



SEPTORIA DISEASE OF OATS

Septoria disease of oats is caused by the fungus *Septoria avenae* f. sp. *avenae* (perfect state *Phaeosphaeria* [*Leptosphaeria*] *avenaria* f. sp. *avenaria*). Other common names for the disease are Septoria leaf blotch, speckled leaf blotch, and Septoria black stem. In cool, moist seasons this is one of the most destructive diseases of oats in the northern third of Illinois.

Up to 93 percent of the leaves and 31 percent of the joints (nodes) have been found infected in an Illinois oat field. Almost 20 percent of the leaf area was killed. The black-stem phase of the disease had killed many of the stems (culms) above the top joints, causing severe lodging.

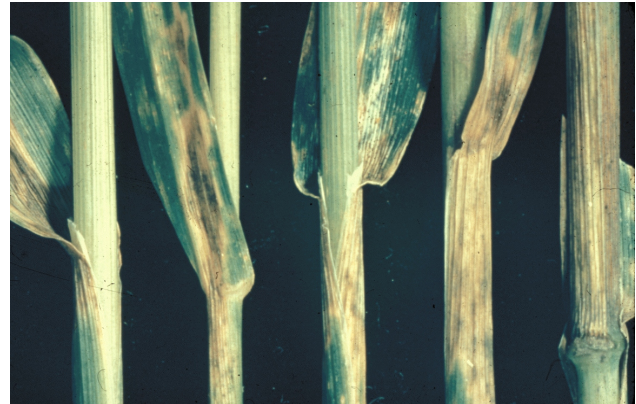


Figure 1. *Septoria* on culms - transition from leaf to culm phase (left to right).

Statewide yield losses of 15 percent or more have been recorded in the major oat-producing states of the Midwest and Northeast and in Canada. The disease is sporadic in its occurrence from season to season and from area to area.

The *Septoria* fungus is capable of attacking all above-ground portions of the oat plant at most states in its development. Under appropriate environmental conditions, characteristic leaf, leaf sheath, culm, glume, and kernel infections are produced. Leaf infections and culm breakage reduce yields and cause lodging. Kernel infections reduce milling quality. Infected straw may have reduced feeding value.

SYMPTOMS

The disease may be divided into three phases so far as symptoms and effects on plants are concerned:

THE LEAF-BLOTCH PHASE. Round to elongate or diamond-shaped spots or blotches (lesions) develop on the leaves. The lesions are yellowish to light brown or chocolate brown and are usually surrounded by a band of dull brown that changes to yellow as it blends into the healthy green leaf. They usually appear first on the lower leaves and then spread upward on the plant. Minute black dots, more or less scattered in the center, give older lesions a speckled appearance. The black dots are the pycnidia or spore-bearing organs of the fungus (Figure 1). As the blotches enlarge, the infected leaf tissue dies.

When severe, the blotches merge, causing the entire leaf to wither and die prematurely. Infection at the base of the leaf often spreads into the adjoining leaf sheath soon after heading. Here the lesions are a dark

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chocolate brown or reddish brown. When the leaves are killed prematurely, the plants may produce light-weight, poorly developed kernels.

THE BLACK-STEM PHASE. The disease symptoms appear on stem or culm tissue beneath infected leaf sheaths. Grayish brown to shiny black lesions develop, mostly above the upper two joints. On very susceptible varieties, lesions may develop on most or all of the culm tissue. Stem lesions commonly take the form of zoned bands (Figure 2). Culms are weakened and the plants frequently break over (lodge) at these rotted areas as they approach maturity.

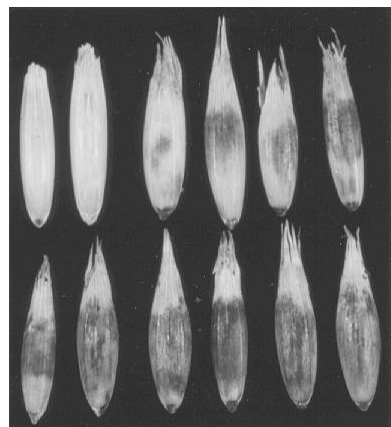


Figure 3. Kernel phase of the disease showing various degrees of infection. Healthy kernels at upper left.

Infection at the joints appears as dark brown to black blotches and may girdle the nodes. Dark gray fungus mycelium usually fills the hollow areas of infected culms. If the culm is severely damaged, sterility of the panicle may result.



Figure 2. Black stem phase of the disease with leaf sheaths removed. Healthy culms at right.

THE KERNEL-BLIGHT PHASE. In prolonged cool, wet weather the head, chaff (hulls), and kernels may be infected. Irregular, yellow-to-brown lesions occur on the outer glumes of the oat flower. These infections resemble those occurring on the leaves. Black or dark brown lesions may later extend to the lemma and palea, and under severe conditions to the groat of the oat kernel (Figure 3).

