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COMMON LEAF BLIGHTS AND SPOTS OF CORN

Corn leaf spots and blights are common foliar pathogens throughout Illinois. Although the intensity can vary due to weather, tillage system, and hybrid resistance, these diseases are among the most common plant disease problems in the Corn Belt.

One of the best known of the leaf blights is southern corn leaf blight (SCLB), which caused extensive and widespread damage to the corn crop in 1970. A new race of this fungus, designated Race T, attacked both inbreds and hybrids with the Texas male-sterile (Tms) cytoplasm. An estimated 80-85% of the dent corn grown in 1970 had Tms cytoplasm. Race T not only attacked leaves, but also leaf sheaths, ears, and stalk tissues.

Race T unexpectedly multiplied and spread rapidly during 1970. The disease began in the southern states and by early to mid-August, it was established as far north as Minnesota, Michigan, and Maine. An estimated 250 million bushels of corn was lost to SCLB in Illinois alone.

In 1971, losses to Race T virtually disappeared. The production of normal cytoplasm (N) seed was greatly increased, weather conditions were not as favorable for SCLB infections, infected residues were buried by farmers, non-host crops were planted in affected fields, and earlier planting was used. Early planted corn generally escaped severe damage in 1970. Since this time, the use of normal cytoplasm plus other management factors has controlled Race T as well as reducing losses to the more common leaf-infecting Race O.

A major change has occurred with respect to the renaming of some of the more common members of the leaf-blighting group. Fungal taxonomists have removed northern and southern corn leaf blight from the

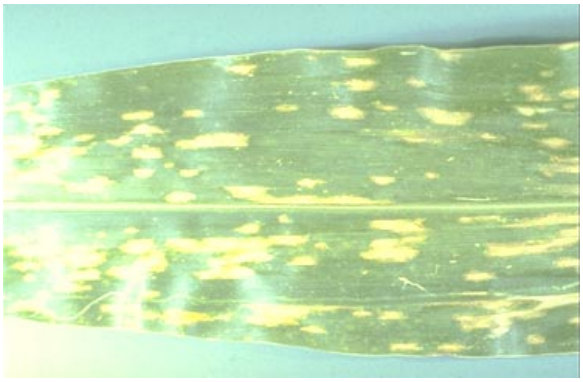

Figure 1. Southern corn leaf blight.

Figure 2. Gray leaf spot.

Figure 3. Eyespot.

Information concerning diseases of field crops can be obtained at your nearest Extension Office or the Department of Crop Sciences, University of Illinois, Urbana.

Helminthosporium group and placed them in other genera. However, there is not yet full agreement or acceptance of the new names. The list below gives the "old" names as well as the most commonly used "new" name and some other synonyms. To avoid listing all the names, the term "***Helminthosporium*** leaf blights" will be used in this text when referring to the group as a whole:

SOUTHERN CORN LEAF BLIGHT (***Helminthosporium maydis***): ***Bipolaris maydis***, synonym: ***Drechslera maydis***, ***Cochliobolus haterostrophus.***

NORTHERN CORN LEAF BLIGHT (***Helminthosporium turcicum***): ***Exserohilum turcicum***, synonyms: ***Bipolaris turcicum, Drechslera turcicum, setosphaeria turcica.***

NORTHERN CORN LEAF SPOT (***Helminthosporium carbonum***): ***Bipolaris zeicola***, synonym: ***Drechslera zeicola***, ***cochliobolus carbonum***.

Other common leaf blights include **Gray Leaf Spot** (***Cercospora zeae-maydis***), **Eyespot** (***Kabatiella zeae***), **Anthracnose Leaf Blight** (***Colletotrichum graminicola***) and **Yellow Leaf Blight** (***Phyllosticta maydis***).

SOUTHERN CORN LEAF BLIGHT

Southern corn leaf blight (SCLB) is favored by warm temperatures (68-90°F) and high humidities. Thus, it tends to be more of a problem in the southern half of Illinois, although it can be found farther north if weather conditions are favorable. Frequent rainy periods enhance disease development.

