

The Sick Seeds

Black Seed Rot and Slash Pines

Vocabulary

Vocabulary in article indicated in italics

Colonize

To establish or form a colony

Fertile

Capable of producing offspring

Fungus

Organisms which contain no chlorophyll and are parasitic

Germination

Beginning of growth; sprouting

Infestation

A large amount of parasites swarmed in one area

Moisture content

The amount of moisture an object contains

Organic matter

Substance which breaks down naturally and which comes from either plants or animals

Seed orchards

A place where trees are planted to harvest seeds

Specimen

An individual or part considered representative of group as a whole

Adapted from:

Fraedrich, S. W., T. Miller, and S. J. Zarnoch. 1994. Factors affecting the incidence of black seed rot in slash pine. *Canadian Journal of Forest Resources*, 24:1717-1725

Scientists often study things using a particular *research design*. That means that they plan in advance what they will do, and they follow their plans carefully. In this study, the scientists wanted to be able to compare the *germination* of seeds that were collected at three different times and in two different ways. Therefore, they carefully planned how and when the seeds would be collected. When scientists carefully follow their plans, they can have more confidence in their results.

Discovery

You are a scientist trying to discover what conditions are most favorable for seed germination. Obtain lima beans from a seed store. Get five clear plastic cups, five pieces of dark blotter paper, and a bag of cotton balls. Soak the lima beans in water overnight. Line the cups with the blotter paper and stuff the centers with the cottonballs. Place ten lima beans in each tumbler between the blotter paper and the plastic so that you can see the beans through the plastic. Moisten the cotton balls in four of the cups, so that the blotter paper becomes moist. Put the dry cup on a table in the classroom, along with two other cups. Cover one of these two "wet" cups tightly with plastic wrap. Put the fourth "wet" cup in the dark and the fifth in a refrigerator. Make sure the blotter paper stays moist (except for the dry cup and the plastic covered "wet" cup) by adding water to the cotton every few days. Observe and record the germination that occurs in each cup. Which conditions are favorable and not favorable for seed germination?

Introduction

Just like you and me, trees can get sick. This can happen in many different ways. One way trees become ill is through an *infestation* of insects or fungi. This is what happens to a certain type of tree called slash pine. In this case though, it is not the actual tree which is affected, but the seeds. When seeds are infected with black seed rot, a type of *fungus*, they become damaged. What happens is that the black seed rot

does exactly what the name says--it rots the seeds and gives them black spots! Sometimes they are damaged so badly that the seeds will never be able to grow into a tree.

The reason this happens is that the rot affects the seed's ability to germinate. This is especially bad news to *seed orchards* where they grow trees specifically for selling the seeds. For people who manage seed orchards, losing seeds to black seed rot means losing money. And for us, that means fewer trees.

Three scientists, S.W. Fraedrich, T. Miller, and S.J. Zarnoch, decided to investigate why black seed rot occurs and what its effects are. This is what they did and what they found out....



A loblolly pine seed orchard.

Reflection

- 1 Why is it important that the scientists study black seed rot?

- 2 Who will benefit from the results of this study?

Methods

First, the scientists traveled to a slash pine seed orchard in Florida. They then began to collect cones, which contain the pine seeds, for their experiment. Three cones were taken directly from the tree and put into storage bags. Three more cones were hand-picked off the trees and dropped to the ground. Three days later, these cones were gathered off the ground and put into bags. The scientists repeated this procedure at three different times of the month.

After the scientists collected all the cones, they stored them as normally done by seed orchard managers. After storage, the scientists opened the cones and took out the seeds.

Three tests were performed on the seeds:

Fungus test

First, the seeds were examined for any *fungus specimens*. The fungus test would show the scientists exactly which seeds were diseased.

Moisture test

Cones were weighed and tested for *moisture content*. Because unopened (or younger) cones have more moisture, they are heavier. This test determined the cone's maturity.

Germination test

The purpose of this test was to find out what percentage of the seeds would *germinate*.



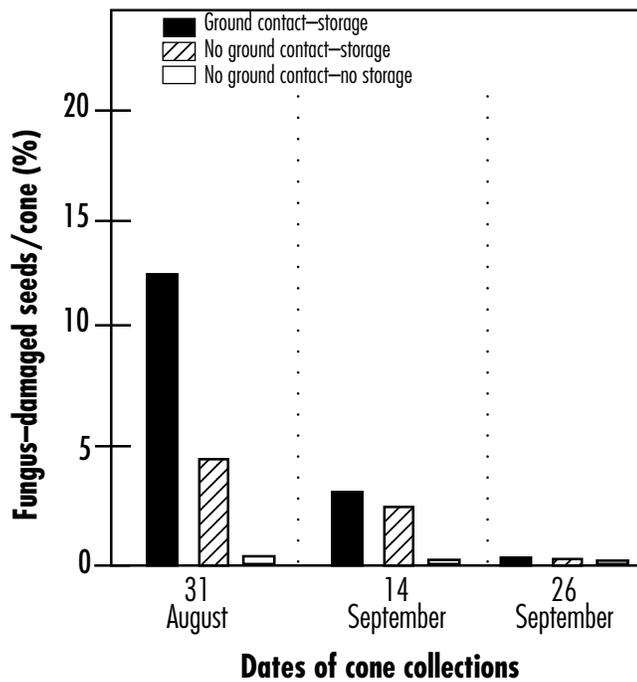


Fig. 1 Can you tell which month was more favorable for germinations? What kind of effects did ground contact or storage have?

Results

After the seeds went through all the tests, the scientists studied the information they obtained. The scientists concluded that the cones that were picked later were the healthiest. If the cones are removed from the tree too early, and they have contact with the ground, the seeds have a greater chance of becoming sick. This is because more *fungus* can get on them when this happens. Collecting cones later greatly decreases the chances that the seeds will get sick. They found that the cones that were collected later have less moisture in them than those collected earlier, and, therefore, are less likely to have fungi develop in them.

The scientists believe that the reasons fungi were growing on the seeds include:

1. *Organic matter* on the ground, such as twigs and fallen branches, help fungi *colonize* cones. Because *fungus* already existed on the *organic matter* on the ground, the cones that had fallen may have been an easy target.
2. Picking the cones off the trees sometimes

made little wounds on the surface of the cones. Some of these wounds were caused as the cones were falling from the tree. On their way down, most cones bump against branches. When they hit the ground they almost always become damaged. These openings can become infected with fungi.

3. *Fungus* needs a moist environment to grow. At the beginning of the harvest season the cones have more moisture than at the end.

Further Discovery

Reflection

- 1 When do you think would be the best time to harvest the seeds?
- 2 If you were a scientist doing this experiment, what would you tell the seed orchard owners to do to increase the amount of healthy seeds?

In the activity that you did at the beginning of this article, you carried out an experiment by following plans. You tested seed germination: 1) at room temperature with no water, 2) at room temperature with no air and with moisture, 3) at room temperature with no light and with moisture, 4) at a cold temperature

