



GLADIOLUS CORM ROT

Gladiolus is susceptible to a variety of corm rots that are caused by a number of fungi and a bacterium. The foliage may turn yellow and die prematurely as a result of corm decay (Figure 1). Fewer and smaller blooms are produced on plants that are grown from diseased corms. The more widespread and serious corm rots that occur in the Midwest are described in this report.

FUSARIUM ROT

Fusarium corm rot, or yellows, is caused by the fungus *Fusarium oxysporum* f. *gladioli*. This is the most common and serious disease of gladiolus. Corm rot has three different forms—vascular, brown-rot, and basal dry-rot—that are distinguished by the symptoms that each produces. The symptoms common to all three forms are a firm, brownish to black corm rot; yellowing, browning, and premature dying of the leaves; and a browning and destruction of the roots. The corms may rot before digging, in storage, or after planting.



Figure 1. Gladiolus plants grown from corms infected with *Fusarium* rot. Infected leaves are commonly weak, stunted, turn yellow, and die back starting at the tips (J.L. Forsberg photo).

In the vascular form of the disease, a corm that is cut vertically in half will reveal a brown discoloration of the core and dark vascular bundles that extend laterally into the flesh (Figure 2A).

In the brown-rot form of the disease, tan, brown, or blackish lesions appear anywhere on the corm, but are most common near the base. The rotted tissue often is quite thick and may extend completely through the corm. Vascular discoloration is not associated with this form of the disease (Figure 2B).

The basal dry-rot form differs from the brown-rot form mainly in the position and thickness of the lesions. The dry-rot lesions occur only on the base of the corms and usually are restricted to the first and second internodes. They rarely, if ever, extend more than 2 to 4 millimeters into the flesh. The diseased tissue is sunken, dark brown to black, hard, rough, and often somewhat scaly. There is a sharp line between diseased and healthy tissues (Figure 2C).

When infected corms are planted, the more severely diseased corms rot in the soil without sprouting, or they produce weak, stunted, and yellowed leaves that soon die (Figure 1). The less severely infected corms may produce plants that grow normally until late in the season. Eventually, however, the tips of the leaves turn yellow and then die back gradually until the entire plant is dead.

For further information contact Nancy R. Pataky, Extension Specialist and Director of the Plant Clinic, Department of Crop Sciences, University of Illinois at Urbana-Champaign.

While there are a number of cultivars of gladiolus that are tolerant or resistant to this disease, no cultivar is immune. Picardy and Spotlight are especially susceptible.

PENICILLIUM ROT

The rot caused by the fungus *Penicillium gladioli* attacks bruised and wounded gladiolus corms in storage. The rot appears as rather firm, but not hard, reddish brown sunken spots, more or less irregular in size and shape, and sometimes slightly roughened by irregular concentric wrinkles. At low temperatures, an abundant blue-green mold grows over the lesions. Numerous egg-shaped, tan to cream colored sclerotia (fungus fruiting bodies) may be found embedded in the rotted corm tissue.

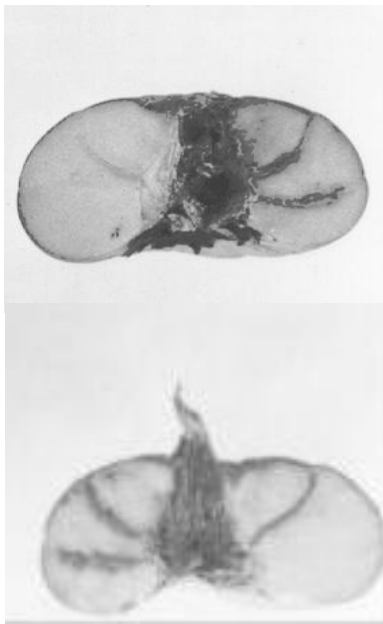


Figure 2A. *Fusarium* rot of gladiolus. Cross sections of older corms showing rotted cores and discolored vascular streaks associated with the vascular form of the disease (IL Natural History Survey photo).