The symptoms of SCLB are leaf lesions ranging from minute specks to spots of one-half inch wide and one and one-half inches in length. They are oblong, parallel-sided, and tan to grayish in color. A purplish to brown border may appear on the lesions depending on the genetic background of the plant. Early and severe infections in susceptible plants predisposes them to stalk rots.

The fungus overwinters in corn debris as spores or mycelium. Spores are spread by wind or splashing water to growing plants. After infection and colonization, sporulation from these primary lesions serves as the source for secondary spread and infections as long as weather conditions are favorable for disease development and living tissues are present. The disease cycle may repeat every few days under ideal conditions. Germination of spores and penetration into the plant can occur within six hours when free water is present on the leaf surface and temperatures are between 60° and 80°F. Control of SCLB is easily accomplished with resistant hybrids. Although some slight flecking may be found in some hybrids, this is simply a part of the resistant reaction and does not lead to any economic loss.

Burial of crop residue is helpful where erosion is not a problem. Crop rotation is especially suggested where no-till is used or where heavy crop residues are found. Since this fungus overwinters on debris, the planting of corn into such residues may result in earlier infection and poor seedling performance. Foliar fungicides are useful in seed production fields. For optimal control, it is important to control foliar disease during the period from 14 days before tasseling to 21 days after tasseling. Research has shown that this four-week period is the most critical for leaf blight damage and that yields and quality are most affected if susceptible inbreds are not protected at this time.

NORTHERN CORN LEAF BLIGHT

Northern corn leaf blight (NCLB) is favored by moderate temperatures (65°-85°F) high humidity and heavy dews during the growing season. Dry conditions greatly reduce disease incidence. Early infections before silking can cause yield reductions of 50% or more on susceptible inbreds and hybrids. If disease onset is delayed until six weeks after silking, losses are minimal. In addition to grain losses, forage value is reduced and plants are predisposed to stalk rots.

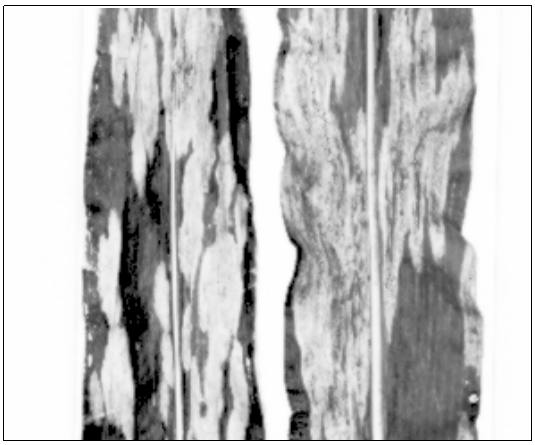

Figure 4. Northern corn leaf blight.

NCLB is recognized by long, elliptical lesions that are typically cigar-shaped. Lesions may be as large as 3/4 inch in width and 2 inches in length. Lesions first appear on the lower leaves. The disease progresses upward until, in severe cases, nearly all of the leaves are infected. However, this is not common since dent corn hybrids planted in Illinois have genetic resistance to this pathogen. Damage can be extensive in susceptible inbreds if lesions occur at or above the ear leaf.

NCLB overwinters in corn debris. Conidia (spores) can be windblown over long distances. Water splashing can also cause lower leaf infections and result in seedling blighting where continuous corn is planted. Infection is initiated when free water is present on the leaf surface for 6 to 18 hours and the temperature is between 65° and 80°F.

Control of NCLB is based upon selection of resistant hybrids. Many hybrids with resistance to NCLB also carry resistance to SLCB. At least two types of resistance to NCLB are known: small lesion size and few lesions (controlled by multiple genes) and chlorotic lesions with little or no sporulation and a yellowish halo (controlled by a single gene). Thus, even where resistant hybrids are planted, leaves may show some flecking or small lesions, but no economic damage occurs.

