

## Cedar-Apple Rust

### *Gymnosporangium juniperi-virginianae*

**I. Introduction:** Cedar-apple rust can infect leaves and fruit of most cultivars in the mid-Atlantic region. A notable exception is 'Delicious', which is nearly immune.

**II. Symptoms:** The most conspicuous symptoms on apple are bright orange, glistening lesions on the leaves (photo 2-10). Lesions which are not inhibited chemically may form small tufts of spore-producing structures (aecia) on the lower surface of the leaf by July or August. Cedar-apple rust appears on fruit first as bright orange, slightly raised lesions (photo 2-11), but may take on a more brown and cracked appearance as the fruit enlarges (photo 2-12). Usually some of the orange color remains at harvest as evidence of the early season infection. Sporulation of fruit lesions is less common than that of leaf lesions. Stem infection causes a slight swelling of the stem and may result in abscission of the young fruit. On the cedar tree, cedar-apple rust produces brown, globular galls ranging in size from 1/4 inch (6-7 mm) to nearly two inches (50 mm) in diameter. These are dimpled like a golf ball in the dormant season, but produce gelatinous, orange spore horns during spring rains (photo 2-13).



**III. Disease Cycle:** The fungus overwinters on galls on the cedar tree. Wetting of galls in the spring initiates expansion of the spore horns and production of basidiospores which are carried to the apple tree to infect leaves and fruit during extended wetting periods. Basidiospores may be produced within four hours at 52 to 77 F (11.1 - 25 C), and an additional four to six hours of wetting will permit severe infection under heavy inoculum conditions (Table 2-2). Basidiospores do not form at temperatures below 46 F (7.8 C) and the length of wetting required for infection is extended considerably at temperatures below 50 F (10 C). Lesions begin to appear 10 to 14 days after infection. In late summer, spores produced on the lower surface of infected apple leaves re-infect foliage of nearby cedar trees. These infections develop into galls which produce spores in the spring following the next full growing season. A cedar-apple rust gall produces spores only one season. All of the lesions seen on the apple tree result from spores produced on the cedar; there is no secondary infection within the apple tree.



**Table 2-2.**

**Approximate wetting period required for cedar-apple rust infection at different air temperatures. <sup>a</sup>**

Average temperature (F)	Average temperature (C)	Wetting period (hr)		
		Basidiospore formation	Light infection	Severe infection
34	1.1	NB <sup>b</sup>	24	NSI <sup>c</sup>
39	3.9	NB	12	24
42	5.6	NB	8	10
46	7.8	7	6	7
50	10.0	5	5	6
52	11.1	4	4	5
57	13.9	4	3	5
61	16.1	4	3	4
64	17.8	4	3	4
68	20.0	4	2	4
72	22.2	4	2	4
77	25.0	4	2	4
79 - 86	26.1 - 30.0	NB	NI <sup>d</sup>	NI

<sup>a</sup> Adapted from APS Compendium of Apple and Pear Diseases.

<sup>b</sup> NB = no basidiospores formed at this temperature.

<sup>c</sup> NSI = no severe infection observed at this temperature.

<sup>d</sup> NI = no infections observed at these temperatures.

**IV. Monitoring:** Note the presence of red cedar trees within 1/2mile (0.8 km) of the orchard and Quince Rust and survey for cedar rust galls (photo 2-13) and quince rust cankers (photo 2-16). For both fresh and processing apples, determine cedar-apple rust infection periods by observing duration of leaf wetness and average temperatures during the wet period (Table 2-2, chapter 2). Monitor rust gall maturity on red cedar trees (photo 2-13). Lesions begin to appear 10 to 14 days after infection. Awareness of wind direction from a large inoculum source may aid in selection of the most effective fungicide before or after potential infection periods.

At midseason, collect rust galls from red cedar trees and determine if they are still capable of sporulating by placing them in water in a white cup. If the horns expand on wetting (photo 2-13) and the water is colored orange within a few hours, the galls are still capable of producing spores during future wetting periods. Because there is no secondary infection within the apple tree, monitoring of the apple tree serves only to pinpoint fungicide selection or timing weaknesses in the control program. Rust lesions appear on foliage and fruit within about 14 days and two to four weeks, respectively, after infection.

**V. Management:** Fungicides that are effective against the rust diseases should be applied periodically from the pink stage of bud development through third cover to protect the emerging leaves and developing fruit. Removing cedars located within a 2-mile radius of the orchard interrupts the life cycle of the fungus and makes control with fungicides easier. Removing all cedars within 4 to 5 miles of the orchard will provide complete control.

#### **Chemical control - commercial growers**

#### **Chemical control - home orchardists**

##### **Option 1 - Virginia Home Orchard**

**Management Guide web site**

##### **Option 2 - Virginia Home Orchard**

**Management Guide pdf file (Acrobat  
Reader required)**

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**READ LABELS CAREFULLY AND USE CHEMICALS IN ACCORDANCE WITH LABEL CAUTIONS, WARNINGS, AND DIRECTIONS. REQUEST A MATERIAL SAFETY DATA SHEET (MSDS) FROM THE MANUFACTURER FOR EACH PRODUCT YOU USE.**

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