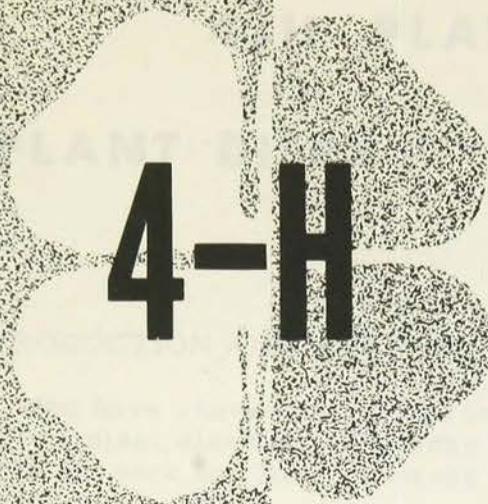


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PLANT PATHOLOGY
SPECIMEN COLLECTION

Plant

Pathology

**Plant Disease
Specimen Collection**

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4-H PLANT PATHOLOGY

PLANT DISEASE SPECIMEN COLLECTION

INTRODUCTION AND WHAT YOU WILL LEARN

You have chosen a new and interesting 4-H project - Plant Pathology, a study of plant diseases. You may not have thought about it very much, but plants get sick and have diseases just as people and animals get sick and have diseases.

In this project you will learn how to collect, identify, and preserve specimens (samples) of plant diseases. It's very important to know how to identify plant diseases, because after you do this you can learn how to cure or control a disease.

You will also find, in this project, that diseases are found in all kinds of plants such as trees, flowers, vegetables, fruits, corn, and other grain. This means that your 4-H leader and the members in your club will plan and go on several field trips to find and collect the plant disease specimens. You will enjoy doing this together.

WHAT CAUSES PLANT DISEASES

A disease develops in a plant when something such as bacteria, fungi, viruses, or nematodes get into and react with the plant. Plant diseases may also be caused by changes in temperature, moisture, or nutrient conditions; or by injuries to the plant.

These three things must be present for a plant disease to develop:

1. A disease-causing agency.
2. A plant that is susceptible to the disease-causing agency.
3. The right kind of conditions for the disease-causing agency to infect and develop in the plant.

WHAT WE SEE OF A PLANT DISEASE

We do not see the plant disease itself. What we really see is the symptom or evidence that a disease is present in the plant. This is much the same as when we get sick with a cold, which is caused by a virus. We do not see the cold itself, but we see the symptoms such as a cough or a runny nose.

Here's an example which will show you how a disease develops in a plant. A leaf spot of cedar-apple rust on an apple tree leaf is not the disease, but a symptom of the disease. The disease itself is the process of the fungus and the plant reacting to each other. In order that this could happen, moisture and temperature conditions have to be favorable so the fungus spore would germinate (start to grow) and enter the leaf. After the fungus has entered the leaf,

the temperature again has to be favorable for the fungus to grow and cause the leaf spot.

COLLECTING YOUR PLANT DISEASE SPECIMENS

In this project you will make a collection of plant disease specimens. Remember that you are really collecting the symptom of the plant disease. You will also learn the common names of the plant diseases you collect.

A. Identifying the plant disease specimens you collect.

You will not be able to find all of the plant diseases described in any one book. Therefore, you and your 4-H leader will have to get books and pamphlets from your county extension office and from libraries. Your 4-H leader has a list of many of these books and pamphlets.

B. Field trips to collect specimens.

The members of your 4-H Club and your leader will want to plan and go on several field trips to look for and collect plant disease specimens. If you make some of the trips in the spring, some in summer, and some in the fall, your collection will be larger and have more variety.

You will want to take the following things with you to protect and carry the specimens you collect:

- (1) A catalog or a discarded telephone book for the leaf specimens.
- (2) A small box for other specimens.

Be sure to carry your things carefully so you won't damage your specimens.