DISEASE CYCLE (Figure 4)

The *Septoria* fungus overseasons as spores within black fruiting bodies or as dormant mycelium in oat stubble, in straw left in the field, or in other plant parts. The fungus produces two kinds of spores—conidia (Figure 4B) that form in subepidermal pycnidia (Figure 4A) in leaves in the summer, and ascospores (Figure 4E) that form in 8-spored asci (Figure 4D) in other spore-bearing bodies called perithecia (Figure 4C) immersed in diseased leaf sheath and culm tissue of oat stubble, straw, and other debris during the winter and early spring. The airborne ascospores initiate leaf infections in new fields early in the season when the weather is cool and moist.

In moist weather the pycnidia in leaf lesions swell and force out the conidia in long, winding tendrils. The conidia are then splattered and splashed about by mixed wind and rain to start new infections. Insects, passing animals, and farm equipment help to spread the spores to other plants or fields. Spores produced in leaf lesions wash down between the leaf sheath and culm, or into the

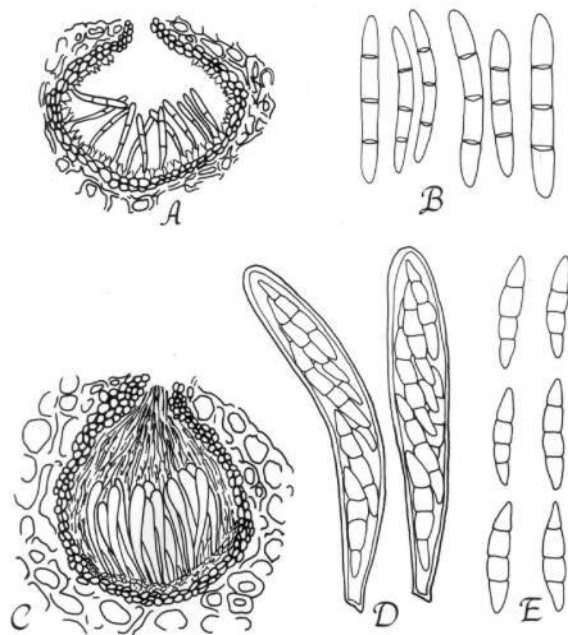


Figure 4. Disease cycle of the *Septoria* fungus as it appears under a microscope. A, vertical section of a subepidermal pycnidium; B, conidia; C, perithecium of the perfect state (*Phaeosphaeria*) filled with immature asci; D, two asci, each containing eight ascospores; E, ascospores.

boot surrounding the developing head to infect these parts. Spreading manure containing infected oat straw is another method of disseminating the fungus from field to field. The disease is not ordinarily seedborne.

CONTROL

1. Where feasible, plant tolerant or resistant oat varieties. Varieties and selections differ in resistance or tolerance. Early-maturing varieties tend to be most susceptible. Tall, late varieties are generally more resistant or escape infection. More resistant oat varieties should be available in the future. The wild diploid species (e.g., *Avena brevis*, *A. nudibrevis*, *A. strigosa*, and *A. wiestii*) appear to have considerably more resistance than common oats (*A. sativa*). These species may serve as useful sources of resistance to this disease.

Reaction to *Septoria* is a quantitative character, and the segregating populations cannot be separated into clear-cut classes. *Septoria* reaction is also influenced by differences in the environment. Oat varieties and selections also differ in their reaction to **all** phases of the disease—leaves, culms, glumes, and kernels. Resistance to one phase, however, tends to be associated with resistance to other phases.

Plant the oat varieties currently recommended by University of Illinois Extension Agronomists and your nearest Extension adviser as adapted to your locality. Refer to Illinois Agricultural Pest Management Handbook which is revised annually and should be available in an Extension office.

2. If possible, plant certified seed that has been thoroughly cleaned and then treated with an EPA-approved seed treatment fungicide. Seed treatment eliminates the fungus on the seed and promotes seedling emergence and vigor.
3. Do not apply manure containing *Septoria*-infected straw on a field to be planted to oats within the next year or two.
4. Where practical, rotate three or four years between oat crops.
5. Where feasible, and there is no underseeding, plow under oat stubble deeply and cleanly as soon as possible after combining.
6. Aerial applications, although not generally economical just to control *Septoria* disease, should be considered as another possible control measure, especially if crown rust and *Helminthosporium* leaf blotch are also serious problems. Spray when disease first appears and the weather forecast is for continued moist weather. Start applications at the tillering to jointing stage. Make a second application 9 or 10 days later. A third application is permissible but is probably not economical.