



Gymnosporangium Rusts: The Three Common Cedar Rust Diseases

There are 36 species of the genus *Gymnosporangium* that are known in North America. The genus *Gymnosporangium* is responsible for the fungus diseases that are commonly referred to as “cedar-apple rust.” Of the 36 species there are only three that are significant enough in the Northeast to warrant our concern.



Fig. 1. Inactive reddish-brown/dark brown second-year kidney shaped galls. L. Barnard, Florida Department of Agriculture and Consumer Services, www.Bugwood.org



Fig. 2. Typical cedar-apple rust gall found in moist spring weather on juniper host. Photograph taken on May 8, 2009. (Thomas Kowalsick, Senior Horticulture Consultant, Cornell Cooperative Extension – Suffolk County)

Cedar-apple Rust (*Gymnosporangium juniperi-virginianae*) - Infected red cedars (*Juniperus virginiana*) and other junipers (members of the genus *Juniperus*) form reddish brown, round to kidney shaped galls of woody tissue (**Fig. 1**), up to 2 inches in diameter, in response to infection by this pathogen.

During moist spring weather, bright orange, cylindrical gelatinous tendrils (**Fig. 2**) are extruded from indentations on the galls. It is from the tendrils that infectious spores are produced for about two to three weeks. The spores are thin-walled and succumb easily to drying, a feature that causes many to be lost as they waft through the air. However, the successful ones land on leaves (occasionally fruit or twigs) of *Malus* sp. (apple, crabapple) where they germinate, penetrate into the tissue, and continue the disease cycle.

Symptoms on apple (and crabapple) appear as small greenish-yellow spots on upper surfaces of leaves (**Fig. 3**) in late spring. During the summer, these spots gradually enlarge and change to yellow-orange surrounded at the border by concentric red bands. Later, the undersides of these spots produce fringed, cup-shaped structures with short protruding “fingers” of spore bearing fungal tissue (**Fig. 3**). Spores from these must find their way back to junipers for infection of foliage in late summer and fall.

Galls on junipers may grow for up to 5 years after infection, producing spores for all but the first of those years.

Damage on junipers is generally minor and involves growth of the galls and some twig dieback. On apples and crabapples, fruit infections and leaf drop also can occur. If infection is severe, enough defoliation may occur to weaken the plant.

Quince Rust (*Gymnosporangium clavipes*) - Quince rust is the most lethal but least noticeable of these diseases on juniper. Infected areas on juniper are much less spectacular than those caused by cedar-apple rust. The pathogen causes junipers to produce perennial cigar-shaped galls that may eventually cause death of larger branches. Bark on infected twigs is usually cracked

and rougher than surrounding healthy tissue. In late April and May, short, gelatinous “cushions” of spore-bearing tissue (**Fig. 4**) emerge from these swollen areas. As with cedar-apple rust, the spores from these must find their way to leaves of twigs of the alternate host.

On the broad-leaved hosts (hawthorn, quince, apple, and crabapple) this fungus causes distortion of twigs, buds, and fruit, but leaf spots are less commonly produced. On hawthorn, the most common host in the Northeast, fruits become shrunken



Fig. 3. Leaf spot symptoms of cedar-apple rust on crabapple leaves. Symptoms on upper surface (*left*) and the spent finger-like spore producing tissue called aecia on the undersurface (*right*). Photographs take in September 2006. (Thomas Kowalsick, Senior Horticulture Consultant, Cornell Cooperative Extension – Suffolk County)

and often die and twigs may become swollen (**Fig. 5**) and cankered. White tubes (**Fig.6**), about the size of pencil lead, protrude as far as 1/4 inch from the surface and bright orange spores are shed from these tubes and carried by wind back to junipers for fall infections.

Hawthorn Rust (*Gymnosporangium globosum*) - Round galls on juniper twigs, seldom over 1/2 inch diameter, form in response to this disease. The galls are usually smaller and more irregular in shape than the cedar apple rust galls, and they produce shorter spore horns. They are mahogany-red with elevated areas on the surface from which tongue-shaped gelatinous tendrils protrude in moist weather. The galls

remain functional for 3 to 5 years, producing tendrils in the spring from which spores may infect nearby rosaceous hosts. Yellow-orange leaf spots (**Fig. 7**), primarily on hawthorns rather than crabapples and apples, are most common symptoms. On hawthorn fruits, light brown cups protrude. The cups produce orange spores that infect junipers.

