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Cedar Rust Diseases of Ornamental Plants

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Cedar rust diseases can be some of the most visibly striking diseases in the landscape. There are a number of "cedar rust" diseases in which the fungus completes its life cycle on two plant hosts; one in the cypress (cedar) family and one in the rose family (the rosaceous host). The following are the three most common cedar rust diseases in the northeast United States:

1. **Cedar apple rust** (pathogen: *Gymnosporangium juniperi-virginianae*). The fungus alternates between Eastern red cedar (*Juniperus virginiana*) and primarily apple and crabapple.
2. **Cedar hawthorn rust** (pathogen: *Gymnosporangium globosum*). The fungus alternates between junipers and hawthorn, crabapple, and apple in addition to several other rosaceous hosts.
3. **Cedar quince rust** (pathogen: *Gymnosporangium clavipes*). The fungus alternates between junipers and a wide range of rosaceous hosts. The most noticeable in the landscape is hawthorn.

In many cases these diseases are minor problems, although the fungal structures produced are highly visible in the landscape. Cedar quince rust and cedar hawthorn rust can be a major problem on hawthorn, and cedar apple rust can affect commercial apple production.

Diagnostic Symptoms and Signs

Cedar Apple Rust

On junipers, tan to brownish, round to kidney-shaped abnormal branch growths (called galls) can been seen in winter and early spring (Figure 1). During moist weather in spring, striking bright orange masses of gelatinous spores develop on these galls, and the galls swell to several times their original size (Figure 2). Spore masses are several inches in diameter, with a central core and radiating hornlike tendrils, and are highly visible during moist weather in mid-spring. The spores can "bleed" in the rain and cover any surface under the galls. Damage on junipers is generally minor and involves the presence of galls and twig dieback.

Figure 1. Cedar apple rust gall on juniper in winter.

Figure 2. Cedar apple rust gall with gelatinous spore horns on juniper in the spring.

On apple and crabapple, bright orange-yellow leaf spots develop on upper surfaces of leaves in late spring. Within a few weeks, light colored, fringed, cup-shaped structures form on lower leaf surfaces. On apples and crabapples, fruit can become infected, and leaf drop can occur.

Cedar Hawthorn Rust

On junipers, symptoms and signs are similar to cedar apple rust except galls are somewhat smaller. Galls continue to produce spores on junipers for more than one year, compared to only one season of spore production with cedar apple rust.

On hawthorn, leaf spots similar to those produced by cedar apple rust are formed (Figure 3). Occasionally, green twigs are deformed by the fungus.

Figure 3. Cedar hawthorn rust symptoms on the upper (left) and lower (right) surface of hawthorn leaves.

Cedar Quince Rust

Infected areas on juniper are much less spectacular than with cedar apple rust, with a cushion-like mat of orangish fungal growth developing on spherical galls in spring (Figure 4).

Figure 4. Cedar quince rust on juniper.

Cedar quince rust causes the greatest damage of the three rusts to ornamental rosaceous hosts, especially to hawthorns, because of extensive, unsightly fruit infestations; stunting and death of fruits; and swelling and distortion of twigs. Infected leaves turn brown and die. Fruits become covered with orangish-pink spore horns (Figure 5). Unsightly spherical cankers developing on stems can last more than one year.

Figure 5. Cedar quince rust on hawthorn fruit.

Disease Cycle and Conditions Favoring Disease

Rust fungi have complicated disease cycles involving five different types of spores that will not be detailed here. A crucial factor relative to control on these cedar rusts, however, is that there is no repeating spore cycle on the rosaceous hosts. In other words, spores produced on hawthorn will not re-infect hawthorns or other rosaceous plants (e.g., apple or crabapple), but can only re-infect junipers later in the year. Likewise, the noticeable spores produced on juniper will not re-infect junipers. Instead, these spores will only infect rosaceous hosts. The alternating host plant is necessary for survival of these fungi.

Spores produced on the juniper host are blown during moist weather to the rosaceous hosts in mid-spring at a time when new growth has emerged. The fungus then causes leaf spots on upper leaf surfaces. While growing in the rosaceous host leaf, two strains of the fungus mate and emerge as aeciospores that form on the lower leaf surfaces. Aeciospores are blown back to junipers in mid-summer to fall. They then develop galled areas on the junipers (which may take one and a half years), and finally, the cycle is repeated. Windborne spread of spores between the hosts of several hundred yards is not unusual and spread can be a matter of miles.

