

# AGRICULTURAL GUIDE

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Apple diseases

## Cedar - apple rust

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In Missouri, cedar-apple rust can be a destructive apple disease if you don't use adequate controls. It also attacks red cedars, as the name implies, causing unsightly galls, but damage is usually minimal. Understanding of the disease cycle of this rust fungus is necessary for proper identification and control.

### Cause

Cedar-apple rust, common in North America and in Europe, is caused by the fungus *Gymnosporangium juniperivirginianae*. Other similar rust diseases are quince rust, *G. clavipes*, and hawthorne rust, *G. globosum*. All three fungi spend part of their life cycle on red cedars that are growing near orchards. Since the disease cycles of these rusts are similar, this guide will discuss only cedar-apple rust.

### Symptoms

**On apple:** Infections occur on apple leaves, fruit, and occasionally on young twigs. However, the brightly colored spots produced on the leaves make it easy to identify. Numerous small, pale yellow spots appear on the upper surfaces of the leaves, usually during late April or May. These spots gradually enlarge and turn orange (see Figure 1). You can see orange drops of liquid in the spots. Later, black dots (spermatia) appear in the spots on the upper leaf surface.

In late summer, tube-like structures (aecia) develop on the under-leaf surface. Leaves might drop prematurely because of infections. Fruit infections are usually near the calyx (blossom) end and are somewhat similar to the leaf lesions.

**On cedar:** The fungus produces reddish-brown galls from one-quarter to 2 inches in diameter. These galls are frequently called "cedar apples" (see Figure 2). After reaching a diameter of about 1/2 inch, they show many small circular depressions (like golf balls). In the center of each depression is a small, pimple-like structure. In the spring these structures elongate into orange gelatinous protrusions known as telial horns. These spore-bearing horns swell during rainy periods in April and May. The wind carries the microscopic spores to infect apple leaves.



Figure 1. Above: Rust lesions appear on apple leaves.  
Figure 2. Right: Cedar-apple rust galls appear on cedar.

## Disease cycle

The disease cycle of cedar-apple rust is complex. Two host plants—apple and cedar—are involved, and three fruiting structures are produced by the fungus: aecia, spermatia, and telia. The fungus requires two years to complete the cycle (see Figure 3).

In warm, wet springs each spore horn produces a fantastic number of spores. The wind carries them to apple leaves just about the time when apple buds are in the pink to early blossom stage.

Upon reaching apple leaves, the spores attach themselves, germinate, and enter the leaf tissues. They infect within four hours under favorable conditions. Yellow lesions develop in one to three weeks.

In July and August, spores from the apple leaves (aeciospores) are produced. The wind carries them back to cedar trees, completing the cycle. The spores land on cedar needle bases or in cracks or crevices of twigs. There, they germinate and produce small green-brown swellings about the size of a pea. Galls do not produce spores until the second spring. However, usually many mature galls are available every year.

## Control

Control of the cedar-apple rust disease involves interruption of the disease cycle.

You should plant **resistant varieties** of apples when cedar trees are nearby. There are definite differences in the susceptibility of apple varieties. Jonathan, Rome Beauty, Wealthy, and York Imperial are susceptible. Grimes Golden, Red Delicious, Winesap, Staymans, Redfree, Jonafree, Prima, and Priscilla are resistant.

**Remove cedars** located within a 2-mile radius of an orchard to interrupt the disease cycle. Orchardists usually try to eradicate cedars near their orchards, but homeowners may not be able to exercise this control measure because their neighbors might plant cedars for ornamental purposes.

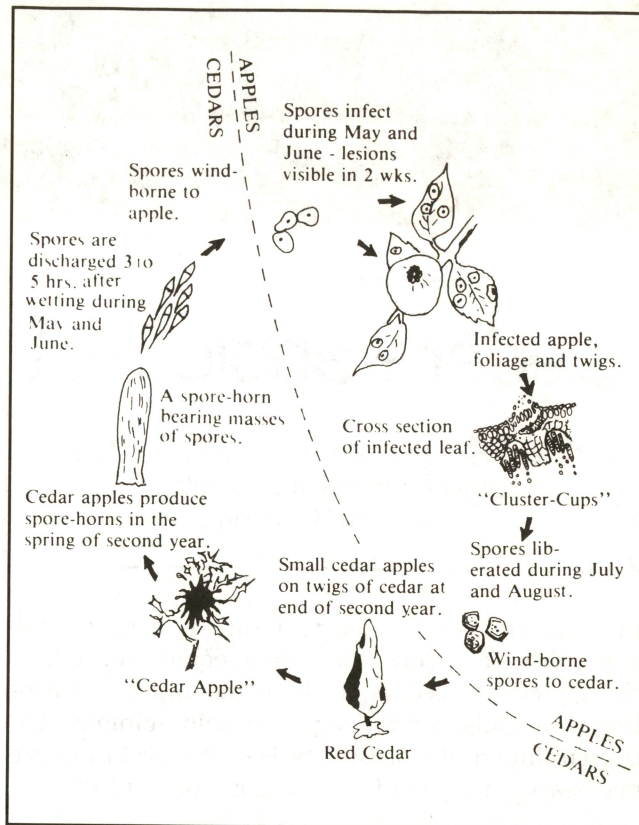


Figure 3. Disease cycle of cedar-apple rust (University of Nebraska-Lincoln).

**Fungicide sprays** are highly effective against the rust diseases when applied properly. Apply them four times at seven to 10 day intervals starting at pink bud to early bloom.

Fungicides such as mancozeb (Dithane M-45 or Manzate 200) or Dikar will protect the apple leaves from infection. The same fungicides can be used in July and August on the cedars to reduce infection, but this is not as important as protecting the apples. Follow label directions.

For more information on fungicides see UMC Guide G6010, "Spray Schedules," or MP264, Missouri Apple Spray Schedule for commercial orchards.

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