Residue burial and crop rotation also will reduce NCLB levels. Although the spores are easily disseminated by winds, rotating to soybeans or another non-host crop helps reduce disease levels. Foliar fungicides are also helpful in seed production fields where susceptible inbreds are planted. Applications should be made as for SCLB during the pollination period. Maintaining high balanced fertility based upon a soil test is also helpful. Do not apply excessive nitrogen since this may increase infection levels.

NORTHERN CORN LEAF SPOT

Northern corn leaf spot (NCLS) is primarily a concern in seed production fields where susceptible inbreds are planted. Hybrids may show some minor flecking or small lesions, but most hybrids carry adequate resistance to prevent economic losses from occurring. NCLS is favored by many of the same conditions as for NCLB and SCLB. It is primarily limited to northern Illinois, but may be found in seed fields in north central Illinois when moderate temperatures and high moisture levels occur. Spores are produced abundantly in damp weather.

Lesions of NCLS can vary depending on the race present. Race 1 lesions are tan, oval to circular with concentric zones and are commonly 1/2 inch in width and 1 inch in length. Race 2 infections are rare. Lesions are oblong, dark brown to blackish in color and 1/8 inch in width and 1 inch in length. Race 3 lesions are most common in the Corn Belt. These lesions are narrow and linear in shape, with lengths less than 1 inch and widths less than 1/8 inch. Lesion shape and size may vary with the genotype of the plant.

Lesions are grayish-tan and surrounded by a pigmented border. Control measures are not usually necessary for commercial hybrids. Seed production fields can benefit from fungicide applications, especially for highly susceptible inbreds.

There are at least three known races of NCLS. Race 1 is highly pathogenic on some inbred lines; Race 2 is much less pathogenic; Race 3 is primarily a problem in seed production fields. It can also produce lesions on commercial hybrids but does no economic damage. There is also evidence that a fourth race may occur or it may be a biotype of one of the other races.

GRAY LEAF SPOT

Due in part to the adoption of reduced and no-till practices, gray leaf spot is increasing in severity across the Midwest. This pathogen survives readily in corn debris and sporulates profusely in the early spring if weather conditions are favorable. The disease is most severe in continuous no-till corn and can cause extensive damage in reduced tillage fields if crop rotation is not practiced.

Lesions are identified by their rectangular or blocky appearance on susceptible corn plants. Lesions are pale brown or gray to tan in color and are 1/4 inch to two inches in length. They are restricted by the veins and usually have blunt or squared-off ends. In susceptible hybrids, lesions may coalesce causing extensive tissue necrosis.

GLS typically appears on the lower leaves because of the spores being either windblown or rain-splashed from previous crop debris. Extensive blighting may result followed by death of the plant and stalk breakage or lodging. If favorable environmental conditions occur, GLS may kill entire fields prior to maturity.

GLS is favored by warm, humid conditions and frequent rainfall. Fungal spores can survive at humidities as low as 60%, but infection and colonization of the host does not occur unless relative humidities reach above 85%. This pathogen has a long latent period when no symptoms are visible. This may last from 2-4 weeks in length. Thus, once initial symptoms are evident, the disease severity may already have reached the epidemic point.

Control of gray leaf spot should begin with identification of potential problem fields and the selection of resistant or tolerant hybrids for these fields. Since GLS is favored by high humidities, only tolerant or resistant hybrids should be planted in these fields. River bottom fields, for example, are typically humid and offer the most favorable environment for GLS infection. Crop rotation is also important for GLS control as this pathogen cannot survive for extended periods without a host plant. Thus, rotating soybeans or another non-host crop helps to reduce the inoculum level.

Plowing heavily infected fields will also reduce carry-over inoculum levels. Once buried, the fungus cannot produce spores and infect the corn crop. However, care should be taken with plowing, especially with regard to slope of fields and erosion considerations. Separation of fields can be a minor, although important, method of reducing infections by GLS. Since this is primarily a wind dispersed pathogen, corn crops should not be planted adjacent to fields with high corn residues, if GLS was a problem in that field the past season. If winds blow across the residues, spores may be transported to the new corn crop and early infections begun. Fungicides are not commonly recommended for commercial corn fields. Several products are available for seed production fields and these should be used with proper scouting to detect the disease in the early stages.