Management

1. **Use plants with genetic resistance.** A number of juniper species and cultivars and a number of rosaceous species and cultivars have varying levels of resistance and susceptibility to these three rust diseases, and should be used where high disease pressure exists. Consult local experts such as knowledgeable nursery growers, experienced horticulturists, or county Extension educators. Also review local Extension literature for recommendations on the best-adapted plant material for your area. For a partial list of resistant cultivars see Table 1.

Table 1. Selected species and varieties of Juniper, Hawthorn, and Crabapple with resistance to rust diseases.

Cedar Apple and Cedar Hawthorn Rust			**Cedar Hawthorn Rust**	**Cedar Apple Rust**
Resistant *Juniperus* (juniper)			**Resistant *Craetagus* (hawthorn)**	**Resistant *Malus* (crabapple)**
J. ashei	'Depressa'	*J. procumbens (=J. chinensis var. procumbens)*	*Crataegus crus-gall**	'Beverly'
J. chinenis:	'Hibernica'	*J. rigida*	*C. intricata*	'Candied Apple'
'Fermina'	'Oblonga pendula'	*J. sabina:*	*C. laevigata* 'Autumn Glory'	'Dolgo'
'Fortunei'	'Pyramidalis'	'Broadmoor'	*C. phaenopyrum**	'Eleyi'
'Hetzii'	'Saxatilis'	'Fastigiata'	*C. pruinosa*	'Inglis'
'Japonica'	'Saxatilis pallas'	'Knap Hill var. Tamariscifolia'	*C. viridis* 'Winter King'	'Liset'
'Keteleeri'	'Suecia'	'Skandia'		'Mt. Arbor'
'Leeana'	'Suecia nana'	*J. squamata*		'Narangasett'
'Mas'	*J. conferta*	'Albo-variegata'		'Periscifolia'
'Oblonga'	*J. formosana* 'Hyata'	'Fargesii'		'Red Jewel'
'Pedula'	*J. horizontalis*	'Mereri'		'Robusta'
'Pfitzeriana'	'Admirabilis'	'Wilsonii'		'Royalty'
'Pfitzeriana compacta'	'Adpressa'	*J. virginiana:*		'Snowdrift'
'Pfitzeriana glauca'	'Argenteus'	'Aurea'		'Special Radiant'
'Plumosa aurea'	'Douglasii'	'Berg's Rust Resistant'		'Zumi'
'Pyramidalis'	'Eximius'	'Burkii'		
'Sargentii'	'Filicinus'	'Globosa'		
'Sargentii variegata'	'Glomerata'	'Kosteri'		
'Sartentii watereri'	'Lividus'	'Pseudocupressus'		
J. communis:	'Glomerata'	'Pyramidalis'		
'Aurea'	'Lividus'	'Skyrocket'		
'Aureo-spica'	'Petraea'	'Tripartita'		
'Cracovia'	'Plumosa'	'Venusta'		

*Susceptible to cedar quince rust

Modified from *Pest Resistant Ornamental Plants* by Deborah C. Smith-Fiola, Rutgers Cooperative Extension.

2. **Eradication of one host plant.** This was once thought to be useful, but it often fails to work due to spore dispersal over long distances. However, planting junipers adjacent to rosaceous hosts is not recommended.
3. **Removal of infected tissue.** To reduce inoculum and reduce disease severity, it is possible to remove galls from junipers lightly infected with cedar apple and cedar hawthorn rust.
4. **Application of fungicides**. Protective fungicides can be applied several times starting with pre-bloom on hawthorn and bud break on crabapples, if the disease is chronically a problem at a given site. These applications are to protect the rosaceous plant from spores being disseminated from the juniper host in mid-spring. Because there is no repeating cycle of this disease on the rosaceous host, further applications after the springtime spread from juniper are unnecessary. Commonly recommended fungicides include those with the following active ingredients: Mancozeb (Fore, Dithane, Mancozeb), Chlorothalonil (Daconil, Bonide Fung-onil), Myclobutanil (Eagle, Immunox), Triadimefon (Bayleton, Strike), and Propiconazole (Banner). It is the user's responsibility to follow all label instructions.
   a. When you diagnose cedar rust disease from infected hawthorn or crabapple fruit and leaves, it is far too late to spray for that year.
   b. Sprays are rarely recommended to protect the juniper host from spores being disseminated from the rosaceous host in late summer and fall.

Source for all photos in this fact sheet: Bulletin 614, *Disease Control in the Landscape*, Ohio State University Extension.