



Soil Facts

Soil and Plant Analysis for Christmas Trees

Nutrient analysis of soil and plant tissue should be an integral part of any tree crop management plan. While this publication was designed for Christmas tree growers, the principles outlined here may be easily applied to other tree crops.

Introduction

Soils used for Christmas tree production in North Carolina vary greatly. Other factors, such as weather and crop history, can affect the nutrient status of the trees. The only way to be sure your trees are being fertilized efficiently and properly is to have the soil and plant tissue analyzed routinely. Ideally, samples should be taken every other year. But yearly soil and plant samples may be useful when nutritional problems occur.

A soil analysis estimates the ability of the soil to supply plant nutrients. Plant tissue analysis measures the nutrient status of the tree. Potential nutritional problems often can be detected before deficiency symptoms can be seen. By routinely using soil and plant analysis together, you can design a custom fertility program for your trees. The general idea is to give each block of trees sufficient nutrients for good growth and quality without applying too much. Proper use of these tools will help ensure quality trees while preventing unneeded fertilizer application.

Sampling for Soil Analysis

A soil analysis report is only as good as the sample it represents. For soil analysis to be meaningful, the sample must be representative of the soils in the tree field. Due to soil variability, each sample should represent no more than 5 acres. Terrain and soil type should be similar throughout the sample area. For example, do not sample bottomland and upland soil together, even if they are in the same tree block. Trees in the sample area should be of the same age.

A good soil sample consists of up to 20 subsamples. These should be mixed thoroughly in a clean plastic bucket before you fill the soil sample box. Ideally, samples should be divided into two depths: 0 to 4 inches and 4 to 8 inches. Using a soil sampling tube is the easiest method. Using a garden trowel or spade may over-sample the surface of the soil and result in abnormally high phosphorus index values.

Sampling for Tissue Analysis

Research has shown that the soil nutrient level is not always a good predictor of a Christmas tree's nutrient status. Several factors, such as soil moisture status, rainfall amount, tree health, and soil compaction, can restrict nutrient uptake. The only way to confirm sufficient nutrient uptake by a tree is to perform plant analysis.

Plant sampling needs to be carried out in a manner similar to soil sampling. The plant sampling areas should be the same as those

Distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914. Employment and program opportunities are offered to all people regardless of race, color, national origin, sex, age, or disability. North Carolina State University, North Carolina A&T State University, U.S. Department of Agriculture, and local governments cooperating.

selected for soil sampling. All trees should be the same age. To make full use of published critical nutrient levels, and thus obtain the best information, always take plant samples when trees are dormant. Dormancy normally occurs from September to November, with earlier dormancy at higher elevations, although eastern Christmas tree species may not become dormant until December. Sample the newest growth on the upper third of the tree by taking two or three shoot tips (about 6 inches long) from at least 10 trees selected randomly from the sample area.

Interpretation of Soil and Plant Analysis

Soil and plant analysis laboratories differ in analytical procedures and report formats. Southeastern laboratories, both private and public, use at least two soil-extracting solutions. So a single soil sample processed by these two methods could yield very different results, especially for phosphorus. Also, different laboratories report the results in different units—some use an index system while others report parts per million or pounds per acre. A given laboratory takes these factors into account when giving fertility recommendations. In other words, the labs' recommendations

are calibrated to their methods, so recommendations from different labs' soil analysis should be similar. However, the differences in reporting units make it difficult to compare results from different laboratories. To track the progress of a fertility program over the life of the trees, it is best to use either one laboratory or to pick laboratories that use the same methods and reporting units. Even though tissue analysis methods are more uniform, reporting units still differ among laboratories, making it difficult to track trends over time.

Record Keeping

Keeping good records of analytical results, along with fertilizer applications, will aid in developing fertility programs. The ability to track nutrient trends easily over time can provide valuable insight into the effectiveness of a fertility program. Long-term soil and plant nutrient trends can indicate if current fertility and liming practices are adequate. Routine sampling also can determine whether the trees are taking up applied nutrients.

Soil parameters that should be tracked include phosphorus, potassium, calcium, magnesium, and soil pH. Plant nutrients that should be tracked over time include nitrogen, phosphorus, potassium, calcium, and

magnesium. If manure, compost, or other waste materials are applied to the trees, soil and tissue levels of copper and zinc should be tracked to avoid a buildup to toxic levels.

One of the easiest record-keeping systems is to record each year's results in a computer spreadsheet. Most spreadsheet software has graphing tools that will allow you to look at trends at a glance. Soil and tissue analysis data can be downloaded directly into a spreadsheet from the Web site of the N.C. Department of Agriculture and Consumer Services' Agronomic Division (www.agr.state.nc.us/agronomi/). For those without computers, graphs drawn by hand are also useful.

For Assistance

Agents at your county Extension center can develop a fertility program for your trees based on your soil and tissue analysis results. They also will be happy to answer any questions you have about your fertility program.

In North Carolina, soil and tissue analyses are both services of the NCDA&CS Agronomic Division. For more information, contact the Agronomic Division at www.agr.state.nc.us/agronomi/.

Prepared by

James W. Rideout, Extension Specialist
Department of Soil Science
North Carolina State University

Published by

NORTH CAROLINA COOPERATIVE EXTENSION SERVICE