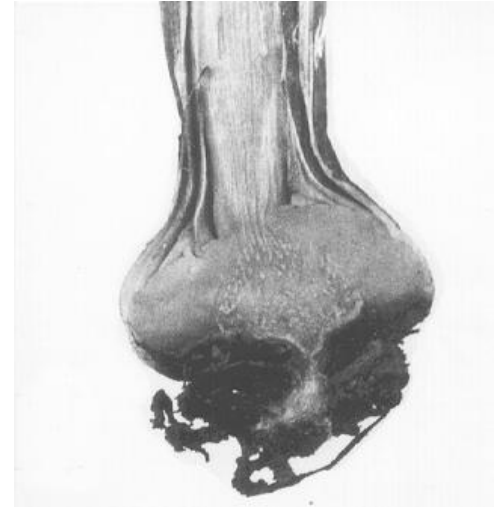


Figure 2B. Brown rot form of the disease. The rotted tissue is quite thick.

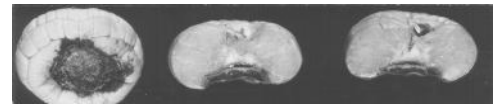


Figure 2C: Basal dry-rot form - Sectioned 'spotlight' corms show the extreme thinness of the rotted tissue in contrast to the brown-rot phase.

BOTRYTIS CORM ROT

The widespread fungus *Botrytis gladiolorum* produces several types of symptoms on gladiolus corms. Slightly sunken, round, straw colored or greenish brown to dark brown spots develop on the corm surface.

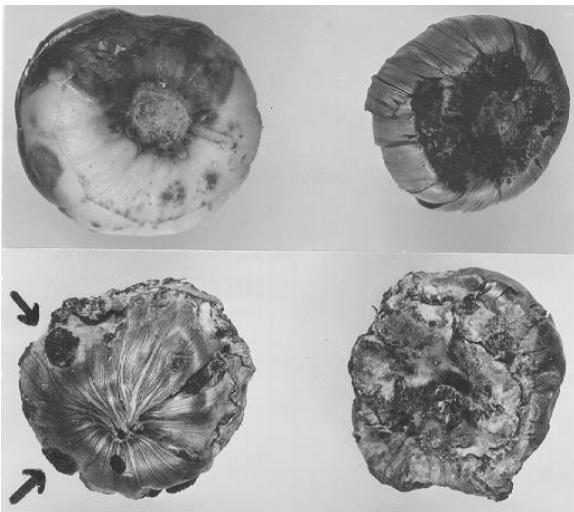


Figure 3. Gladiolus corms in various stages of *Botrytis* rot. The husks have been removed from the corm at the upper left to show the brown, decayed tissue. Black sclerotia (arrows) may be seen protruding through the husks of the other corms.

These lesions often appear water-soaked and vary in size from pinpoint to one-half inch in diameter. Occasionally the basal plate turns brown. One or more brown vascular bundles may extend up to the stem area. The core may be partially or completely rotted, with or without a decay of the surrounding tissue, and with or without brown vascular strands radiating to the surface. The core may drop away, leaving a doughnut-like appearance, or become completely covered.

In other instances, the decay is general, varying in texture from soft and spongy to rather fibrous and firm. The husks may appear normal, but the corm beneath is completely rotted. During an early stage, water can be squeezed from such a corm; in an advanced stage, the decay becomes spongy or corky, tan to chocolate brown, and the corm is usually very light in weight. When the husks are removed, the corm is either a dark punky mass

interspersed with whitish pockets of mold (mycelium of *Botrytis*), or it is rock hard and mummified. Flat, oval to irregular black sclerotia, 1/8 to 1/4 inch long, often form on the corms in storage or are intermingled with the rotted tissues and mycelium of the fungus (Figure 3).

When infected corms are planted, some decay in the soil, others give rise to weak, yellow shoots that soon die, while only a few produce healthy shoots. The causal fungus also commonly produces leaf and flower spots and a rotting of the stem and leaf bases. Infected tissues may be covered with gray masses of *Botrytis* spores.

CURVULARIA CORM ROT

The fungus *Curvularia trifolii* f. *gladioli* almost always produces a corm rot in the Midwest, but occasionally foliage and flower infections occur. The corm lesions are brown to black, round to elongated or irregular in shape, varying in size from pinpoints to lesions three-fourths of an inch in diameter. Infections may be shallow or deep, and many lesions are completely walled off by protective corm tissue (periderm). Many corms develop a dark brown corky core rot. Brown vascular strands frequently extend from the core through the flesh of the corm to the surface.

