



There's a Fungus Among Us!

Developing Fusiform Rust-Resistant Loblolly & Slash Pines

VOCABULARY

Vocabulary in article indicated in italics

Basidiospore (*bah sid e o spor*)

A spore responsible for causing Fusiform Rust Disease by infecting pines

Fungus

Organism which contains no chlorophyll and is parasitic

Galls

A swelling of plant tissue caused by fungi, parasites, or insects

Genes

Small sections of DNA containing hereditary information

Susceptible

Can easily be affected by a disease

Inoculation

The introduction of a harmful disease agent into a host

Mortality

Death of an organism or organisms

Orchards

Places where many tree selections are planted for the harvesting of their seeds

Resistance

Able to withstand the infections by a disease agent

Seedlings

Small, young trees

Adapted from:

Powers, H.R., Jr., and J. F. Kraus. 1983. Developing fusiform rust-resistant loblolly and slash pines. *Plant Disease*. 67:187-189.

Sometimes a study is done that completely changes how scientists study or understand a problem. This is called **seminal research**. That is what happened with this research. Prior to this research, scientists looked for the causes of tree disease. This research was different—it looked at how some trees are naturally resistant to disease. Following this research, other scientists began looking at how to encourage the growth of trees that are resistant to disease, rather than at the cause of the disease

Discovery

Your job is to gather spores that cause tree disease. First gather 2-3 red oak leaves and put them aside. Then, find a tree with a gall, which is a swelling in the trunk or limb. Lay a piece of newspaper under the gall. Brush the gall with a broom. Although you will not see them, spores from the gall will fall onto the paper. The spores are so small that you cannot see them without a microscope. Carefully brush the spores into a plastic bottle (pick one that has a large lid). Put some talc in with the spores, and shake the bottle up to mix the talc and the spores. Dust the underside of the red oak leaves. Keep the leaves moist for 24 hours by wrapping them in moist paper towels. Removed the moist paper towels in 24 hours. Within two weeks, the Fusiform Rust Disease will appear as spots on the red oak leaves



A fusiform rust gall on a branch.

Introduction

We need trees for many important activities. Trees reduce soil erosion, reduce noise, lower temperatures, and provide habitat for animals. Trees also provide wood and paper products, such as lumber, furniture, writing paper, and baseball bats. Trees may be found in orchards and in natural forests. Natural forests contain trees that grow naturally while orchards contain trees that are raised and cared for by humans.

Trees get diseases just like humans do. That is why scientists Harry R. Powers and J. F. Kraus study trees. They hope to prevent diseases to maintain a healthy supply of trees. One of these diseases is

Fusiform (fusé a form)Rust Disease. This disease is considered one of the most deadly diseases of forest trees and affects loblolly and slash pines throughout the southeastern United States.

This disease is caused by a *fungus* that forms *galls*, which are growths on the stems of trees. These growths cause early *mortality* in the tree and an increase in the chances of storm breakage. That is, the tree becomes so weak that it may break in half when severe winds or storms occur. Stem *galls* can also cause *seedlings*, or small trees, to die at a very early age. *Resistance*, the ability to avoid the disease, is the most practical means of controlling the disease.

