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# Diseases of Shade Trees

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# Preface

This book was prepared primarily as an introductory work on tree diseases for students and others concerned with the care of shade and ornamental trees. Since my major objective was to develop a text for those without any prior training in plant pathology much of the technical nomenclature about plant pathogenic microorganisms was not included. Scientific names of trees mentioned were also not included in the text; however, a listing of common and scientific names of these trees is given in Appendix I. A statement about the use of pesticides is given in Appendix II, but specific pesticide recommendations are not included. Additional sources of tree disease information are given in Appendix III.

Diseases of woody plants fall into two major categories: infectious diseases and noninfectious diseases. In Part I, Chapters 2 through 13, the infectious pathogens and the diseases they cause are presented. Chapters on bacteria, mycoplasmas, nematodes, seed plants, and viruses contain discussions of both the nature of these pathogens and the diseases caused by them. The nature of the fungi is presented in Chapter 2, but since the fungi are the most widespread group of infectious pathogens of plants individual chapters are presented on leaf, root, rust, stem, and wilt diseases caused by fungi. Wound diseases, Chapter 13, which are associated with both fungi and bacteria that invade wounds, are also included in this section. In Part II, Chapters 14 through 23, noninfectious agents and the diseases they cause are presented. Noninfectious agents are separated into environmental stress, Chapters 15 through 17, animal injury, Chapter 18, and people-pressure diseases, Chapters 19 through 22. Diebacks and declines—complex diseases, Chapter 23, which are often caused by a combination of both infectious and noninfectious agents are also included in this section.

Special Topics, Part III, Chapters 24 through 26, includes discussions of non-pathogenic conditions often mistaken for diseases; diagnosis of tree diseases; and living hazard trees, respectively. Although Part III does not present additional shade tree diseases, this information may be of value for those concerned with field applications of the principles given in Parts I and II.

*Terry A. Tattar*

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# Contents

PREFACE	xv
ACKNOWLEDGMENTS	xvii

## **PART I Infectious Diseases**

### *1 Introduction*

Forest Trees versus Shade Trees	4
Tree Health Care	4
Categories of Shade Tree Diseases	4

### *2 The Fungi*

Introduction	7
Nature of the Fungi	7
Identification of Fungi That Cause Tree Diseases	10
How Pathogenic Fungi Enter the Tree	12
How Fungi Cause Diseases in Trees	12
Conditions Favoring Disease by Fungi	12

### *3 Bacteria*

Introduction	14
How Bacteria Cause Disease in Trees	14
Bacterial Diseases of Trees	15
Suggested References	24

### *4 Nematodes*

Introduction	25
Plant Parasitic Nematodes	25
Life Cycle	27
How Nematodes Cause Tree Disease	27
Nematode Diseases of Trees	29
Reference	36
Suggested References	36

## 5 *Viruses*

Introduction	37
How Viruses Cause Tree Disease	37
Symptoms	40
Treatment	42
Virus Diseases of Trees	43
Virus Diseases of Ornamental Apples, Cherries, Peaches, Pears, and Plums	44
Suggested References	45

## 6 *Mycoplasmas*

Introduction	46
How Mycoplasmas Cause Tree Disease	46
Symptoms	47
Treatment	47
Mycoplasma Diseases of Trees	48
Other Common Mycoplasma Diseases of Shade Trees	54
Mycoplasma Diseases of Ornamental Apples, Cherries, Peaches, and Pears	54
Confusion of Virus and Mycoplasma Symptoms with Noninfectious Diseases	55
Suggested References	55

## 7 *Seed Plants*

Parasitic Seed Plants	56
Nonparasitic Seed Plants	69
Suggested References	73

## 8 *Leaf Diseases*

Introduction	74
Treatment	76
Some Common Leaf Diseases of Deciduous Hardwoods	78
Broad and Narrow-Leaved Evergreens	92
Some Common Evergreen Leaf Diseases	93
Insect Conditions Commonly Confused with Diseases	104
References	105
Suggested References	105

## 9 *Stem Diseases*

Introduction	106
Typical Life Cycle of Stem Disease Fungi	107
Treatment of Stem Diseases	107

Target Cankers	108
Diffuse Cankers	112
Canker Blight	121
Other Canker Diseases	123
Canker-Rots	124
Reference	131
Suggested References	131

### *10 Root Diseases*

Introduction	133
Growth of Tree Roots	133
Mycorrhizae	134
Typical Life Cycle of Root Disease Fungi	135
Treatment of Root Diseases	135
Categories of Root Diseases	136
Some Examples of Root Diseases	136
References	144
Suggested References	144

