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Cedar Apple Rusts – Woody Ornamental Tips

Michigan State University

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Gerard Adams, Peg Bessette

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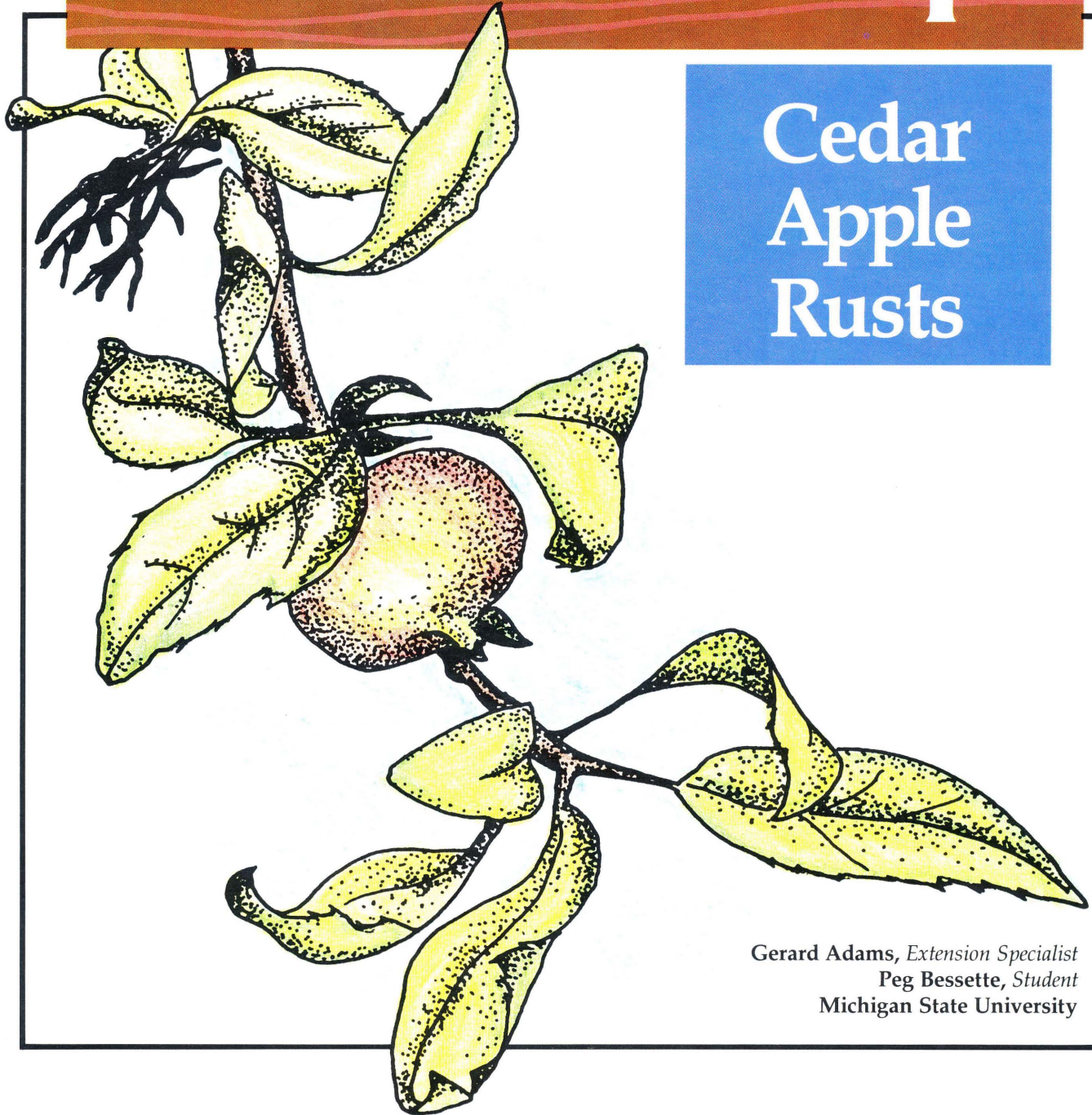
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Woody Ornamental Tips

