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report on
PLANT
DISEASE

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STRIPE SMUT OF FORAGE GRASSES

Stripe smut, caused by the fungus *Ustilago striiformis*, is a widespread and destructive disease of common timothy, orchardgrass, Kentucky bluegrass, redtop, and quackgrass in Illinois. Other grass hosts in the Midwest that are less commonly infected include Canada and Virginia wild-ryes, smooth bromegrass, reed canarygrass, perennial ryegrass, other bluegrasses (including annual, Canada, Canby, Chapman, fowl, rough and other stalks, and Sandberg), creeping, colonial and other bentgrasses, bottlebrush, brown-sedge, various fescues and wheat-grasses, foxtail barley, prairie Junegrass, ticklegrass, beachgrasses, velvetgrass, alkaligrass, fringed brome, bluejoint, and Scribner reedgrass.

Figure 1. Stripe smut on timothy. (Courtesy University of Wisconsin)

More than 30 percent of the plants infected with stripe smut have been recorded in timothy, Kentucky bluegrass, and redtop pastures. Areas within a pasture may have 70 percent or more of the plants infected. Losses due to stripe smut may be placed in four classes, (1) reduction in the yield and quality of the hay caused by the shredding and killing of diseased leaves or of entire plants; (2) reduction in amount and quality of the seed; (3) lowered carrying capacity for the pasture; and (4) widespread killing of plants in bluegrass lawns. See Report on Plant Diseases No. 409, "Leaf Smuts of Turfgrasses." Stripe smut is far more extensive and damaging in Illinois than is generally realized.

Isolated, infected plants or small patches of diseased plants may be observed most readily during cool (50° to 60°F, or 10° to 16°C) weather in the spring and fall. Such plants are often difficult to find during hot, dry weather because diseased leaves wither prematurely and a large percentage of the smutted plants often die during summer droughts. Severely affected plants are usually stunted or dwarfed and yellowed, with many shredded leaves that are dead and dying. Before shredding, narrow leaf streaks filled with black, dusty masses of smut spores are evident. Infected plants often do not head (or they produce abnormal, sterile heads) and are easily overlooked in uncut pastures or after mowing because of their slower growth. Affected seedlings are predisposed to drought injury and root rot. Mature plants commonly fail to survive hot, dry weather or severe winters. Once infected, grass plants rarely recover. Diseased plants may, however, produce some healthy stems (culms) on which smut-free seed develop.

A number of highly specialized varieties and pathogenic races of the stripe smut fungus are restricted to certain grasses, such as timothy, redtop, perennial ryegrass, Kentucky bluegrass, and so on.

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SYMPTOMS

Initial symptoms appear as stripes that are long, narrow, and grayish in the leaf blades and heaths, occasionally in the culms and inflorescences. The stripes become coal-black when the grass epidermis ruptures to expose the dusty mass of smut spores. The stripes may fuse and extend the entire length of a leaf (Figures 1 and 2). Affected tissues later rupture and liberate blackish-brown, greasy masses of smut spores (teliospores). Diseased leaves then curl from the tip downward and become shredded as they wither and die. The symptoms are similar on all grasses.

Figure 2. Stripe smut on redtop. Left, healthy plant (Courtesy University of Wisconsin).

DISEASE CYCLE

The smut fungus overwinters as dormant mycelium in the crowns and nodes of infected plants or as teliospores in the soil. The teliospores are carried by the wind and rain and by mowing to uninfected plants. Spores may also be carried on other equipment as well as on the seed. A teliospore germinates to produce an infection hypha that penetrates susceptible host tissue directly (Figure 3). Invasion may occur through the coleoptile of seedling plants and actively growing (meristematic) tissues produced by the lateral or axillary buds in the crowns, stolons, and rhizomes that come in contact with germinating spores. Once inside the grass plant, the smut hyphae develop systemically in the direction of plant growth. New leaves, tillers, rhizomes, and stolons become infected as they form. The mycelium continues to grow within developing tissues. The stripe smut fungus is systemic and persists indefinitely within the crowns and other underground parts of perennial grasses.

Spore formation begins with thick, tangled mats of hyphae (mycelium) within affected grass tissues. The mycelial mat breaks up to form the masses of blackish-brown, greasy smut spores that are released when the tissues rupture.

Depending on the strain or race of the smut fungus, the teliospores may require an after-ripening or "rest" period before they can germinate and produce infection. The need for and length of this period varies with the race and collection of the smut fungus, grass host, time of year when the collection is made, nutrients in the soil solution, soil temperature, and probably other unknown factors. The teliospores of certain races are capable of germinating immediately. Others, apparently, need a minimum period of dormancy that may vary from 20 to 300 days or more before they germinate. The duration of the dormancy period usually depends on how soon after maturity the spores are exposed to an environment suitable for germination. The germination of teliospores on artificial media is erratic. The optimum germination temperature–depending on the smut race, grass host, and other factors–is 64° to 90°F (18° to 32°C). The maximum is about 95° to 100°F (35° to 38°C); the minimum, 41° to 54°F (5° to 12°).

CONTROL

1. Where possible, sow only certified, disease-free seed of improved, well-adapted grass varieties. Use those recommended by University of Illinois Extension agronomists and your nearest Extension office.

2. Treat the seed, where feasible, with a suggested fungicide. The Report on Plant Diseases No. 101, "Seed Treatments for Field Crops," for details. Seed treatment helps prevent the introduction of the stripe smut fungus with the seed.

3. Plow down severely infected fields cleanly. Plant a nonsusceptible crop, such as corn, soybeans, small grains, forage legumes, or sorghum, for two years or more.

4. Keep down weed grasses by cultural and/or chemical means.

In the future, it may be possible to develop resistant varieties of certain grasses, such as timothy, redtop, orchardgrass, and reed canarygrass.

Bluegrass and bentgrass cultivars apparently differ greatly in their resistance to stripe smut. Since numerous races of the smut fungus exist, it is difficult to predict the relative resistance or susceptibility of a cultivar in any given location. The Kentucky bluegrasses reported as having good resistance to stripe smut are listed in Report on Plant Diseases No. 409, "Leaf Smuts of Turfgrasses."