

Geranium Rust

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Geranium rust, caused by the fungus *Puccinia pelargonii zonalis* was detected in several Michigan commercial geranium greenhouses in 1980. The source of the rust infections is not known although we suspect that infected cuttings were shipped in from neighboring states. It is also possible that the disease has become native in Michigan. For these reasons, the 1975 State of Michigan Geranium Rust Quarantine has been revoked and growers will not be quarantined if rust is discovered in their houses. With the lift of the quarantine, there will be less regulation of geraniums shipped into Michigan. However, rust can spread easily and can be very serious if not properly controlled. Therefore, Michigan growers must become even more conscientious of their own rust control programs.

SYMPTOMS

The early symptom of the disease is the formation of small, pale yellow spots on the undersides of leaves. These spots enlarge (5-8 mm) and turn rusty-brown (Figures 1 & 2) indicating that spores are being released from the pustules. One or more partial-to-complete circles of pustules commonly develop around the original. Yellow spots opposite the pustules appear on the upper leaf surface (Figure 3). Heavily infected leaves turn yellow and drop, often resulting in complete defoliation of the plant.

HISTORY & HOST RANGE

Geranium rust was reported in South Africa in the 1920's, the country where most *Pelargonium* species originate. By 1960, it had spread to New Zealand, Australia and Hawaii, and was reported in the continental U.S. in 1967 in California and New York. In 1970, rust was found in Florida, another geranium producing state. It is



Figure 1. Initial leaf spot symptom of rust.

now native to all areas of the U.S. where geraniums are commercially grown.

Although the development of rust pustules has been induced on other species, the only host plant of significance is *Pelargonium hortorum*, the florist geranium. Rust is usually associated with cutting geraniums, but seedling geraniums (*P. zonale* hybrid) are also susceptible. The fungus is not a problem on ivy geranium (*Pelargonium peltatum*), Martha Washington (*P. domesticum*), wild geranium, or the scented leaf geraniums.

DISEASE DEVELOPMENT

Geranium rust develops most rapidly at temperatures ranging from 61 to 70° F. High temperatures (above 81° F) inhibit spore germination and pustule formation. Five to six hours of free moisture are needed for a spore to infect a leaf. Once the spore has penetrated the leaf, it is protected from



Figure 2. Fully developed rust pustules.

drying. Under favorable conditions, it takes 7 to 10 days from the time of spore deposition on the leaf surface to the appearance of chlorosis. An additional 7 to 9 days pass before spores are released from newly formed pustules. Hence, disease development takes from 16 to 20 days. Rust spores are dispersed by splashing water and air currents. Spores can remain viable up to 12 weeks, although viability falls off rapidly after 8 weeks.

CONTROL

A combination of strict sanitary practices and the use of effective fungicides can prevent the introduction and spread of the organism.

The best approach to controlling geranium rust is to avoid introduction of the pest. Do this by starting with cultured cuttings purchased from a reputable supplier. Do not keep stock from year to year especially if it is "oversummered" outside. Oversummered stock is particularly dangerous if other geranium growers or home geranium gardens are nearby. If new geranium plants are introduced into the greenhouse, keep them isolated from other *Pelargoniums* for 3 or more weeks and inspect frequently for possible appearance of the disease. If possible, a "geranium free" period in the greenhouse should precede new plantings for stock.

If rust is introduced, institute the following sanitation, cultural, and spray practices. Thoroughly check the undersides of leaves for rust to determine the extent of the infection. If a rust pustule is detected, carefully remove the infected leaf, place in a plastic bag and destroy. There should be no movement of infected plants or cuttings between different greenhouses or different areas of the same house. Do not move other plant types in an infected house because rust spores could adhere to these plants. Workers that have been in an area containing infected plants should



Figure 3. Yellow spots opposite the pustules on the upper leaf surface.

wash their hands and brush off their clothing thoroughly before moving to a non-infested area.

When the growing season is over remove all remaining geranium plants, steam and discard them in an area at least a half mile away from the greenhouse. Clean-up all geranium debris. Sterilize cutting benches and fumigate the house. These procedures should eliminate any viable rust spores in the greenhouse. However, it is best not to grow geraniums for 3 to 6 months in the same greenhouse.

The rust spore requires 4 to 6 hours of free moisture to infect, so employ practices to keep foliage dry. This includes the regulation of temperature and humidity to prevent moisture condensation (as temperatures fall). Avoid overhead watering and use alternative watering methods, such as Chapin tubes. If overhead watering is necessary, water in the morning so that foliage dries quickly.

As a spray program, use Plantvax (oxycarboxin) for a maximum of two applications spaced two weeks apart. Since Plantvax is phytotoxic, it is best not to use it for a prolonged period. However, it is systemic and would be of particular value in initial rust control applications. Mancozeb (Dithane M-45, Manzate 200), Zineb (Z-78) can be used in a weekly spray program. Continued treatment is important and coverage of the foliage with chemicals is crucial. Therefore, use a high pressure, piston sprayer up to 250 psi. Use a spreader sticker with each application.

There are indications that Exotherm Thermit (chlorothalonil) smoke bombs will also inhibit rust spores when used on a 2-week basis.

Hot water, hot air and fungicide dips are not currently recommended for control. Although these treatments have been found to be effective, they are damaging to the plant.

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Issued in furtherance of cooperative extension work in agriculture and home economics, acts of May 8, and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Gordon E. Guyer, Director, Cooperative Extension Service, Michigan State University, E. Lansing, MI 48824.

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