

A2600

Gladiolus disorder: Fusarium yellows and bulb rot

M. F. HEIMANN and G. L. WOLF

Fusarium disease on gladiolus causes corm rot, yellowing and stunting of foliage, and occasionally misshapen and discolored flowers. This disease is common throughout Wisconsin, although it is more prevalent in the southern half of the state.

Symptoms and effects

Symptoms may show up during the growing season in the field or garden, or they may appear first as a conspicuous rot of the corm. First evidence in the field is often a general yellowing of the foliage of individual plants. Such plants may then turn brown and die, or they may remain somewhat stunted and yellow. In some cases no aboveground symptoms exist, but when the corms are harvested in the fall they may appear rotted. In still other cases, corms appear healthy when harvested, but rot develops in storage. You can make the best diagnosis by examining the external and internal portions of the corms and the lower stem area. There are essentially two types of rot symptoms associated with corms affected with Fusarium—brown rot and vascular rot.

Brown rot is the most common type of rot. Symptoms appear as brown to nearly black spots that develop on the surface of the corm, typically near the base. The corm tissue remains firm, but it may shrivel, become scaly, and have a light colored mold over the surface. In some cases the rot extends deeply into the corm flesh, but in other instances the size of the spots and depth of rotting are quite limited.

Vascular rot develops only occasionally. There may or may not be any external symptoms with this form, but when the bulbs are cut open you may see a dark core extending from the base toward the top. Sometimes brown spots will develop on the corm surface when the infected vascular bundles extend completely through the flesh and reach the outer corm layers.



This plant is turning yellow in the field, an early symptom of the disease in summer.



Brown rot in the base of corms is typical of Fusarium disease.



Suspect bulbs can be sectioned to determine whether the vascular core is infected.

When yellowing plants suggest that *Fusarium* may be a problem in the field, dissect suspect corms and examine for internal symptoms to aid the diagnosis.

If you plant infected corms, the severely diseased ones will rot without sprouting or produce feeble shoots that soon die. Less severely infected corms may produce plants that grow normally until late in the season. The leaf tips of these plants often yellow and begin to die back gradually until they are completely dead.

Fusarium occasionally causes distinct flower symptoms in plants. In colored varieties the petal color darkens, and the petals are narrower with less ruffling of the edges. The florets are also smaller than normal, often tulip-shaped and tilted upward. They do not open as fully as normal florets.

Most *Fusarium* infections can be diagnosed in the field with reasonable accuracy, although some symptoms are similar to those caused by other diseases, particularly *Stromatinia* dry rot. When possible, examine several suspect plants to determine the cause of the disorder. General yellowing of the foliage of individual plants in midsummer is not sufficient evidence for diagnosis. However, if you find the symptoms described above when you examine dissected corms and lower stem areas, you can make a confident diagnosis. *Fusarium* disease in the stored corms is usually distinguishable from other disorders. However, a number of other corm rots may be present simultaneously.

Cause

This disease is caused by a soil-borne fungus, *Fusarium oxysporum* f. *gladioli*, that can survive indefinitely in the soil. It readily invades corms and is spread easily by diseased planting stock. Corms may be infected without showing obvious symptoms.

Control

Fusarium is a severe enough threat to gladioli in the state that any serious gladiolus grower should take precautionary measures to prevent its development in the crop. Some steps are quite simple and may be all that are required in minor disease situations. If the disease becomes intense, more stringent control measures will be needed. Control is aimed at eliminating the fungus or keeping it in check in both the soil and planting stock. No control methods completely eliminate the disease.

Cultural

Fertilize only sparingly, especially when using nitrogen or manure. In several Wisconsin trials, urea fertilizer substantially increased disease in susceptible varieties. The nitrate form of nitrogen is preferable to the ammonium form because the latter intensifies the disease level. However, if planting stock and soil are free of *Fusarium*, gladiolus will respond favorably to ample fertilizer applications.

Plant only healthy corms. Discard any that show signs of decay. It sometimes is best to discard entire lots of corms when most of the planting appears infected. Also, certain varieties are more susceptible than others. Unless such varieties are especially desirable, control measures can be simplified by discarding the very susceptible varieties from your collection as you identify them.

Harvest corms during dry weather when possible, and clean and dry them rapidly at a warm temperature. This is an important curing process. Forcing warm air (80–100°F) through the corms for a few hours is very helpful in reducing surface moisture and encouraging rapid callusing, or healing of wounds. The curing process prevents fungus invasion and growth in the corms. When possible, remove the old corm and outer husk prior to drying and curing. Avoid over-drying the corms as this harms the quality of next season's crop. Discard all obviously diseased corms at harvest and place the healthy ones in cool storage. Since *Fusarium* can develop in storage as well, more corms may show infection by planting time next spring. Discard these, too.

Whenever possible, remove infected plants as symptoms appear during the growing season. In small plantings it may also be helpful to remove the surrounding spadeful of soil from the garden. Virus-infected plants should be removed also, when practical, because viruses reduce the quality of the flowers and the resulting corms may carry more *Fusarium* fungus. (For more information about viruses, see Extension publication *Gladiolus Disorder: Virus Complex and Aster Yellows*, A2595.)

Commercial growers may want to consider heat treating dormant cormels (bulblets) at approximately 130°F to eliminate infections. The temperature that destroys the fungus is just a few degrees below that which will also kill or damage the cormels, so temperature conditions must be carefully controlled. Cormels must be fully dormant. Large corms cannot survive the treatment.

Chemical

Most commercial growers and serious hobbyists find it necessary to supplement cultural and physical treatments with chemical treatments to produce reasonably disease-free and satisfactory corms. Chemical treatments should be regarded as supplementary to, and not replacements for, cultural practices that reduce disease.

The most common and effective chemical means of reducing infection is through corm treatments right after harvesting in the fall and just prior to planting in the spring. Treat the corms within 24 hours after digging for greatest effectiveness. A few fungicides are registered for corm treatment. Make your choice on the basis of availability, ease of application and effectiveness. Commercial growers can use the chemicals available in large drums and those that are more difficult to handle. The amateur should confine his selection to chemicals that are safer to use and available in small quantities. Determine the rate of use and method of application according to the manufacturer's recommendations. The following chemicals are among those registered for use on gladiolus.

References to products in this publication are for your convenience and are not an endorsement or criticism of one product over other similar products. You are responsible for using chemicals according to the manufacturer's current label directions. Follow directions exactly to protect the environment and people from chemical exposure.

Gladiolus corm dips. Remove papery scales from corms before treating.

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| Chipco 26019 | 2 lb/100 gallons water; 1 ½ oz/5 gallons water | Soak corms in dip for 5 minutes before storing. |
| Cleary 3336 | 12–16 oz/100 gallons water; ½–¾ oz/5 gallons water | Soak immediately after digging for 30 minutes in warm (80–85°F) bath. Dry well before storing. |
| Fungo Flo | 33 fluid oz/100 gallons water 2 teaspoons/gallon water | Soak after digging for 15–30 minutes in warm (80–86°F) bath. |



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Authors: M.F. Heimann is distinguished outreach specialist and G.L. Worf is professor emeritus of plant pathology, College of Agricultural and Life Sciences, University of Wisconsin-Madison and University of Wisconsin-Extension, Cooperative Extension. Produced by Cooperative Extension Publications, University of Wisconsin-Extension.

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