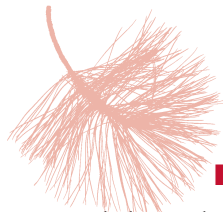




Integrated Pest Management *for* Christmas Tree Production

A GUIDE FOR PENNSYLVANIA GROWERS





IN MEMORIAM

We dedicate this publication to Dr. Paul Heller and Dr. William Merrill for their contribution to the Christmas Tree IPM Program and for many years of commitment to helping growers in Pennsylvania and throughout the United States.



Paul R. Heller (1948–2010)
Professor of Entomology
The Pennsylvania State University
1976–2010



William Merrill Jr. (1933–2003)
Professor Emeritus of Plant Pathology
The Pennsylvania State University
1965–1999

PREFACE

The Pennsylvania Integrated Pest Management Program (PA IPM) is pleased to provide *Integrated Pest Management for Christmas Tree Production*, designed to help Christmas tree growers manage pests based on sound integrated pest management principles. PA IPM is a collaboration of the Pennsylvania Department of Agriculture (PDA) and The Pennsylvania State University. This partnership has resulted in excellent service to Pennsylvania growers as well as to growers in surrounding states. The institutional collaboration embodied by PA IPM allows us to draw on Department of Agriculture technical experts and Penn State faculty and extension educators.

This manual is part of an educational program that was initiated in 1985 by Dr. William Merrill Jr., professor of plant pathology, for the thriving Pennsylvania Christmas tree industry. Dr. William Merrill and Ms. Nancy Wenner, along with other personnel from the Departments of Plant Pathology, Horticulture, and Entomology, organized the first Christmas Tree Pest Management Short Course held at Penn State University Park. Over the years, the course has evolved but is still held each winter in State College to provide growers with hands-on experiences in diagnosing the common insect and disease problems on Christmas trees.

In 1991, Penn State entomologist Dr. Paul Heller initiated the *Christmas Tree Landscape Pest Management Newsletter*. The newsletter was mailed to county extension offices and interested growers on a regular basis. PDA entomologists Rayanne Lehman and Dr. Karl Valley began contributing scouting information to the newsletter in 1992. PDA staff continued the scouting program with support from PDA by providing weekly scouting reports for growers. The scouting report is still produced weekly during the growing season with support from PDA and growers.

To enhance this educational outreach, and in response to the needs of Christmas tree growers for pest control information pertinent to Pennsylvania, a committee comprising scientists, regulators, extension educators, and growers was assembled to discuss their needs. One need was a resource customized for Pennsylvania conditions that describes pests and their management. An advisory body was assembled to help design and review the manual, and several experts contributed text and photos.

We hope this manual will encourage growers to develop their own IPM programs and train their employees to become familiar with IPM practices.

Funding and support to write and review this manual were provided by the Pennsylvania Department of Agriculture, The Pennsylvania State University, and through grant support from the Environmental Protection Agency Region 3.

—Cathy Thomas, IPM Coordinator,
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—Ed Rajotte, Professor of Entomology and
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HOW TO USE THIS MANUAL

The purpose of this manual is to help growers identify, monitor, and control disease and insect pests affecting Christmas trees. The pests included are common on Christmas trees in the Mid-Atlantic and Northeast regions of the United States; however, many of these pests can be found in other regions of the United States. This manual is intended for field use by any level of grower, whether professional or hobbyist. Unfamiliar terms are defined in the glossary at the back of the manual.

Steps for using this manual to identify a pest problem:

1. Identify the tree species.
2. Refer to Appendix A: Pest and Disease Photo Chart. This chart has a series of thumbnail photos corresponding to pests or abiotic problems. Select the photo(s) that best matches symptomatic plants and refer to the appropriate "fact sheet(s)" for additional information.

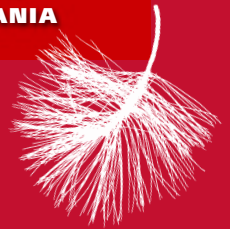
Each pest fact sheet provides useful information, including hosts affected, damage potential, symptoms and signs, similar symptoms, calendar of activities, identification tips, biology and life cycle, monitoring and management strategies, control options, and next crop/prevention strategies. Photographs contained in the fact sheets show the symptoms and life stages of the pests as seen throughout the growing season.

Seasonal calendars have been included to serve as guides for scouting and controlling pests; growing degree days have been included when available. However, the best method for detection and control is still personal observation. Guidelines for scouting can be found on page 9 of this manual. Additionally, several templates (Growing Degree Day Record, Scouting Record, and Pesticide Record) are located in the appendix. These templates can be copied to help with yearly record keeping.