### *11 Rust Diseases*

Introduction	146
Typical Life Cycle of Rust Disease Fungi	146
Treatment of Rust Diseases	147
Canker Rusts	148
Gall Rusts	151
Leaf Rusts	158
Other Rust Diseases	166
References	166
Suggested References	166

### *12 Wilt Diseases*

Introduction	167
Typical Wilt Disease Cycle	167
Typical Control of Wilt Disease	168
Wilt Diseases of Trees	169
Reference	182
Suggested References	183

### *13 Wound Diseases—Discoloration and Decay in Living Trees*

Introduction	184
Wounds	185



Events after Wounding	185
Microbial Successions after Wounding	190
Wound Treatment	190
Other Conditions Resulting from Wounding	195
Sprout Clump Treatment	199
Reference	200
Suggested References	200

## **PART II Noninfectious Diseases**

### *14 Introduction to Noninfectious Diseases*

Some Common Basic Needs of Trees	205
What Are Some Reasons for Prevalence of Noninfectious Disease?	206
General Symptomatology of Infectious and Noninfectious Diseases	207
Categories of Noninfectious Diseases	208
Suggested References	208

### *15 Temperature Stress*

Introduction	209
High Temperature	209
Low Temperature	212
Containerized Ornamental Plants	215
Rapid Changes in Temperature	216
Reference	216
Suggested References	216

### *16 Moisture Stress*

Introduction	217
Water Deficiency	218
Water Excess	222
Erosion	224
Physical Damage from Snow and Ice	224
Suggested References	225

### *17 Soil Stress*

Introduction	226
pH (Degree of Acidity or Alkalinity)	227
Nutrient Deficiencies and Toxicities	227
Physical Condition of Soil	232
Root Girdling	233
Root Competition	235

Contents	xi
----------	----

Juglan Toxicity	235
Lightning Injury	236
References	238
Suggested References	238

## 18 *Animal Injury*

Introduction	240
Animal Wounds	241
Toxic Chemicals on Trees and Soil	247
Soil Compaction	247
Suggested References	247

## 19 *Construction Injury and Soil Compaction*

Introduction	249
Construction Injury	249
Prevention of Construction Injury	259
Soil Compaction	260
References	262
Suggested References	263

## 20 *Injury from Chemicals, Electricity, and Artificial Light*

Introduction	264
Chemical Injury	264
Electrical Injury	280
Injury from Artificial Light	282
References	284
Suggested References	284

## 21 *Tree Maintenance*

Introduction	285
Tree Planting	285
Follow-Up Maintenance	294
Reference	298
Suggested References	298

## 22 *Air Pollution*

Introduction	299
Meteorology	300
Phytotoxic Gases	303
Particulates and Aerosols	307
Acidic Precipitation	308

Mimicking Symptoms	308
References	308
Suggested References	309

### 23 *Diebacks and Declines—Complex Diseases*

Introduction	310
Maple Decline	311
Oak Decline and Mortality	314
Ash Dieback	315
Other Complex Diseases	316
Conclusions	317
References	317
Suggested References	318

## PART III **Special Topics**

### 24 *Nonpathogenic Conditions*

Introduction	321
Misinformation about Trees	321
Nonparasitic Organisms	325
Reference	327
Suggested References	327

### 25 *Disease Diagnosis*

Introduction	328
Diagnosis of Tree Disease in the Field	329
Diagnosis by Office Visit, Telephone, or Letter	332
Tools Used in Disease Diagnosis	335
Conclusions	335
Reference	336
Suggested References	336

### 26 *Living Hazard-Trees*

Introduction	337
Background	337
Categories of Hazardous Trees	339
Living Hazard-Trees and Their Detection	345
Suggested References	346

## GLOSSARY

347
-----

**Contents**

xiii

APPENDIX I COMMON AND SCIENTIFIC NAMES OF ORNAMENTAL WOODY PLANTS	350
APPENDIX II USE OF PESTICIDES	353
APPENDIX III LITERATURE CONTAINING INFORMATION ABOUT SHADE TREE DISEASES OR INSECTS	354
INDEX	357

*PART I*

INFECTIOUS  
DISEASES

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# Introduction

Of all living creatures, trees are best adapted for life on earth. They live longer, grow taller, and weigh more than all other forms of life. However, they still suffer stress from adverse environmental conditions and from other living organisms. In the natural forest, these pressures on trees serve a positive purpose. They select the most vigorous and healthy individuals, which are the only ones that live long enough to reproduce. As trees become older and lose vigor they become more susceptible to stresses. Eventually they die and rot and so are recycled back into the forest. Thus, the forest "ecosystem" is in perfect balance and stresses on trees have a beneficial role in the continuum of life.