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Cedar Apple Rusts



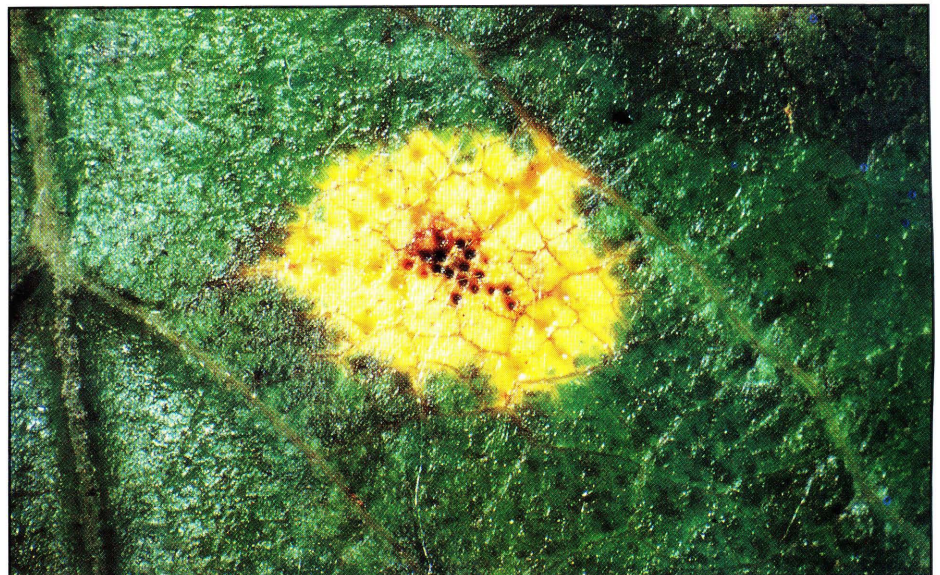
Gerard Adams, *Extension Specialist*
Peg Bessette, *Student*
Michigan State University

Referred to as simply Cedar-Apple Rusts by most, these diseases of landscape ornamentals are actually three diseases: Cedar-Apple Rust, Cedar-Hawthorn Rust and Cedar-Quince Rust. They are caused by three rust fungi: *Gymnosporangium juniperi-virginianae*, *G. globosum* and *G. calvipes*, respectively. Several species of hawthorn and juniper, most varieties of Eastern red cedar (*Juniperus virginiana*), and many cultivars of juniper, apple and crabapple are susceptible to infection. The Cedar-Hawthorn and Cedar-Quince Rusts can infect mountain ash, pear and serviceberry (amelanchier). Cedar-Quince Rust can also infect chokecherry, cotoneaster, photinia, quince and dwarf Japanese quince.



Figure 1A
Yellow leaf spots are the symptom of infection in the cedar rusts' deciduous hosts (hawthorn in this case).

Figure 1B
Black dots will appear on the lesions in mid-June.



Distinguishing Symptoms of the Cedar-Rust Complex Diseases

The initial symptoms of the three cedar rust diseases on the deciduous hosts (trees that lose their leaves in the winter) are similar to each other and familiar to many homeowners, landscapers and growers. Look for circular, yellow spots (lesions) that appear on the upper surfaces of the leaves shortly after bloom, in May (Fig. 1A). The size of these lesions will vary, depending on the number of spots present on a leaf and the type of tree or shrub. Lesions may also develop on twigs and fruits. As the disease progresses, the yellow spots turn orange and, once they reach $\frac{1}{8}$ inch in diameter, orange-colored droplets ooze from the centers. Next, black dots (fruiting structures) will appear in the lesions (Fig. 1B) and spots corresponding to the lesions on the upper leaf surfaces will appear on the leaves' undersides. In August, the undersurface spots form brownish clusters of threads or cylindrical tubes. These threads will appear in lower leaf surface lesions or on fruits and twigs (Fig. 2). Infected leaves may drop prematurely in August.



Figure 2

In August, brown clusters of threadlike tendrils or cylindrical tubes arise from the undersurfaces of the yellow leaf spots or fruit lesions. The threads are masses of spores that infect the juniper and red cedar hosts.

Dry summers will promote defoliation. Early defoliation weakens the plant by reducing the production and storage of food reserves



