



Daylily Rust: *Puccinia hemerocallidis*

Introduction

Daylily rust, caused by the fungus *Puccinia hemerocallidis*, is a relatively new disease to the United States. The pathogen was first described in 1880. It is native to Asia, commonly found in China, Japan, Korea, Taiwan, and Russia. In the U.S., it was first identified in August of 2000 in the southeastern part of the country. The disease moved swiftly throughout the country and by the fall of 2001 it had been identified in over 30 states including New York State. The reason for such a fast movement of the pathogen is most likely due to the widespread, fast shipping of plant material throughout the country.



Figure 1: Symptoms include yellow leaf spots and streaking on the surface of the leaves (provided by Karen L. Snover-Clift, Cornell University)

Symptoms and Signs

Symptoms of the rust infection may not be present early in the development of the disease. The most obvious symptoms of daylily rust are yellow to brown streaks on the leaves. The plant veins tend to

constrain fungal growth making streaks. You may also see very bright, small, yellow spots on the surface of the leaves. (Fig. 1). The undersurface of the leaves will have numerous small, orange to yellow spots, called pustules, that poke out of the undersurface of the leaf. The pustules grow and release numerous dusty, orange-colored spores. (Fig. 2). The orange spores are very dust like in nature and if you rub the leaf surface, will notice the dusty spores lofting about. As symptoms progress, leaves turn yellow and dry up.



Figure 2: Orange, powdery urediospores on the undersurface of the daylily leaves (provided by Karen L. Snover-Clift, Cornell University)

It's easy to confuse daylily rust with a couple of look-alike daylily problems. Daylily leaf streak, caused by the fungus *Aureobasidium macrostictum*, also causes similar symptoms of brown to yellow leaf streaks, but it lacks the orange pustules that develop on the undersurface of the leaves. Aphid feeding damage can also look similar but again there are no pustules.

Disease Cycle

Little information is known about the biology of *Puccinia hemerocallidis*. The spores can be spread by wind or by human movement of plants. Rust diseases are caused by very complex organisms that often have two separate host species and a five stage cycle. Daylily rust is a heteroecious rust, which means it needs two distinct hosts to complete its life cycle. The primary host is Daylily (*Hemerocallis* sp.) and alternate hosts are *Patrinia* spp. perennial plants of which six species are known in the United States. *Patrinia* allows sexual reproduction of the fungus. Although *Patrinia* is a required as a host to complete the lifecycle of the pathogen, the fungus is capable of producing spores that are aggressive and virulent on daylily alone. The literature states another reported host common in the landscape industry includes *Hosta* spp. Research using isolates of the U.S. daylily rust on *Hosta* **have not** resulted in disease development. Whether *Hosta* is a host is still unknown at this time.

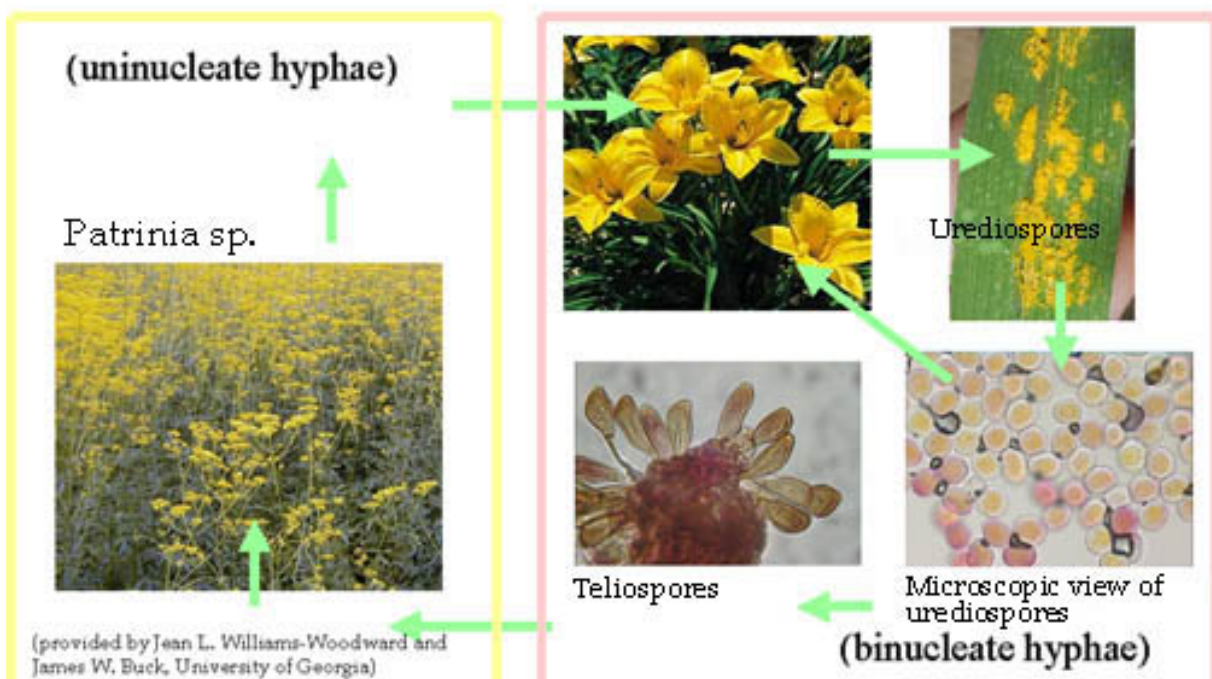
Heteroecious rusts produces 5 kinds of spores. Two of the spore stages are of concern with daylily rust, urediniospores and teliospores. The urediniospores

