



Cedar-Apple Rust: *Gymnosporangium juniperi-virginianae*

Introduction

Cedar-apple rust is one of several similar fungal diseases which could be broadly classified as Juniper-Rosaceous rusts. All of these rusts have similar disease cycles but differ in which juniper and rosaceous species they infect and in symptoms they cause on these hosts. All of these rust diseases are caused by fungi in the genus *Gymnosporangium*. Each species spends part of its life cycle on a juniper host and part on one or more hosts in the rose family, and requires both hosts to complete their life cycles. Cedar-apple rust is caused by the fungus *Gymnosporangium juniperi-virginianae*. Two other common juniper-rosaceous rusts are hawthorn rust and quince rust, although there are many more.



Figure 1: Juniper branch with a mature Cedar-Apple Rust gall displaying gelatinous tendrils. (provided by Dr. George Hudler, Cornell University)

Examples of juniper hosts include eastern red cedar, southern red cedar, Rocky Mountain juniper, some prostrate junipers, and Chinese juniper. Examples of

rosaceous hosts are apple, crabapple, hawthorn, quince, serviceberry, and pear. Some commercial apple varieties are also highly susceptible to cedar-apple rust; fruit may be infected by the fungus, and infected leaves may drop prematurely causing potentially severe defoliation.



Figure 2: Apple leaves displaying bright yellow-orange leaf lesions. (provided by Dawn Dailey O'Brien, Cornell University)

Symptoms and Signs

Symptoms on the juniper hosts often include swollen growths or woody galls on branches or shoots. Once mature, bright orange, gelatinous, spore-producing growths emerge from the galls. This may be apparent for a period of just a few to several weeks each spring depending on the weather. Mature galls are generally easier to find after a moist period as moisture causes the gelatinous material to swell and appear orange in color. On leaves of rosaceous hosts, lesions may be apparent as yellow or orange spots on the upper surfaces of the leaves, and this bright coloration may

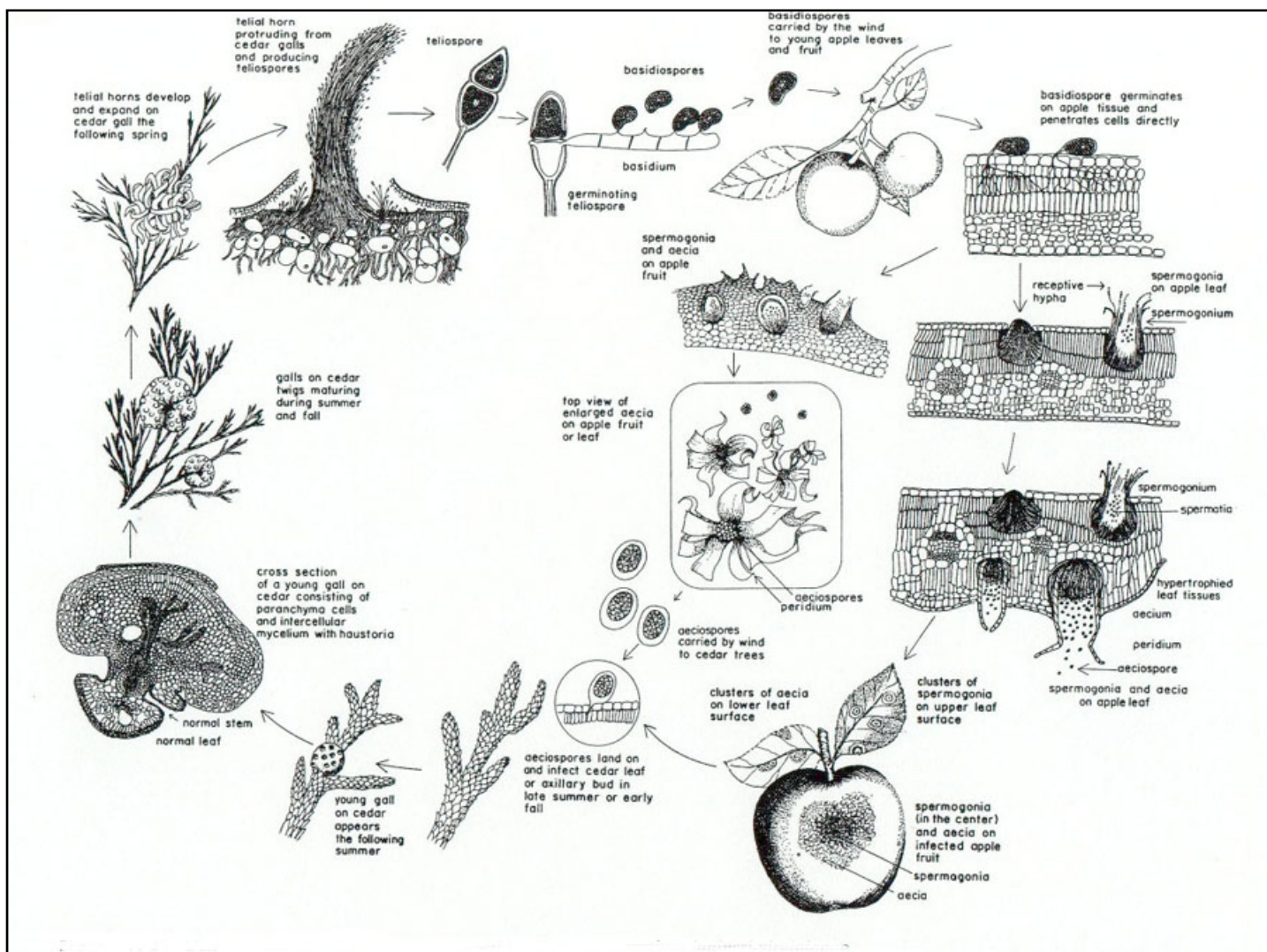
be very distinct. Spots initially appear similar on the undersides of the leaves, but later fruiting bodies called aecia develop on the undersides of the leaves appear as small pale papery tubes. In some cases, tender shoots and/or fruit may also become infected. Powdery yellow-orange or reddish spores will eventually be produced from aecia.