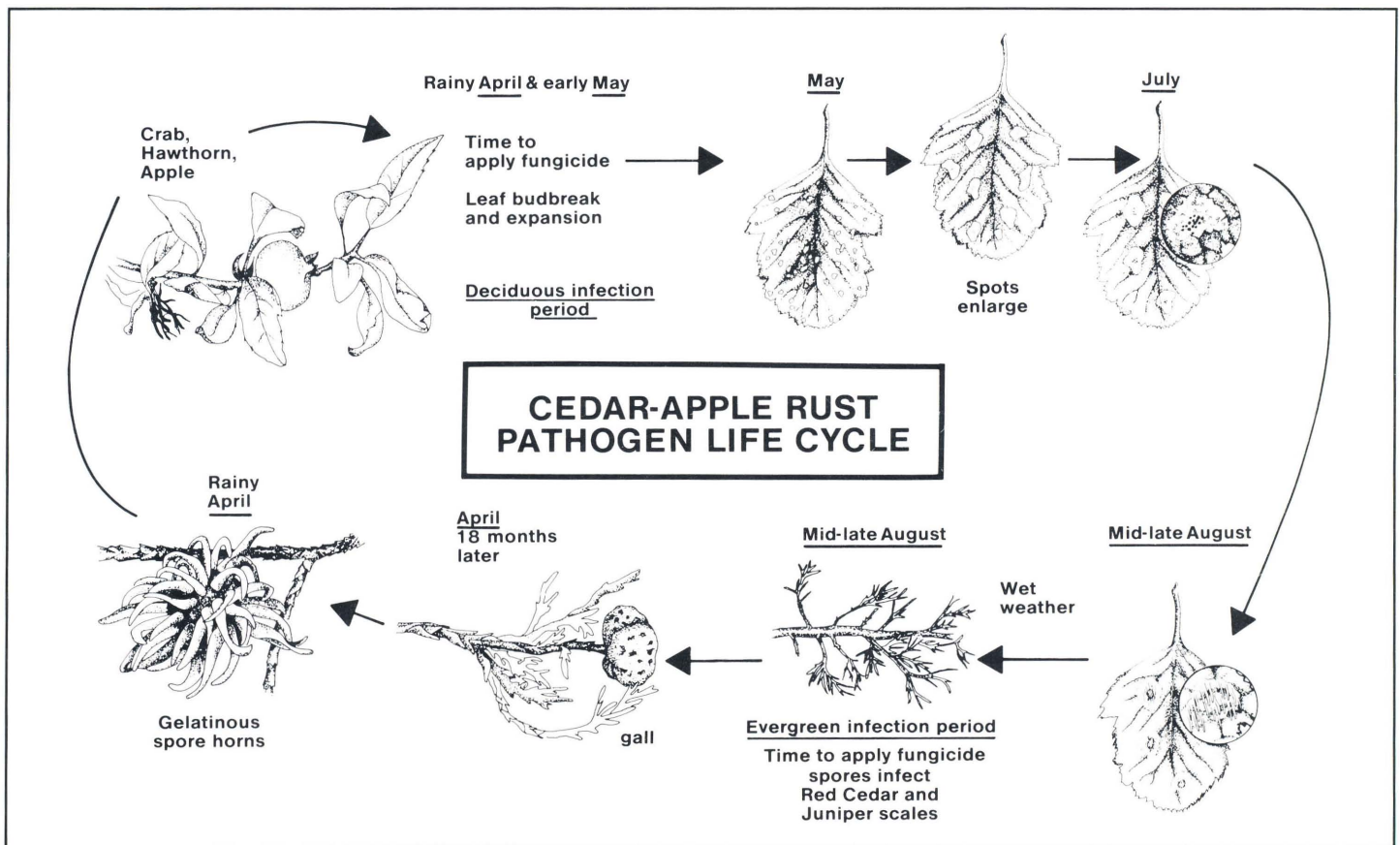
Figure 3

A dark green lesion on an apple is characteristic of Cedar-Quince Rust. Infection of fruit is caused by either Cedar-Apple Rust or Cedar-Quince Rust but not Cedar-Hawthorn Rust. Cedar-Quince Rust will usually distort the shape of the fruit, also.

required for spring bloom and leaf emergence.

Cedar-Hawthorn Rust on the deciduous host can be distinguished from Cedar-Quince Rust and Cedar-Apple Rust in that lesions occur on leaves only and are yellowish red. Though the lesions of Cedar-Hawthorn Rust look similar to Cedar-Apple Rust lesions, they usually do not reach over $\frac{1}{8}$ inch in diameter. Cedar-Hawthorn Rust generally does not infect fruit.

Cedar-Quince Rust differs from Cedar-Apple Rust and Cedar-Hawthorn Rusts in that it does not cause leaf lesions and is much more



likely to attack fruit (Fig. 3). Fruit lesions caused by Cedar-Quince Rust are dark green and $\frac{3}{4}$ to $1\frac{1}{2}$ inches in diameter, with necrotic tissue reaching through to the fruit's core. Infected fruits will usually become badly distorted and drop off before harvest. Fruit lesions caused by Cedar-Apple Rust are orange or yellow and do not distort the shape or extend to the core.

