



Diagnostic Facts



Diagnostic Services
Michigan State University

MSU-DS20

www.pestid.msu.edu

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Gladiolus Rust

Biology and Control Advisory

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Hawaii Department of Agriculture identified Gladiolus Rust, *Uromyces transversalis* (Thum.), on leaves of cut gladiolus flowers coming from Florida on April 7, 2006. Michigan has a thriving gladiolus industry located mainly in southwest Michigan and has concerns about this disease and its management.

The objective of this document is to describe the disease and suggest cultural and chemical crop protection options for growers of gladioli in Michigan. The major hosts for

this rust disease are gladiolus hybrids but *Crocasmia* spp. are also hosts. The disease has been located in several parts of the world including Europe, South

America, Australia and Africa but has not previously been reported in the USA.

Symptoms

The spore clusters (uredinia) are most common on leaves but in severe cases may appear on the flower-

bearing spikes of the plant. The disease symptoms include yellow-brown uredinia or black-brown telia pustules on the leaves and typical of other rusts, the uredinia are produced first. However, the spores tend to orientate



Orangish pustules (uredinia) on surface of infected leaf.

across the leaves from margin to margin rather than down the leaves as in the leaf-stripe rusts of other plant species.

Biology

Like many other rust species urediospores germinate between 5°C and 25°C (41 and 77 °F), with optimal germination at 15 °C (59 °F). Twelve hours of leaf moisture at 10 - 20 °C (50 - 68 °F), results in the most severe infection. The period of infection and incubation varies from over 20 days at 10°C to 8 -10 days at 25°C.

Most gladiolus hybrid cultivars that have been tested are susceptible to this rust. Resistance to the rust is found in other species such as *G. tristis* var. *concolor*, *G. tristis* var. *tristis*, *G. ochroleucus*, *G. papilio*, and *G. daleni*.

Cultural control

In Michigan, an exotic species of rust appeared in only one ornamental crop in recent history; daylily rust (*Puccinia hemerocallidis*) on *Hemerocallis* spp.. Infected plants were thought to be introduced into Michigan by local gardeners and suppliers obtaining samples from southern US. Transport of rust-infected gladioli would likely arrive in Michigan by similar means. There has been some concern related to the biology and dispersal of rust spores by direct human transport e.g. on clothes and luggage. Although possible the main dispersal mechanisms are on plant parts that are liable to carry the pest in trade/transport and according to the Crop Protection Compendium these include

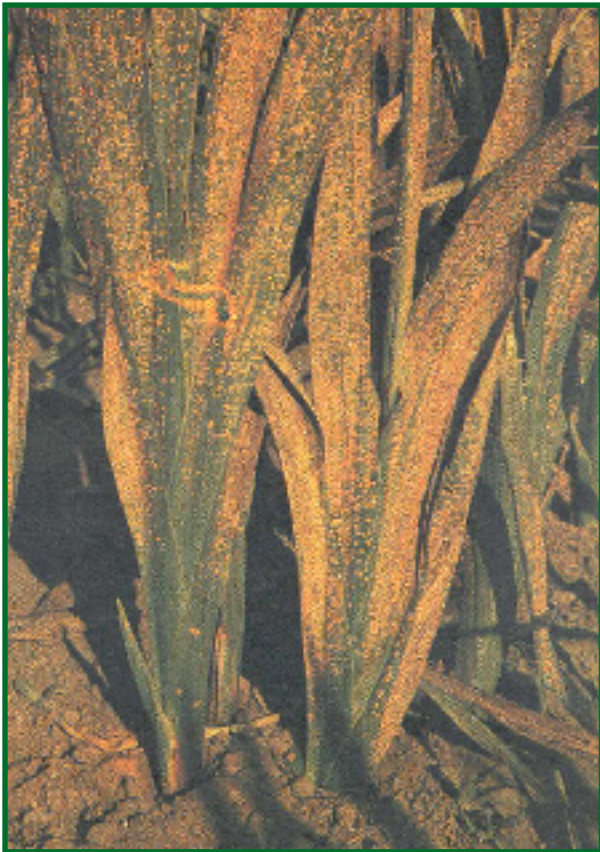
- Bulbs/Tubers/Corms/Rhizomes: Spores; borne externally; invisible.
- Flowers/Inflorescences/Cones/Calyx: Spores; borne externally; invisible.
- Leaves: Spores, Hyphae; borne internally; borne externally; visible to naked eye.
- Stems (above Ground)/Shoots: Spores, Hyphae; borne internally; borne externally; visible to naked eye. As rust is an obligate parasite and survives only on its living host it is unlikely that spores will