Management - These diseases are typically more harmful to broad-leaved hosts than to the junipers. They can cause reduced fruit size on apples and premature defoliation of hawthorn, apple, crabapple or mountain ash. *G. clavipes* also causes twig blight.



Fig. 4. Gelatinous “cushions” of spore-bearing tissue called telia of quince rust forming on a juniper twig (Photograph courtesy NYS Agriculture Experiment Station, Geneva, NY)

The best method of avoiding cedar rust diseases is to keep susceptible junipers far enough away from rosaceous hosts to minimize chances for successful exchange of spores.

Another valuable strategy is to use resistant cultivars when choosing new trees. Much progress in identifying resistant crabapple selections has been made, but one should not focus solely on rust resistance. Crabapples have several other important diseases and the best selections should be resistant to them, as well.

Rust on broad-leaved hosts can also be reduced with use of appropriate fungicides, but applications must be made *before* infection occurs. When you see one of the cedar rusts on infected hawthorn, apple or crabapple fruits and leaves, its far too late to spray that host for that year.

Control on Fruit Bearing Apple Trees (cedar-apple rust): If rust has been a serious problem in previous years, use copper soap (copper octanoate), kaolin clay (for suppression), sulfur, or a multipurpose spray (with sulfur or captan). Do not apply copper products after “pink bud” stage or it may russet the fruit.

Control on Flowering Crabapple (cedar-apple/cedar-hawthorn rust): If needed when sphere-shaped galls on nearby junipers produce orange masses (jellylike and sometimes stringy), treat crabapple trees with chlorothalonil, myclobutanil, potassium bicarbonate, propiconazole, or sulfur.

Control on Hawthorn (cedar-apple/cedar-hawthorn rust): If needed when sphere-shaped galls on nearby junipers produce orange masses (jellylike and sometimes stringy), treat hawthorn with chlorothalonil, copper ammonium carbonate, myclobutanil, potassium bicarbonate, or propiconazole.



Fig.5. A swollen hawthorn twig infected with quince rust (Plant Pest Diagnostic Lab, Purdue University)

Control of Rust on Quince (*Chaenomeles* sp.): Follow these **disease sanitation practices:** Avoid crowding plants; allow air to circulate around and within plants. Prune to thin plants or plantings and/or to remove diseased parts. Prune only when conditions are dry, and, where feasible, disinfect pruning tools between cuts or between plants. Discard all diseased tissue and in autumn, rake and discard or destroy all fallen leaves, fruit, and branches. Avoid wetting foliage overnight or for long periods of time. If needed apply chlorothalonil following label directions.

Control of Rust on Junipers (cedar-apple/cedar hawthorn rust): Remove galls in early spring. Beginning in early August, spray with copper ammonium carbonate or potassium bicarbonate.



Fig. 6. A hawthorn fruit infected with quince rust exhibiting the whitish aecia (*Branching Out*. Vol. 12 #8, July 22, 2005. Cornell University)

The information for the leaflet was obtained from: “*Gymnosporangium* Rusts: The Three Common Cedar Rust Diseases” by George Hudler and Dawn Dailey O’Brien, *Branching Out*, Volume 4, No. 2, 4/25/97.

Pesticide and management recommendations obtained from: *Part I Guide to Pest Management Around the Home, Cultural Methods* and *Part II -- Pest Management Around the Home, 2009-2010 Pesticide Guidelines*, Contact Cornell Cooperative Extension – Suffolk County to order copies.

The Pesticide Management Education Program (PMEP), in cooperation with the New York State Department of Environmental Conservation (NYSDEC), maintains a web site with a searchable database for pesticide products currently registered in New York State. Individuals who have Internet access can locate currently registered products containing the active ingredients suggested above at

<http://pims.psur.cornell.edu/index.php> (NYS PIMS).

This publication contains pesticide recommendations. Changes in pesticide regulations occur constantly and human errors are still possible. Some materials mentioned may no longer be available, and some uses may no longer be legal. All pesticides distributed, sold 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. Read the label before applying any pesticide.

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Fig. 7. A hawthorn leaf exhibiting the leaf spotting symptoms of hawthorn rust (Robert L. Anderson, USDA Forest Service, www.bugwood.org)