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Seedling Blight of Sweet Corn

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About 90 percent of the sweet corn seed produced in the United States is grown in southwestern Idaho. The region produces another 18,000 acres of sweet corn for processing. This concentration of sweet corn production is due primarily to the region's long growing season and arid climate that greatly reduce the incidence of common foliar diseases. Nevertheless, seedling blight and ear rots are important production problems in this region.

Sweet corn is generally more susceptible than field corn to seed rot and seedling diseases. These diseases became more common and serious in the 1980s following the introduction of "supersweet" corn hybrids that incorporate the shrunken-2 (*sh-2*) trait. Shrunken-2 varieties are more prone to seed and seedling diseases than conventional sweet corn with the sugary (*su*) trait. In 1988, approximately 40 percent of the sweet corn seed produced in Idaho was of the *sh-2* type.

Seedborne fungi are one of the principal causes of seed decay, seedling blight and stunting under typical climatic and soil conditions in Idaho, although soilborne fungi may be a more important cause of seedling diseases in some areas. Under cold, wet soil conditions, soilborne fungi such as *Pythium* spp. may be more damaging than the seedborne fungi.

Post-emergence seedling death has been variously referred to as "dieback," "five-leaf dieback" and "seedling blight." Seedlings can die as late as the five- or six-leaf stage, when it may be too late in the season to replant. Stand reductions of 50 percent are not uncommon.

Symptoms

Symptoms are variable, and sometimes the only obvious aboveground symptom is stunting and variability in seedling size. Typical seedling blight symptoms include lower leaves with light yellow to straw-colored necrotic streaks that begin at the leaf tips and margins (Fig. 1). The oldest leaves die first. Wilted and rolled leaves of scattered plants are symptoms of water stress associated with the disease and are most pronounced under dry conditions (Fig. 2). The infection may persist into the plant's reproductive phase resulting in barren stalks, uneven maturity and lower marketable yield.

Causal Organisms

Sweet corn seed microflora is complex, and the exact roles of the various seedborne fungi and their interactions are not clearly understood. *Penicillium oxalicum* has been identified in some studies as the main pathogen involved, and it shows a high degree of virulence in seedling inoculation tests. *Fusarium moniliforme* commonly is isolated from most seeds and seedlings, yet its role in causing seedling blight is unclear. Other species such as *F. graminearum* and *F. culmorum* have been isolated from diseased seedlings and are believed to be soilborne. Other common seedborne fungi include species of *Rhizopus* and *Aspergillus*. *Rhizopus* spp. also are isolated frequently from diseased seedlings. Soilborne pathogens, especially *Pythium* spp. and *Rhizoctonia solani*, have been associated with seedling diseases in some sweet corn growing areas.

Disease Development

Seed infection often begins in the field before harvest. Signs of mold growth are usually evident in the infected ears. Several fungi, especially species of *Fusarium, Rhizopus, Aspergillus* and *Penicillium*, can be isolated from kernels at this stage. Ears damaged by corn earworm and other pests frequently are heavily colonized by fungi.

Further contamination and infection of kernels may occur when high-moisture ears are husked and mixed in preparation for drying. Although most visibly infected kernels are removed during seed conditioning, virtually every seed in the finished product carries one or more of the above fungi. When a contaminated seed is planted, the seedborne fungi may colonize the endosperm and embryo.

The pericarp of *sh-2* seed is almost invariably cracked during conditioning. The cracked pericarp aides internal invasion by seedborne and soilborne organisms. The *sh-2* endosperm is a readily utilizable nutrient base for growth of the pathogens, thus aiding invasion of the scutellum.

The infection progresses from the scutellum upward into the mesocotyl (Fig. 3). At this stage, the seedling usually shows the typical aboveground symptoms and often dies because the primary root has been girdled or severed.