Christmas tree scouting updates can be found at ento.psu.edu/extension/christmas-trees/scouting-reports starting in March and continuing weekly through June. Additional reports are included during the month of August. Past reports starting in 2000 are available for historical perspective.

INTEGRATED PEST MANAGEMENT for CHRISTMAS TREE PRODUCTION

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PENNSYLVANIA
GROWERS**



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INTEGRATED PEST MANAGEMENT BASICS

Christmas tree growers everywhere face obstacles to growing healthy trees. Perhaps the largest challenge is controlling the pests that feed on and live off of conifers. The aim of this manual is to help growers combat their pest problems by using integrated pest management (IPM) methods. IPM is a multilayered approach to keeping pests and pest damage to a minimal level with the smallest cost to health, environment, and budget.

IPM attempts to improve on some of the common problems with traditional Christmas tree pest control. One problem is improper timing of pesticides. Traditionally, growers may use two unsuccessful timing methods: calendar spraying and reaction spraying. Calendar spraying is making pesticide applications at the same time every year regardless of the actual pest situation. Reaction spraying is making a spray immediately upon discovery of a pest problem. Both of these methods are generally incorrect because they may not coincide with the target pest's vulnerable life stage.

Another problem IPM attempts to correct is the overuse of broad-spectrum, or nonspecific, pesticides. Broad-spectrum pesticides kill a wide range of insects, not just the target pests. Beneficial insects that help keep pest populations in check may be eliminated by these harsh pesticides. If spray timing is not correct, growers may make multiple broad-spectrum applications and possibly still not get control. Using the steps of IPM addressed on the following pages, growers should be able to implement safer, more effective pest control.

STEP 1. Preparing for IPM: Planning and Prevention

IPM practices are generally aimed at an established crop, but some pest prevention can occur before the crop is even planted. Most growers know what species they intend to grow at their location. However, since a tree grown in a suitable location is a good defense against pests, consider the following points before planting:

- **Property assessment.** Identifying the challenges to growing trees on a property will help growers determine the best locations for tree blocks. Assessing the property may include collecting and testing soil samples, surveying property slope and topography, and determining water drainage rates and sunlight levels. Historical meteorological information and knowledge of past crops can be useful. Talking to area growers about possible pest problems (insect, mite, disease, mammal, etc.) to expect would also be beneficial.
- **Tree species.** Selecting tree species best suited to the property is the next step. This will involve research and may mean that the site is not appropriate for the intended species. By using printed publications, Web resources, and information from other growers and seedling nurseries, growers can predict the success of the intended crop. For instance, knowing that Colorado blue spruce may grow best in a flat, sometimes wet field can help a grower decide not to plant Fraser fir, which could be susceptible to root rot issues in this same location.
- **Seed source.** In addition to choosing tree species, growers may have options for the seedlings based on seed source. Seed sources generally refer to different geographical regions where the trees grow naturally. The trees resulting from these seeds may be adapted to certain growing

conditions or may show some pest resistance in addition to foliage and growth attributes. Growers selecting seedlings from a particular seed source for its pest resistance need to understand that resistance characteristics may change when the tree is grown outside its natural range.

- **Planting.** The success of a tree block has a lot to do with proper planting of seedlings and transplants. Consider the following factors when planting:

- **Spacing.** Adequate spacing between the trees will provide good air circulation, which can prevent disease development and allow for good spray coverage during pesticide applications. Other factors to consider when spacing trees are the minimum requirements for mowing, harvesting, and shearing equipment. A spacing of 5½ feet by 5½ feet or 6 feet by 6 feet will allow for fewer trees than a spacing of 4 feet by 4 feet, but the trees with wider spacing will be healthier through harvest time. Spacing needs will vary depending on the final desired age of the trees in a block.
- **Depth.** The depth at which seedlings are planted will greatly affect tree health. Planting trees so that the root collar is at or just slightly below the soil line and not planted too deep or too shallow will be a factor in preventing pest attack.
- **Method.** Some planting methods are more prone to future problems. Mechanical planters may encourage J-rooting. In this situation, roots do not spread out but actually grow in a “J” shape (Fig. 1). As a result, trees are unable to establish a good root system, which after several years will lead to poor tree health. J-rooted trees are also more susceptible to insect and disease problems.



Figure 1. J-rooted tree resulting from improper planting. Courtesy of Tracey Olson, PDA