SEPTORIA HARD ROT

The fungus *Septoria gladioli* occurs generally, producing leaf spots and round, water-soaked reddish brown to brownish black spots in the corms. (The lesions are usually not evident until the husks are removed). As the corm spots enlarge, the centers become sunken, dark brown to almost black, and hard. The margins become more definite, irregular, and somewhat angular. A diseased corm is frequently reduced to a hard, wrinkled mummy. Plants arising from diseased corms are usually stunted or dwarfed, often fail to bloom, and may die early.

STROMATINIA DRY ROT

The widespread fungus *Stromatinia gladioli* produces a dry rot of all below-ground plant parts. Rotting of the leaf bases often results in premature yellowing and death of the tops (Figure 4). Diseased corms characteristically have many small lesions ranging in size from pinpoints to about one-half inch in diameter. The lesions are minute and reddish brown at first, usually developing on the side and lower half of the corm. The spots frequently appear on the upper half as well. The line separating the healthy and diseased tissue is rather sharp. As the



Figure 4. *Stromatinia* dry rot. Rotting of the tissues gives the leaf bases a shredded appearance. The tiny black dots on the tissues are sclerotia of the causal fungus (University of Wisconsin photo).

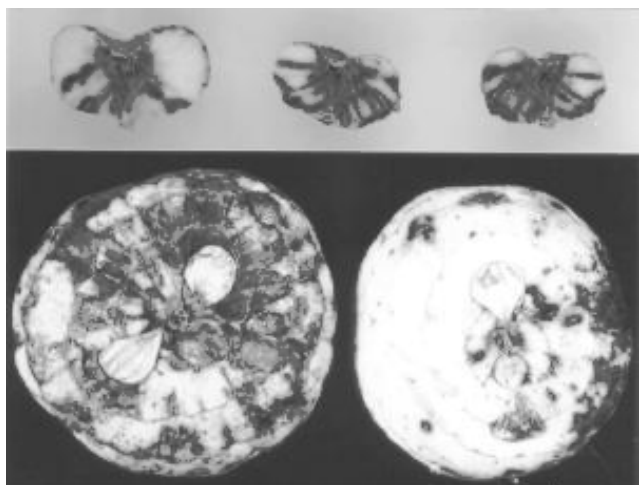


Figure 5. *Stromatinia* dry rot. Top: Blackened vascular strands extend through the flesh of infected corms. Bottom: *Stromatinia* lesions on *gladiolus* corms. All of the husks except the bud scales have been removed to show the lesions in the flesh of the corms (IL Natural History Survey photo).

lesions enlarge, the centers become sunken and usually turn black with definite, slightly raised margins. The lesions often merge into large irregular areas (Figure 5). On the husks, the lesions are tobacco brown. Very small black sclerotia form on the husks, in corm lesions, and on dead stems (Figure 4). When infected corms are cut vertically in half, blackened vascular strands can be seen that extend from the core to the surface of the corm (Figure 5). The decayed tissue is corky in texture and mummification of the corms often occurs in storage.

PENICILLIUM CORE ROT

The fungus *Penicillium funiculosum* causes a dark brown or black core rot with infections usually starting at the corm base. Diseased tissue becomes dark brown or black and the infection may progress until the center of the corm is destroyed, leaving a hole so that the resulting corm resembles a doughnut. Decayed corm tissue gradually becomes dry, corky, and light brown and can be separated easily from the adjacent healthy tissues. Careful removal of the decayed core leaves a smooth inner surface with occasional depressions that represent conical decayed projections. Corms in which decay is less advanced show only an internal darkening of lateral or longitudinal vascular tissue. Internal decay is well advanced when the first external symptom is evident—a darkening of the top of the corm or a pronounced depression of the basal callus layer. Dull green masses of *Penicillium* spores form on the base of the corms when the storage temperature is warm-to-hot and there is excessive humidity.

When corms are maturing after the flower spikes are harvested, the stubs may become infected with the fungus growing into the top of the corm. Infected flower spike stubs soon turn brown, and the leaves develop brown dead areas where they contact the stub tips.