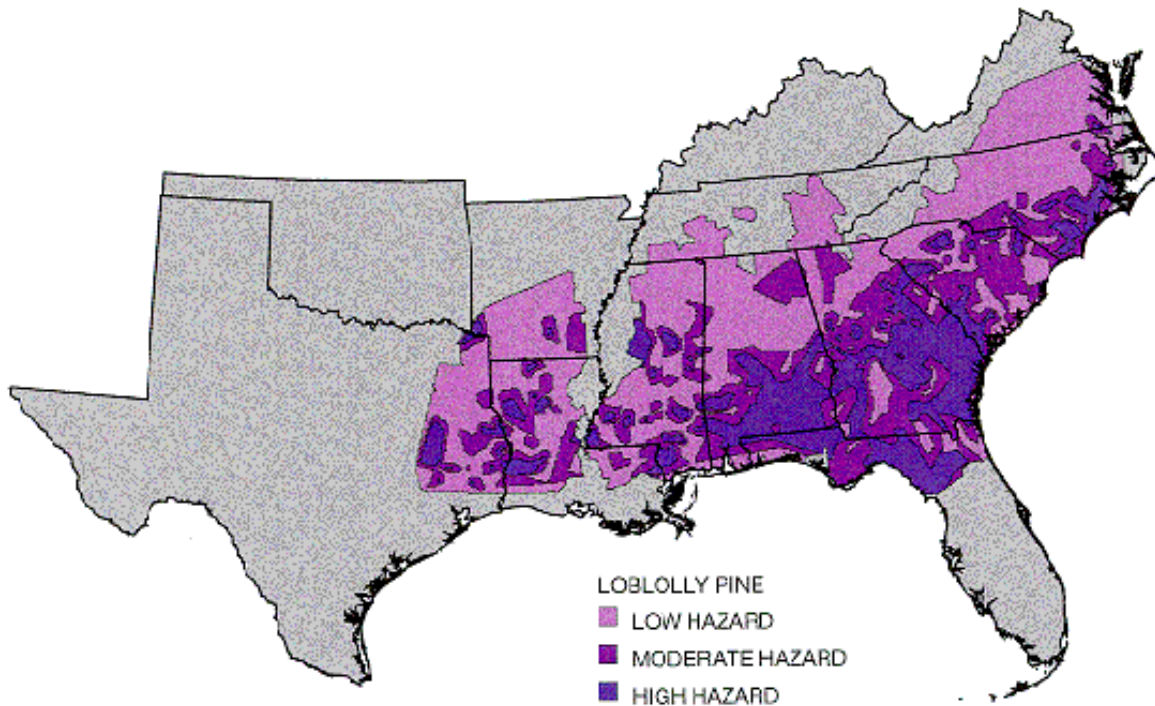
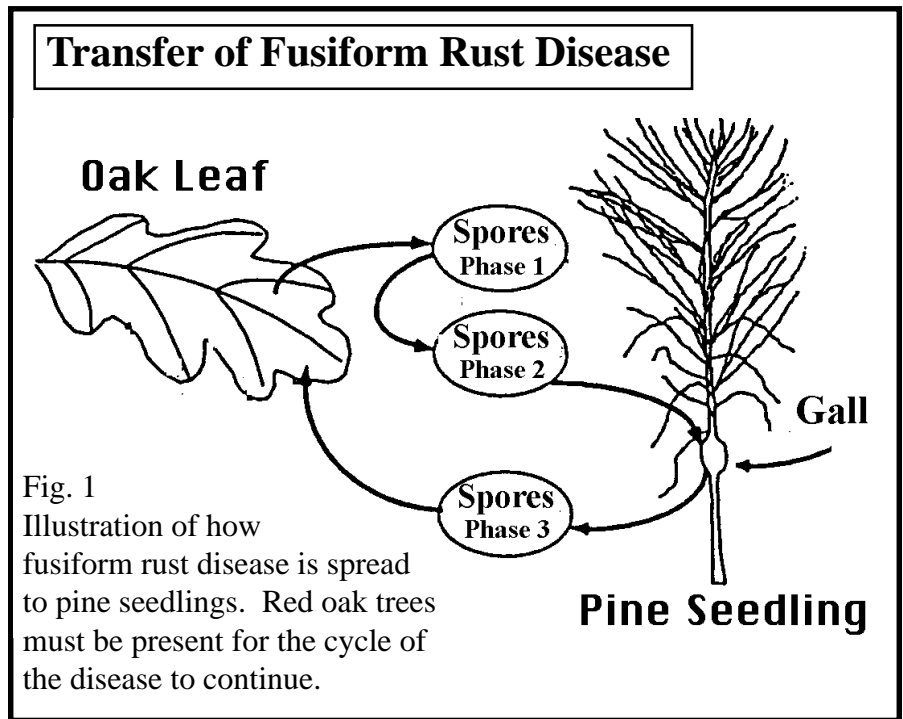
Reflection

- 1 What problem are the scientists trying to solve?
- 2 Why do you think that resistance is the most practical means of controlling the disease?

Methods

The procedure Drs. Powers and Kraus used involved *inoculation*, or spraying trees with *basidiospore* spray, to determine if the trees were *resistant* to the disease. *Basidiospore* spray is an agent that contains *basidiospores*, or the spores responsible for spreading Fusiform Rust Disease to pine trees. The scientist sprayed *seedlings* from trees that had never showed symptoms of developing the disease. They inoculated the *seedlings* and picked out those that survived the spray. These trees were then planted in 60-acre *orchards* where seeds were to be produced. Trees showing symptoms of the disease were removed from the orchard.

The *basidiospore* spray is used to determine if trees are *resistant* to Fusiform Rust disease. Trees that are *resistant* will not get the disease. Some trees are more *susceptible* to the disease than others, and those trees will get the disease after being sprayed with basidiospores.



Fusiform rust hazard for loblolly pine

Reflection

- 1 Why do you think the scientists chose to inoculate *seedlings* from suspected healthy trees?
- 2 Why do you think we need to plant disease resistant *seedlings*?

Results

As a result of Dr. Powers' and Dr. Kraus' research, there has been a great increase in the number of healthy *seedlings* raised in nurseries and *orchards*. Since beginning this project, millions of healthy tree *seedlings* have been produced. The seeds which produced these *seedlings* were harvested in an 85-acre orchard which is now estimated to produce at least 12 million *seedlings* per year. Any trees showing symptoms of developing the disease are removed from the orchard to eliminate any *susceptible* trees. Most trees are then sold to small forest landowners who have never before had trees that are *resistant* to Fusiform Rust Disease. The results from this research have led to other studies. Some studies involve finding the *genes* responsible for resisting the disease.

Reflection

- 1 Why should trees showing symptoms of developing the disease be removed from an orchard?
- 2 Do you think trees in an orchard are more susceptible to Fusiform Rust Disease than trees in a natural forest? Why or why not?