are the orange, powdery spores observed on the under surface of the leaves. They have thin walls and spread the disease during the normally mild summer months. Urediniospores are capable of re-infecting other daylily plants. The spores need 4-5 hours of moisture to germinate and cause infection. Rainy overcast days are ideal for spore germination and infection. Optimum temperatures are between 21-24°C (70-75°F) but a slower germination can occur above and below that range.

Germination produces a germ tube that grows on the surface of the leaf looking for access to the internal plant tissue. It often gains access through natural openings such as stomata. Once in the plant, the fungus produces additional spore stages that result in the production of more infectious urediniospores and possibly teliospores capable of infection alternate hosts. Teliospores are found on daylily, have thick walls and exist to survive the winter months. These spores are capable of infecting the alternate host. Aeciospores are formed on the alternate host and are capable of infecting daylily.

Severity varies with daylily cultivar. The rust mass grows below the outer layer or cuticle, then the blister forms below the skin. The pustule ruptures through

Theorized Rust Life Cycle



the epidermis to release the powdery spores.

Management Strategies

1. Use resistant varieties: Different varieties of daylily have different susceptibilities to the rust. Select a variety that has some known resistance. And don't grow both hosts at the same site, keep daylilies and *Patrinia* apart. A limited number of cultivars have been studied for susceptibility to the rust pathogen.

Very susceptible: Attribution, Colonel Scarborough, Crepe Eyed Ruffles, Double Buttercup, Flower Shop, Hello Sunshine, Imperial Guard, Irish Ice, Karie Ann, Lemon Yellow, Little Gypsy Vagabond, Lonesome Dove, Ming Toy, Pandora's Box, Pardon Me, Patience Plus, Pink Beacon, Quannah, and Rosie Pinkerton, Royal Ebony, Russian Rhapsody, Silken Touch, Siloam Doodlebug, Siloam Ralph Henry, Solomon's Robes, Splendid Touch, Springtime Treasurer, Violet Explosion, White Wow, and Woodland Romance.

Moderately susceptible: Butterflake, Crystal Tide, Gertrude Condon, Joan Senior, Prelude to Love, Star Struck, Stella D'Oro, and Wilson's Yellow.

Very resistant: Age of Gold, All-American Hero, Antique Rose, Barbara Mitchell, Butterscotch Ruffles, Catherine Neal, Creole Blush, Dainty Designer, Devonshire Cream, Ed Brown, Fashion Design, Femme Fatale, Gentle Rose, Golden Monday, Happy Returns, Heartfelt, Holy Spirit, Joie de Vivre, Joleyne Nichole, Lavender Bonnet, Lilac Lady, Mac the Knife, Mae West, Meadow Sweet, Neon Pink, Pink

Flirt, Prairie Blue Eyes, Raspberry Splash, Siloam Bill Monroe, Siloam Double Classic, Siloam Ury, Winniford, and Yangtze.

2. Sanitation: Clean up all plant residue in the fall. Remove all remaining foliage from the plants and remove it from the site. Burn or compost the residue, hot composts will kill the urediniospores. Newly purchased plants can be pruned back in the spring, this may lessen your chances for introducing the pathogen into your garden from new plant material.

3. Fungicides: that may be useful for the home garden include some products that contain the active ingredients neem oil, potassium bicarbonate (Greencure: EPA Reg. #70870-1)), sulfur, or *Bacillus subtilis* (Serenade: EPA Reg. #69592-12, or Plant Guardian: EPA Reg. #69592-12-56872). Some of these fungicides are currently registered to treat rust diseases and/or Puccinia rusts on flowering landscape plants in New York State. Once an infection has become established, applications may be needed weekly because new infections are constantly beginning while plants are actively growing. Be certain any product purchased is appropriately labeled.

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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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