SCAB

Scab is a widespread disease by the bacterium *Pseudomonas marginata*. It is easily recognized by the definitely outlined, pale yellow, water-soaked, circular spots in the corms that later turn light to dark brown or almost black. The lesions eventually become shallow, sunken, and surrounded by definite, raised, scab-like margins. The individual scabs vary in size from pinpoints to one-fourth inch in diameter. The lesions may be few or many and are usually most numerous on the lower half of the corm. The shallow scabs are easily popped out, leaving clean, saucer-like cavities.

The lesions (or scabs) secrete a gummy ooze that is first colorless, then changes to yellow brown or dark brown; when dry, it is brittle and shiny. The diseased husks may be glued together by the dried varnish-like ooze along with masses of soil. The lesions on the husks are elongated and dark brown to coal black. The centers of the lesions disintegrate, leaving holes with rough, black margins.

When affected gladiolus plants are growing in wet soil, a dark brown, shredded, stem- or neck-rot stage may develop that starts with numerous, enlarging, soft and watery spots. When disease is severe, the weakened plants may collapse and die.

Disease Cycle

All of the corm-rotting fungi and the scab bacterium overwinter in the soil and in or on diseased corms in storage. Infections occur in storage and especially in the field during damp weather, where plantings are dense and growing in wet, poorly drained soils. The *Fusarium* fungus can survive in soil for 5-to-10 years or more, in the absence of a host plant.

Control

Since there is usually more than one corm rot organism present in and on a batch of corms, the following control measures should be directed against all of the various rots.

1. Purchase only top-quality, disease-free corms.
2. Before planting, inspect the corms carefully and discard all those with rot lesions.
3. Soak the remaining healthy-looking corms in a fungicide solution as recommended in the Illinois Commercial Landscape and Turfgrass Pest Management Handbook or the Home, Yard, and Garden Pest Guide.
4. Plant the treated corms in a sunny spot in fertile, well-drained soil where the air movement is good. Avoid low, wet sites and dense plantings.
5. Practice at least a 4- or 5-year rotation between plantings of gladiolus.
6. Control Botrytis leaf and flower spot in the field by spraying at weekly intervals during damp or rainy periods. Start spraying when the disease first appears. The suggested fungicides to use are listed in the Illinois Commercial Landscape and Turfgrass Pest Management Handbook or the Illinois Home, Yard and Garden Pest Guide.
7. Dig the corms in warm dry weather, as early as possible, and before the onset of cold, wet weather. Avoid bruising, cutting, or otherwise injuring the corms while digging and handling. Shake off all loose soil. Discard all corms showing rot lesions, and soak the remaining healthy looking corms within 24 hours after digging, as outlined in control measure number 3.
8. After treatment, immediately place the corms in shallow, wire-mesh trays, and cure them promptly at a temperature of 85° to 95°F (29° to 32°C), with a relative humidity of about 80 percent, for 7 to 10 days.
9. Clean the corms as soon as the old and new corms separate readily, then return them to the curing room for an additional 4 to 7 days.
10. Store the cured corms at 40° to 50°F (3.5° to 10°C), with a relative humidity of 70 to 80 percent. Avoid damp storage conditions that can lead to infection of the corms. Inspect them carefully several times during the winter months and discard any with obvious symptoms of storage rot.
11. Fully dormant cormels can be treated in January, using water and fungicides. Consult pest management guides in your state. Dormancy varies with the gladiolus varieties and the temperature under which they were grown and stored. Place the corms in cool storage (40°F or 3.5°C) until they are ready to plant in wilt-free soil.
12. To control *Stromatinia* dry rot, apply a recommended fungicide (see pest management guides) in the planting furrow just before the corms are covered.

13. The scab bacterium is increased by bulb mites and may be related to grub and wireworm injury. Apply a granular or liquid soil insecticide, as suggested by University of Illinois Extension entomologists, in the planting furrow just before the corms are covered.
14. Avoid overhead sprinkling of the foliage in the field or garden.
15. Where feasible, remove all infected leaves, old flower spikes, and other plant debris. Collect and burn the debris or haul it away with the trash. Do not bury this debris or place it in the compost pile.