You may also want to help your parents to become interested in this project. They could then help you with your collection when you go on a drive or trip.

C. Preserving your specimens.

Plant disease specimens can be preserved in several ways, the particular method varies with the type of specimen at hand. Use dry methods when possible. Some specimens require a liquid preservative; the specimen is stored in the liquid in a sealed jar.

Flat material such as leaves and thin stems may be dried and fastened to sheets of heavy paper (figure 1). Cellulose tape makes a good fastener. Dry specimens before mounting by placing between blotters, several sheets of newspaper, or pieces of corrugated paper board alternated with several sheets of newspaper. Press leaves or stems between the layers and keep in a warm place to dry. Dry in 1 or 2 days to prevent molding of the specimens.

Thick specimens that can be dried by exposure to air or with some heat may be placed in small boxes (figure 2). Sometimes these specimens may be glued to the bottom of the box or glued to a card which is placed in a box. Both flat and thick dry specimens can be mounted behind transparent film or glass. For thick specimens cotton or other soft material may be used in a box with the transparent material for a cover. Similar ready made mounts are



Figure 1. Flat, dried specimens mounted on heavy paper (fastened with cellulose tape).



Figure 2. Dried specimens loose in box.



Figure 3. Specimens in Riker Mount. This cotton-filled box is about 1 inch thick. Face of mount is heavy plastic.

available commercially, in the NASCO Catalog in your county agent's office, under the trade name, "Riker Mounts" (figure 3). These ready made mounts could get expensive if you use a number of them. Therefore you might prefer to make your own.

Soft, gelatinous, or fleshy plant materials such as fruits, roots, or cedar-apple rust galls with gelatinous tendrils, must generally be preserved in a solution in a sealed jar (figure 4).

The formula for a good preservative solution is:

Water	8 cups
Formaldehyde (40 percent)	1/4 cup
Ethyl alcohol (95 percent)	1 1/4 cups

For smaller amounts of the solution, cut this formula by one-half. All mounted or preserved specimens must be labeled with as much of the following information as possible:

Host (name of the diseased plant)

Figure 4. Fleshy specimens in liquid preservative. Identification card may be glued to container or fastened with a tag.



Name of the disease
Parasite (the name of the organism causing the disease)
Place where collected (nearest town and state is usually sufficient)
Date collected
Name of the collector

Insects or rodents sometimes damage an important plant collection during storage. This can usually be prevented by placing some moth crystals with the collection.

You can use a great deal of individual ingenuity in preserving and mounting specimens. Flat boxes made of cardboard or thin wood with plastic windows make good containers similar to "Riker Mounts." If made uniformly, they can give a distinctive style to a collection. Uniformity of size of mounting materials helps when collections are to be packed for moving. Also keep in mind that preserved plant materials often become brittle and may be damaged during handling or transporting. Select mounting materials and methods that will protect specimens from damage.

DESCRIPTIONS OF COMMON PLANT DISEASE SYMPTOMS

Here is a list and short description of some fairly common and easy to see plant disease symptoms that make good specimens for your collection. Study these before you go on your field trips and you will have a start on what to look for.

1. Cedar-apple rust -- Brown, hard galls up to 2 inches in diameter on twigs of eastern red cedar. Present in fall and spring. Also leaf and fruit spots on apple during middle and late summer. See Plant Pathology Fact Sheet No. 4, "Cedar-Apple Rust."
2. Corn smut -- Galls on leaves, stems, tassels, or ears of corn plants. Silvery white at first, and later becoming dark brown inside. Vary in size up to several inches in diameter. Small specimens may be preserved by drying. See USDA Agricultural Handbook No. 199, "Corn Diseases."
3. Stalk rot of corn -- You can find specimens by inspecting corn stalks during the fall. Lodged stalks are more likely to be rotted. Cut stalks open by splitting lengthwise. Select specimens that show severe rotting and discoloration; those showing pink or red discoloration are especially desirable. See also Plant Pathology Fact Sheet No. 3, "Stalk Rot and Lodging of Corn," and USDA Agricultural Handbook No. 199, "Corn Diseases."
4. Apple scab -- First evident in late spring and early summer as a black, sooty growth on apple leaves. Usually shows up first on the bottom side of leaves. Spots often become more distinct later in the summer and areas may become yellow around the spots. Infected apple fruit has large brown spots that usually crack open.
5. Black leaf spot of roses -- Distinct black spots on leaves of rose bushes.
6. Rose rust -- Spots on rose leaves, buds, and young green stems which put out yellow spores in the late spring and early summer. During the fall the rust goes into the winter stage in the form of a thick, black crust on the infected part of the plant.