EYESPOT

Eyespot may attack corn early in the growing season, but is more commonly seen in late summer or fall. Eyespot symptoms include small, oval to round spots, about 1/8 inch in diameter, on the leaves. The centers of these lesions are tan-to-cream with a distinct water-soaked to brown or purple margin. A yellowish "halo" that appears translucent when the leaf is held to the light, surrounds each spot and gives the appearance of an eyespot.

The eyespot fungus overwinters in corn debris. Spores produced in the spring are wind-disseminated to nearby seedlings with lesions visible 10-14 days after infection. Secondary spread is by wind or rain splashing. Disease development is favored by cool, humid weather. Control is based upon crop rotation, tillage where feasible, and resistant hybrids. Proper fertilization and control of other pests is also beneficial.

ANTHRACNOSE LEAF BLIGHT

Anthracnose leaf blight is also becoming more common in the Midwest, due in part, to changes in tillage systems. This pathogen also survives in crop debris and can become a serious problem if susceptible hybrids are planted in fields with infected corn residues.

Symptoms of anthracnose vary greatly with hybrid susceptibility, age of leaves, and environment. Small, oval to elongated water-soaked lesions appear at any stage of growth. Lesions can enlarge until reaching a length of about 1 to 1 1/4 inch and typically have tan centers with red, reddish-brown, or reddish-orange borders. On susceptible hybrids, lesions may coalesce and blighting of the entire leaf can occur. Leaf symptoms are most common in the early season on the lower leaves, and on the upper leaves late in the season when diseased leaves can wither and die rapidly.

Control of anthracnose leaf blight is based upon selection of resistant hybrids. Resistance to anthracnose leaf blight is not well correlated to resistance to the top kill or stalk rot phases of this disease. Where anthracnose leaf blight is a problem, producers should be certain that the hybrids selected are resistant to the leaf blight phase as well as to the other two phases. Crop rotation and clean plowdown of residues will help reduce inoculum levels however care should be exercised when plowing to avoid erosion problems.

YELLOW LEAF BLIGHT

Yellow leaf blight, or Phyllosticta leaf spot, is characterized by oval-to-rectangular yellow, cream-colored, or tan-colored lesions, sometimes surrounded by a yellowish halo that first appear on lower leaves. Lesions vary in size, averaging 1/10 by 1/2 inch and may coalesce to produce severe leaf blighting. Infected leaves turn brown and die. Leaf sheaths and outer husks are also susceptible. Where severe, diseased plants may be stunted and more susceptible to stalk rots.

The causal fungus overwinters primarily in corn debris, but may also overwinter in foxtail or sudangrasses. Susceptible host plants may be attacked at any stage. Spores produced in the spring are windblown or water-splashed to nearby corn leaves. These primary infections produce additional spores that maintain the epidemic. Young corn plants growing through debris are especially vulnerable.

CONTROL MEASURES FOR LEAF BLIGHTS

Corn leaf blights can be successfully managed if a routine scouting program is adopted combined with a knowledge of each major disease and its life cycle. Control of all of these corn diseases is best accomplished using an integrated disease control program emphasizing the following:

1. Learn to identify common leaf blight symptoms. Proper identification helps to select the right resistant hybrid.

2. Practice crop rotation. Rotation with non-hosts like soybeans helps reduce inoculum build-up and the possibility of a serious disease outbreak.

3. Use tillage to bury crop residues where erosion is not a problem. Once buried, crop residues begin to decay and sporulation is reduced.

4. Utilize stress reduction practices where feasible. Proper fertilization and pest control will reduce stresses on the corn plants and help maintain a vigorously growing crop.

5. Plant hybrids with resistance to the common leaf blights. Resistant hybrids offer the best and most economical method of controlling most common diseases of field crops. Difference in resistance to these diseases will vary among hybrids, so a knowledge of the common diseases is needed.