Prehistoric people discovered the multiple uses of trees for fuel, food, shade, beauty, and shelter. People began to see trees as a natural resource, indeed so essential that sometimes they were worshipped. It was also noticed that some trees were more valuable than others. Selection of trees for man's use had begun. As civilization advanced to recent times man's need for trees appears to have moved along two distinct lines: (1) trees for use as wood products; and (2) trees for shade, beauty, and recreation. The former generally became the responsibility of the forester and the latter the responsibility of the arborist. There are occasions, however, such as in urban forest recreation areas, when both the arborist and the forester must have the same concerns.

The study of tree health in the forest is called "forest pathology." Its aim is to reduce losses of wood. Shade tree pathology is a study of the health of trees that are grown primarily for shade, ornament, or recreation. Shade trees in contrast to forest trees are not usually considered to have potential value for wood products but add value to the areas in which they are growing primarily because of the aesthetic benefits. Shade tree "harvest," therefore, occurs throughout the lifetime of the tree and ceases at its death. In addition, shade trees, due to their longevity, often have personal attachment and historical or even religious significance.

## **FOREST TREES VERSUS SHADE TREES**

In addition to the obvious differences between the management objectives for forest and shade trees there are many other differences between trees growing in the forest and those trees growing around homes, along streets, and in recreation areas. Since the forest is the normal ecological niche for trees it would be expected, in most cases, that more stress would be found in shade trees than on forest trees. The backyard, roadside, city park, and recreation areas are not usually ideal locations for the growth of trees. This increased stress often predisposes shade trees to vigor-related diseases. Thus, a major responsibility of the arborist is to provide the necessary care to maintain vigor and to prevent or alleviate as many of the adverse stress factors as possible from harming the trees. The study of the diseases of shade trees has become a distinct branch of tree pathology because shade trees require specialized maintenance rarely used in the forest, and because shade trees are usually treated as individuals and not as a member of a forest stand.

## **TREE HEALTH CARE**

There are several fields related to arboriculture, such as botany, entomology, forestry, microbiology, plant physiology, and soil science, as well as plant pathology, that are involved with all the various types of health care problems of shade trees. Since the arborist often needs advice from several different academic specialties there has to be some crossing of fields to provide the needed information. Those who care for trees need to be able to recognize and control tree disorders, regardless of origin, but often do not need to have memorized all the detailed information required to be specialists in a particular field.

## **CATEGORIES OF SHADE TREE DISEASES**

Most shade tree diseases can be placed into two broad categories: (1) infectious diseases, and (2) noninfectious diseases. In addition, there are arthropod-caused injuries and nonpathogenic conditions that are often confused with diseases. However, there often is considerable interaction between all these categories, much to the detriment of the tree and to the confusion of the public. Distinguishing these is the task of the plant diagnostician. In many cases there is also considerable overlap between these categories, but they are still a useful means for understanding the general types of tree health problems.



### Infectious Diseases

Disease of plants caused by living pathogens (organisms able to infect plants and cause a plant response) are termed *infectious diseases*. This group of diseases includes most of the well-known disease problems of trees and it has been the group of diseases most studied by plant pathologists. Most of the infectious diseases are caused by microorganisms: fungi, bacteria, nematodes, viruses, and mycoplasmas. But certain pathogenic higher plants also commonly cause tree diseases.

Most of the infectious diseases will be discussed according to the type of pathogen that causes the disease. However, infectious diseases caused by fungi are so numerous that some will be discussed according to the portion of the tree (leaves, stems, or roots) and some will be discussed according to nature of the pathogen (rusts and wilts). The fungi will first be examined in detail because of their importance as plant pathogens.

### Noninfectious Diseases

Diseases of plants caused by nonliving pathogens (nonliving stress factors able to cause injury and death to plants) are termed *noninfectious diseases*. This group of diseases, in general, is not as well known as infectious diseases and often causes considerable problems in disease diagnoses, especially because the tree may have both infectious and noninfectious diseases at the same time. Noninfectious diseases are caused by environmental or meteorological stresses, such as temperature, moisture, and solar radiation, animal injury, and human activities known as people-pressures.

### Arthropod-Caused Conditions That Mimic Diseases

Insects and mites belong to the group of animals known as arthropods or "jointed-legged animals." Both insects and mites are well-known pests of trees and are such an important cause of animal injury that their studies are separate disciplines. Although obvious insect problems will not be discussed in this text, numerous insect and mite-caused conditions are worth mentioning because they are often confused with common shade tree diseases. Symptoms of such stress usually are apparent on the host but the responsible insect or mite is obscure. These conditions will be discussed in the sections about diseases that are commonly confused with them.

### Nonpathogenic Conditions of Shade Trees

Although most people observe trees everyday and feel generally familiar with them numerous events occur to normal healthy trees that are often overlooked