIREMENTS

THE NUTRIENT REQUIREMENTS OF A FOREST DEPEND ON THE SITE AND THE SPECIES PLANTED

The nutrient requirements of trees are low in comparison with agricultural crops. However trees planted on certain soil types can develop nutrient deficiencies resulting in slower growth and reduced timber yields in the future.

Nutrient problems will be greatly reduced by matching tree species with soil type.

This leaflet is intended as a general guide in detecting nutrient problems in forest crops. As some problems can arise from more than one nutrient deficiency, foliage analysis is always recommended to determine the nature and extent of suspected nutrient deficiencies.

How you can help?

Walk your plantation regularly and check your trees for any of the following common symptoms:

- Changes in tree colour
- Reduction in shoot growth
- Reduction in needle length/leaf size
- Die-back of top or side shoots
- General reduction in vigour

Warning! Other factors can produce symptoms in trees similar to those caused by nutrient deficiency:

- Poor drainage
- Exposure
- Frost
- Vermin damage

Always identify the cause of a growth problem before trying to rectifying it!

NITROGEN (N) DEFICIENCY

Nitrogen is vital for healthy growth in trees. Deficiencies can occur on infertile sites such as blanket peat and other sites where heather is present.

Deficiency symptoms in **conifers** include:

- Uniform light green or yellow colour on all needles, the greater the deficiency the lighter the colour
- Thin and spindly leading shoot
- Short and light needles



Nitrogen deficient and healthy spruce foliage

Nitrogen deficiency can also arise in association with extreme phosphorus deficiency on some organic soils. In such cases, both deficiencies may sometimes be resolved by phosphorus application.

Foliage analysis is vital to detect and confirm nutrient disorders.

Nitrogen deficiency can also be overcome by the control of heather.

Nitrogen deficiency is not common in broadleaf trees. Where it occurs symptoms include:

- Size reduction in leaves
- Pale colour of both leaf blade and veins



Severe nitrogen deficiency in Sitka spruce



Nitrogen deficiency in oak

PHOSPHORUS (P) DEFICIENCY

Phosphorus is important for root development in trees. It is the main fertiliser required at establishment stage. Deficiency will seriously limit growth.

Phosphorus deficiency symptoms in conifers include:

- Poor height growth
- Dull green colour on needles
- Reduced needle length
- Foliage appears sparse
- Death of older needles in severe cases

Phosphorus (P) deficiency can also cause low nitrogen (N) availability in soils, resulting in combined P and N deficiency symptoms.



Phosphorus deficiency in Sitka spruce foliage



Severe phosphorus deficiency in spruce

Phosphorus deficiency is rare in broadleaf trees. Symptoms include:

- Light spots more obvious on the periphery of the leaf
- Leaves may have a reddish/violet tinge
- Possible reddening of the main veins on the leaf



Phosphorus deficiency symptoms in Alder

POTASSIUM (K) DEFICIENCY

Potassium deficiencies can arise both on fertile midland peats and on western blanket peats

Deficiency symptoms in **conifers** include:

- Pale straw yellow discolouration
- Yellowing of needles at tips of the current shoots with moderate deficiency
- Yellowing of individual needles, gradually increasing from the base to the tip, which can become purple or brown
- Yellowing can be accompanied by death of leading shoot and side shoots
- All needles on current shoots are affected in more severe deficiencies



Potassium deficiency symptoms in Sitka spruce

Potassium deficiency symptoms in **broadleaves** include:

- Dwarfing and yellowing of leaves in case of slight deficiency
- Irregular browning of leaf margins as well as yellowing/dwarfing of leaves if deficiency is moderate to severe
- Yellowing between leaf veins if symptoms are very severe



Deficiency symptoms in Oak

TRACE ELEMENT DEFICIENCIES

Deficiencies of trace elements such as Magnesium (Mg) and Copper (Cu) may occasionally occur in conifer crops.

Magnesium deficiency

Symptoms include:

- Yellowing of needle ends, usually in needles older than one year (spruces and Douglas fir).
- The change in needle colour from green base to yellow top is sharp (compared to gradual change for potassium deficiency)
- No loss of growth



Magnesium deficiency in Scots pine

Copper Deficiency

Copper deficiency may be associated with heavy phosphorus application.

Symptoms include:

- Contorted growth of leading shoot and side shoots
- Stem deformity



Copper Deficiency symptoms in spruce

FOLIAGE ANALYSIS

If you are concerned about the health of your trees and suspect a nutrient deficiency in your forest, foliage analysis is recommended. An approved laboratory will analyse foliage samples from the forest and provide a written report identifying possible deficiencies and will recommend remedial action. You should use the same laboratory for repeat or future analysis.



Foliage Collection Procedures

- **The levels of nutrients will vary with time of year so correct timing of foliage collection is critical:**

Timing

Conifers – November/December

Broadleaves and Larches – August

Method of Collection

- **Select foliage from the current seasons growth, on secondary branches from the upper third of the tree. Do not cut the main shoot.**
- **Each sample should contain foliage from at least 20 trees of the same species in the problem area.**
- **Place foliage in a clean labelled plastic bag**
- **Fill out a Foliage Sampling Form for each sample**
- **Send sample to approved laboratory without delay. If a delay in dispatch is unavoidable, store the foliage sample(s) in a cool place**



Approved Laboratories

Coillte Laboratories
Church Road
Newtownmountkennedy
Co. Wicklow
Tel: 01-2011111

Dept. of Environmental Resource
Management
University College Dublin,
Belfield,
Dublin 2
Tel: 01-7067721

PROTECT OUR ENVIRONMENT

Application of fertiliser should be considered as part of **Sustainable Forest Management**. The Forest Service outlines appropriate methods for the safe application of fertilisers in a series of Forestry and the Environment guidelines. These guidelines should be consulted prior to fertilisation operations and are available from your local Teagasc Forestry Development Officer and the Forest Service.



Some of the main operational guidelines:

- Apply fertiliser **only between April and August, inclusive**
- **No fertiliser after periods of rainfall** or if heavy rain is forecast
- Apply fertiliser manually or by ground-based machine where ever possible
- Obtain a **licence** from the Forest Service prior to aerial fertilisation
- **No fertiliser application within buffer zones** or within 20m of aquatic zones, whichever is greater. Fertiliser must also be applied **by hand in the 20-50m area adjacent to the aquatic zone**
- Observe the **recommended exclusion zones** for aerial fertilisation
- Store fertilisers on a **dry elevated site** at least 50m from the nearest aquatic zone drainage system
- Ensure **environmentally-acceptable disposal** of fertiliser bags and containers off-site

Photographs by kind permission of the Teagasc Forestry Development Unit, and Dr. Florence Renou, School of Biology and Environmental Sciences, UCD.



THE DEPARTMENT OF
AGRICULTURE & FOOD
AN ROINN TALMHAÍOCHTA AGUS BIA

July 2007