Life Cycle of the Pathogens

The clusters of threads found beneath the spots on the deciduous leaves and on

fruits in August and September are conglomerated masses of spores. The spores formed in these threads infect the leaves and twigs of junipers during wet, warm weather in the late summer and early fall (Fig. 2). Seven months later, in spring, galls (or swellings) will appear on the junipers. After an additional 11 to 12 months (in the following April and early May), the galls will form gelatinous masses of spores in the form of bright orange horns on the cedars and junipers (Fig. 5A, B and C).

Cedar-Apple Rust and

Cedar-Hawthorn Rust form brown, spherical galls on the branches of red cedars and junipers. The galls of Cedar-Apple Rust are often over 2 inches in diameter, while those of Cedar-Hawthorn Rust are seldom over $\frac{1}{2}$ inch in diameter. These galls may remain on juniper branches for years. Cedar-Hawthorn Rust galls produce spores for several successive springs (3 to 5 years). On the other hand, Cedar-Apple Rust galls produce spores for one year only. Cedar-Hawthorn Rust galls on cedar and juniper are usually smaller than Cedar-Apple Rust galls.

To distinguish between Cedar-Apple Rust and Cedar-Hawthorn Rust, examine the surface of the spherical galls and the shape of the spore horns protruding from the galls. Cedar-Apple Rust galls have circular markings on their surface and resemble the dimpled covering of a golf ball, while Cedar-Hawthorn Rust galls have no such pattern (Fig. 4). Also, from the centers of the circular markings on the Cedar-Apple Rust gall the cylindrical, orange-brown, gelatinous horns protrude. These masses of spores are most prevalent in wet spring weather (Fig. 5A). The orange-brown, gelatinous

spore horns that protrude from the galls caused by Cedar-Hawthorn Rust are tongue-shaped (Fig. 5B) rather than cylindrical (Fig. 5A).

The symptoms of Cedar-Quince Rust on red cedars and junipers include perennial, elongated swellings on the branches, which, in turn, may crack and form cankers. In damp spring weather, cushion-shaped, orange, gelatinous blisters burst through the bark of the branch swellings (Fig. 5C). The ornamental value of susceptible cedars and junipers is at risk here because Cedar-Quince Rust kills young branches and weakens plants

when cankers form on the main trunk. Nursery juniper stock exhibiting the branch cankers is generally quarantined by inspectors of the Michigan Department of Agriculture. A Cedar-Quince Rust canker on juniper can produce and release spores for as many as 20 successive springs.

The orange, gelatinous masses on the galls and swellings are made up of two-celled teliospores, each of which produces four basidiospores. Basidiospores are carried through the air to the emerging leaves and fruits of the deciduous host, where they may infect within four hours if leaf and fruit surfaces are wet.

Spring infection is most likely to occur when temperatures range from 50 to 75 degrees F, though infection can occur over a wide range of temperatures, from slightly above freezing to 90 degrees F. Very young leaves (less than eight days old) are most susceptible. Wet, rainy weather in early spring expedites the infection of twigs, fruits and leaves of deciduous hosts. Disease is most severe in years when heavy rains coincide with the first two weeks of budbreak and leaf expansion in the deciduous hosts.



Figure 4

The gall on cedar formed by the Cedar-Apple Rust differs from the gall of Cedar-Hawthorn Rust. The Cedar-Apple Rust gall has characteristic depressions resembling the dimples of a golf ball (left). The gelatinous telial horns originate from these pitlike depressions (right) in wet spring weather.

Controlling the Cedar Rust Diseases

Perhaps the most practical and effective control is to remove one of the alternate hosts from the vicinity where cedar rust disease is prevalent. The basidiospores released from the cedar galls are fragile and readily desiccated by dry winds and hot sunlight. Making sure the cedar or juniper host is at least 1,000 feet away from the deciduous host can reduce the severity of the leaf spot and defoliation. The evergreen host will most likely continue to be infected, however. Another option is to replace the favored diseased host with a resistant host (see the list of resistant hosts on the next page.)

Fungicides can effectively control the rust diseases when they are applied to deciduous hosts at the proper time. A general recommendation would be to apply a registered fungicide (see Extension bulletin E-2022, *Disease Control Guide for Broadleaf Trees, Shrubs, Ground Covers and Vines*) beginning at early blossom and repeating every 10 days for one month. A more prudent approach for protecting ornamental trees is to apply a registered fungicide at budbreak, particularly if

spring rains are expected. Keep the new leaves protected until they are two weeks old. The number of applications and the interval between applications will vary with the formulation



Figure 5

The orange, gelatinous telial horns or blisters of the cedar rusts produce spores that infect the deciduous hosts.