Disease Cycle

Rust fungi spend the winter on their juniper hosts as stem galls up to 5 cm in diameter. Galls can be perennial and survive from year to year or may take more than one year to reach maturity. In the spring, bright, orange, gelatinous, horn-like growths 1-2 cm long emerge from the galls (Fig. 1). These orange structures produce spores, called teliospores, which

spread by wind to infect the rosaceous host. On the rosaceous host, the teliospores infect leaves, fruit, and succulent stem tissue and produce bright yellow or orange colored lesions (Fig. 2).

From these yellow-orange lesions more spore producing structures called aecia develop in mid to late summer. The aecia are papery tubes or cups up to approximately 4 mm in length. The coloring can vary from white, light pink, or orange, to yellow. On leaves the aecia develop on the underside of the leaf. On fruit they develop anywhere on the surface (Fig. 3). Inside these aecia are spores called aeciospores which are powdery in texture and red-brown, bright orange or orange-yellow in color. During dry weather in mid to late summer, the aeciospores are spread by wind and cause infections on nearby juniper hosts.



Cedar-Apple Rust disease cycle.

(provided by George Agrios, *Plant Pathology* 3rd edition, APS Press)

Galls form on the juniper host where the pathogen survives the winter, and the cycle starts over (**Fig. 4**). In addition to galls, the pathogen can cause dieback in the juniper host.

Management Strategies

In severe cases these rusts may be managed with fungicides, however registered fungicides will vary by the type of plant(s) to be treated and their use or site. In the home orchard, specific products may be labeled for managing the disease or simply for suppression. For a list of products registered in New York for home orchard use, please refer to our [fruit fungicide table](#). Please note that some restrictions or warnings may apply so be certain to read and follow the label.

Products labeled for fruit trees and for ornamentals may differ so be certain any product used is registered for the correct host(s) and site(s). Follow the label instructions for all pesticides used, and avoid the use of insecticides during bloom so that bees are not harmed. For commercial applications, please refer to the appropriate commercial pest management guidelines, or contact your local Cooperative Extension Office for more information on currently registered products.

In addition, there are resistant varieties of juniper, apple, crabapple, and hawthorn available for use in new plantings or when replacing severely diseased specimens. There may also be some potential for control by eliminating nearby juniper hosts, or removing galls from hosts before sporulation occurs, however, this is not always practical because the

spores can travel several miles by wind to infect the alternate hosts.

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Chemical Management

Fungicides labeled for cedar rust control on fruit trees include:

Chemical Class: Common Name	Trade Name ¹
DMI: triadimefon	Bayleton [®]
DMI: myclobutanil	Nova, [®] Immunox[®]
Carboximide: thiophanate methyl	Topsin-M, [®] Cleary's 3336[®]
multisite: mancozeb	Mancozeb[®] , Penncozeb [®]
Multisite: captan	Captan[®]

¹ Fungicides set in **bold** are labeled for homeowner use.

READ THE LABEL BEFORE APPLYING ANY PESTICIDE! Changes in pesticide regulations occur constantly. All pesticides distributed, sold, and/or applied in New York State must be registered with the New York State Department of Environmental Conservation (DEC). Questions concerning the legality and/or registration status for pesticide use in New York State should be directed to the appropriate Cornell Cooperative Extension Specialist or your regional DEC office.

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