7. Leaf spots on many plants -- Most plants become infected at some time with leaf spotting fungi or bacteria. Many infected leaves make good specimens. Select distinct specimens so that they can be identified.

8. Powdery mildew -- This type of leaf spot affects many plants. The disease occurs as a silvery white area on leaves and may cover the entire leaf. It is especially common during the last half of the summer and can usually be found on leaves of lilac bushes. Grass on the north side of buildings or other shaded places is also commonly infected. For a colored illustration of this disease on grass see North Central Regional Extension Publication No. 12, "Lawn Diseases in the Midwest," page 11.

9. Smuts of cereal grains -- These diseases affect the heads of wheat, oats, barley, and many other plants of the grass family including some grass weeds such as foxtail. Plant Pathology Fact Sheet No. 6, "Barley Smuts," describes these diseases on barley. Illinois Natural History Survey Circular 48, "Diseases of Wheat, Oats, Barley and Rye," is also a good reference.

10. Pasmo of flax -- This fungus disease of flax causes bands of infected tissue alternated with bands of healthy tissue on stems. It is often described as a "barber pole" effect. Plant Pathology Fact Sheet No. 7, "Flax Diseases," describes this disease. The disease is evident near harvest time for the crop.

11. Cane blights of raspberry -- These diseases occur in two forms: Anthracnose occurs as light gray spots on the canes while spur blight appears as purple spots or bands on the canes. These diseases are usually present late in the season on canes that grew during that season. Plant Pathology Fact Sheet No. 8, "Raspberry Diseases," has descriptions and photographs of these diseases.

12. Downy mildew of grapes -- This fungus disease on leaves and fruit of grapes causes yellowish spots up to $\frac{1}{2}$ inch in diameter on the leaves. Grapes themselves are sometimes covered with a white fuzzy material which is the mycelium and spores of the downy mildew fungus. Farmers' Bulletin No. 1893 USDA 1961, "Control of Grape Diseases and Insects in the Eastern United States," has illustrations and a description of this disease on pages 4, 5, and 6.

13. Black knot of plum -- The symptoms of this disease are very obvious as a thick, black, crusty growth on branches of plum trees. The growth is similar to the winter stage of rust of rose.

14. Ergot -- This is a fungus disease of cereal grains and many other grass plants. The fungus grows in individual grain kernels in the head of the plant and changes the kernels into ergot bodies that are dark brown in color and larger than normal kernels. Ergot bodies can be found near harvest time on many grasses and cereal grains, but rye is one of the best plants on which to search for them. See Circular 48 listed in (9) above, pages 136 and 137 for more information and a photograph.

BASIS FOR JUDGING YOUR COLLECTION

You will want to exhibit your collection of plant disease specimens at the county fair. The minimum number of specimens for your exhibit is 10. Your exhibit will be judged on the following factors.



1. Variation in types of specimens.
2. Use of several different methods of preserving.
3. Quality of specimens. (Do the specimens show distinct symptoms? Are the host plant and disease symptom well preserved as to color and shape?)
4. Accuracy and completeness of identification and other information. (Avoid specimens that have vague symptoms or for other reasons are difficult to identify.)
5. General neatness.
6. Answers to questions on the project record.

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