- A)** The Cedar-Apple Rust telial horns are cylindrical, as seen in top photo.
- B)** Those of the Cedar-Hawthorn Rust (center) are tongue-shaped.
- C)** The Cedar-Quince Rust (bottom) forms cushion-shaped blisters that burst through the bark on branch cankers rather than on galls.

of the fungicide chosen. A single application of some fungicides may be adequate. On the other hand, if rains are heavy, fungicides may wash off and more frequent reapplications will be required. When spring weather is dry during budbreak and leaf expansion, no fungicidal application is warranted.

One way to judge the timing for applying protective treatment on the deciduous host is to keep watch over a red cedar containing galls. When galls first begin to exhibit the orange growth of spore horns, it is time to apply a fungicide. It is not necessary to spray if spore horns form weeks after budbreak and leaf expansion is completed. To prevent infection of red cedar or juniper, apply a registered fungicide (see Extension bulletin E-2023, *Disease Control Guide for Conifers and Christmas Trees*) to evergreens in early August, when tendrils of spores are forming on the leaf spots of deciduous hosts. Protect evergreens for approximately six weeks. The number of applications will vary, depending on the fungicide chosen.

The following is a list of crabapples, hawthorns and junipers resistant to both the Cedar-Apple and Cedar-Hawthorn Rusts, unless otherwise specified as:

resistant to Cedar-Apple Rust exclusively.

resistant to Cedar-Hawthorn Rust exclusively.

Columnar Chinese Juniper (*J. Chinensis*)

- J. chinensis* 'Aureoglobosa'
- J. chinensis* 'Columnaris'
- J. chinensis* 'Femina'
- J. chinensis* 'Fortunei'
- J. chinensis* 'Japonicus'
- J. chinensis* 'Ketekeeri'
- J. chinensis* 'Leeana'
- J. chinensis* 'Mas'
- J. chinensis* 'Oblonga'
- J. chinensis* var. *parsonsii*
- J. chinensis* 'Pendula'
- J. chinensis* 'Pyramidalis'
- J. chinensis* 'Variegata'
- J. chinensis* 'Watereri'
- J. chinensis* 'Plumosa'
- J. chinensis* 'Plumosa Aurea'
- J. chinensis* var. *procumbens*

Red cedar (*Juniperus virginiana*)

- J. virginiana* 'aurea'
- J. virginiana* 'Berg's Rust Resistant'
- J. virginiana* 'Burkii'

LIST OF RESISTANT HOSTS

- J. virginiana* 'Pseudocupressus'
- J. virginiana* 'Pyra-midalis'
- J. virginiana* 'glauca'
- J. virginiana* 'venusta'

Savin Juniper (*J. sabina*)

- J. sabina* 'Fastigiata'
- J. sabina* var. *tamariscifolia*
- J. sabina* 'Variegata'

Crabapple Cultivars

- 'Abundance'
- 'Adams'
- 'Albright'
- 'Ames White'
- 'Centurion'
- 'Henningi'

J. communis

- J. communis* 'Aurea'
- J. communis* 'Aureo-Spica'
- J. communis* 'Cracovia'
- J. communis* var. *depressa*
- J. communis* 'Hibernica'
- J. communis* 'Oblonga Pendula'
- J. communis* 'Pyramidalis'
- J. communis* var. *saxatalis* 'Pallas'
- J. communis* 'Suecica'
- J. communis* 'Suecica Nana'

Hawthorns (*Craetaegus* spp.)

- Washington Hawthorn (*Craetaegus phaenopyrum*)

Juniperus Ashei

- J. conferta*
- J. formosana*
- J. rigida*

J. squamata

- J. squamata* 'Albovariegata'
- J. squamata* var. *fargesii*
- J. squamata* 'Meyeri'
- J. squamata* 'Wilsonii'

Pfitzer Junipers

- J. chinensis* 'Pfitzeriana'
- J. chinensis* 'Pfitzeriana Aurea'
- J. chinensis* 'Pfitzeriana Compacta'

Creeping Junipers (*J. horizontalis*)

- J. horizontalis* 'Admirabilis'
- J. horizontalis* 'Argenteus'
- J. horizontalis* 'Douglasii'
- J. horizontalis* 'Eximius'
- J. horizontalis* 'Felicinus'
- J. horizontalis* 'Glomerata'
- J. horizontalis* 'Lividus'
- J. horizontalis* 'Petraeus'
- J. horizontalis* 'Plumosa'
- J. horizontalis* 'Variegata'
- J. horizontalis* 'Wiltoni'



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