survive for any significant length of time attached to inanimate objects such as clothing, bark, potting medium and is thought not to survive even on true seeds or roots of the host plant. Disinfestations of migrant worker's belongings and clothing is therefore unlikely to impact the dispersal of gladiolus rust.

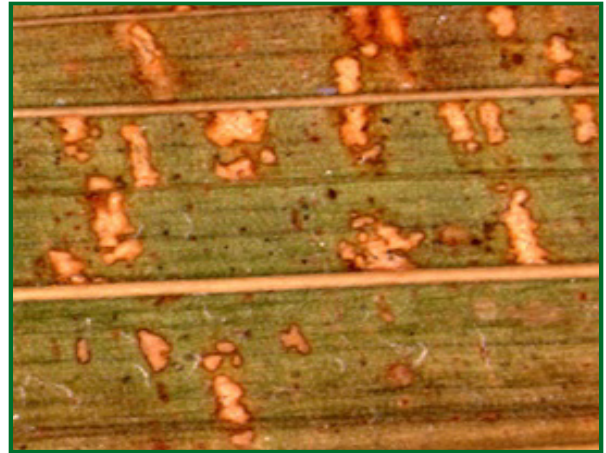
Leaves of imported plants should be inspected carefully using a hand-lens and if spore or spore-like structures are visible a sample of the symptomatic foliage should be sent immediately to the Diagnostic Service laboratory at MSU. The spores will be similar to those shown in the figure.

Unlike daylily rust, which was very intolerant of temperatures below 55°F, spore germination of gladiolus rust has been reported at 41°F and is optimal at 59°F. Therefore it is unlikely that lower evening temperatures will impact this disease. Consequently, crop protection strategies may have to be implemented as insurance against infection. As most fungicide efficacy tests have been from countries with different fungicides registered for use the recommendations for Michigan will be limited to fungicides already registered on gladiolus for other diseases. It has been found however that weekly applications with mancozeb or chlorothalonil were effective protection strategies in Spain which is roughly on the same latitude as Michigan. Applications of protectant fungicides should be with products with broad-spectrum activity against common diseases of gladioli e.g. *Penicillium* spp. and *Botrytis* spp. especially as gladiolus rust may not appear in Michigan and the applications would not therefore be wasted. Other products registered for Gladioli include Cygnus (krexosim-methyl) which is generally effective against other rust species and Cleary's 3336 (thiophanate-methyl) which is recommended in tank mix with chlorothalonil. In

general, tank mixtures and alternations of fungicides may work best against gladiolus rust and would delay the appearance of resistant populations. All fungicides should be used in accordance with the label and fungicides applied after symptoms and signs of rust have already developed are unlikely to provide curative activity.



Severely infected plants.



Uredinia across the width of the leaf.



Urediniospores.

Table 1. Fungicides that may be used as preventative protection strategies against *Gladiolus* rust.

Chemical Name	Rate per 100 gal water (Fl or dry oz)	Rate per Acre (Fl or dry oz/A)	Fungicide Group ¹	Resistance Risk ²
Cygnus	1.6	0.4	11	High
Clearys 3336 F	16	6.14	1	High
Echo ZN	32	8	M	Low
Dithane 75DF	128	32	M	Low
Systhane ³	15.6	6	3	Medium

¹ Fungicides now come with the fungicide group number listed on the label. These have resistance risks associated with them and it is recommended that fungicides with high or medium risk associations be tank-mixed and/or alternated with fungicides from low risk categories.

² Resistance risk category.

³ *Gladiolus* spp. are not mentioned on the label however this product is mentioned as being effective for control of *gladiolus* rust in trials in Tuscany, Italy and is available for use on ornamentals in the USA.