If adventitious roots establish before substantial damage to the axis occurs, the seedling usually survives (Fig. 4). Sometimes, an internal brown discoloration visible only in the core of the mesocotyl progresses into the plant crown. Seedlings may die when severe infection of the crown or coleoptilar node occurs, regardless of adventitious root growth.

Control

Sweet corn hybrids differ in their susceptibility to the disease. Insect and bird control in the field before harvest reduce ear rot and the amount of inoculum carried into the processing plant. Harvesting after the kernels have toughened and partially dried may help prevent further spread of infections during husking and drying. Early planting of seed production fields results in seed maturation under warm, dry conditions, which promotes field drying. Drying facilities and practices should aim to ensure rapid drying of ears to prevent further fungal growth.

Fig. 1. Typical seedling blight symptoms in shrunken-2 sweet corn.

Fig. 2. Leaf rolling is symptomatic of water stress caused by root/mesocotyl damage in blight-affected shrunken-2 sweet corn.

Seedling blight is most severe in Idaho when corn is planted under cool, dry conditions. Seed should be planted as soon as possible after irrigation and at least 1 inch into the moist zone to ensure that sufficient water is available for rapid seedling establishment. Brief irrigation immediately after planting instead of before may help control the disease if the soil is not cooled to less than 50°F by the irrigation and if soil crusting is not a problem. Irrigation at the two- or three-leaf stage may reduce seedling mortality by stimulating adventitious root growth.

Field trials have demonstrated that seed treatment with certain combinations of fungicides is effective in controlling seedling blight. The most effective mixtures consist of three components: (1) a broad spectrum protectant such as captan or thiram or both, (2) a systemic fungicide with activity against internally borne *Penicillium* and *Fusarium* and (3) metalaxyl to control soilborne *Pythium*, especially in cold, wet soils. Check with the Extension agricultural agent in your county to learn what products are currently available for treatment of sweet corn seed.

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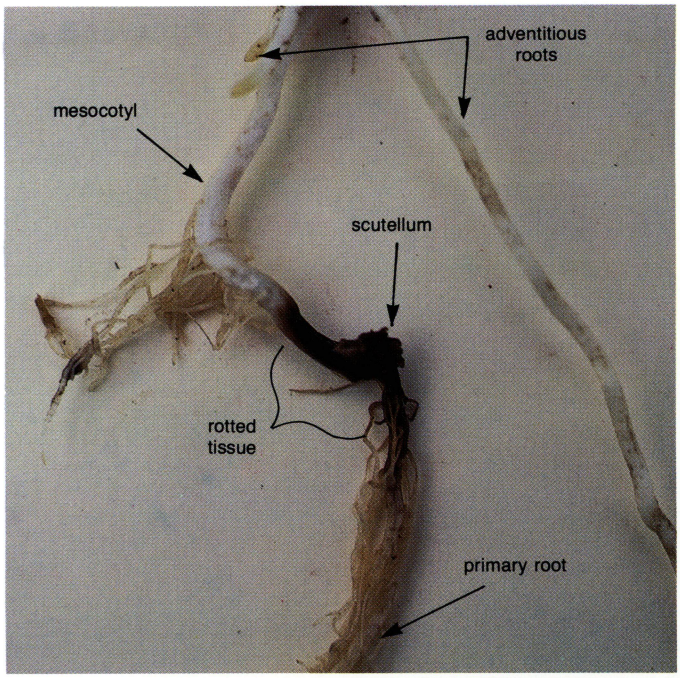

Fig. 3. Typical below-ground seedling blight symptoms showing progression of rotting from scutellum into the mesocotyl and primary root.

Fig. 4. Blighted shrunken-2 corn seedlings showing various degrees of adventitious root growth.

Pesticide Residues — Recommendations for use are based on currently available labels for each pesticide listed. If followed carefully, residues should not exceed the established tolerances. To avoid excessive residues, follow label directions carefully with respect to rate, number of applications, and minimum interval between application and reentry or harvest.

Groundwater — To protect groundwater, when there is a choice of pesticides, the applicator should use the product least likely to leach.

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