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Gray Leaf Spot Disease of Corn

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In Virginia gray leaf spot disease of corn (Fig. 1), caused by the fungus Cercospora zeae-maydis, has been generally associated with the corn pro-duction areas west of the Blue Ridge Mountains. It is known to occur in fields along creeks or river bottoms after tasselling. However, the widespread use of reduced-tillage, resulting from federal incentives to farmers, has contributed to the expansion of the geographical distribution of gray leaf spot and to an increase in disease severity over the past 25 years. Gray leaf spot is now recognized as one of the most significant yield-limiting diseases of corn worldwide. It poses a serious threat to corn production in many areas of the eastern United States, including Virginia, and more recently in large areas of the U. S. Corn Belt and Africa. No-till or reduced tillage practices, coupled with continuous corn production, is associated with disease development prior to tasselling, with significant yield losses being common. Documented losses in Virginia and elsewhere range from 10 to 60% of grain yield depending on the hybrid and year.

Fig. 1. Corn blighted by Cercospora zeae-maydis, causal agent of gray leaf spot disease.

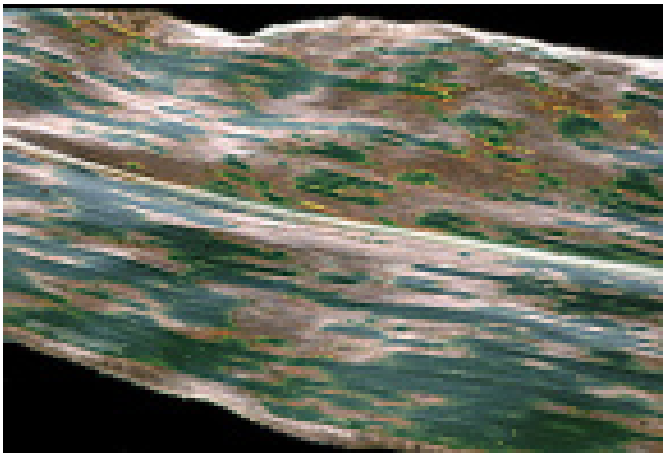

Fig. 2. Characteristic mature gray leaf spot lesions on corn leaf. Note the grayish cast of these lesions. This is due to the production of numerous conidia (spores), which are able to spread to other corn plants and leaves by air currents.

Symptoms

Mature foliar lesions symptomatic of gray leaf spot are gray to tan in color, long (3/4 to 2 1/2 inches), narrow (1/8 to 1/4 inch), rectangular, and run parallel to the leaf veins (Fig. 2). Under heavy disease pressure these lesions may coalesce and blight the entire leaf. Early symptoms of infection include pinpoint lesions surrounded by yellow haloes that can be seen by holding an affected leaf up to light (Fig. 3). Generally within two weeks or so these pinpoint lesions elongate and develop into their distinctive rectangular shape. With severe blighting of leaves and leaf sheaths in heavily infested fields, stalk deterioration and severe lodging may occur (Fig. 4). Severe blighting not only causes premature death of

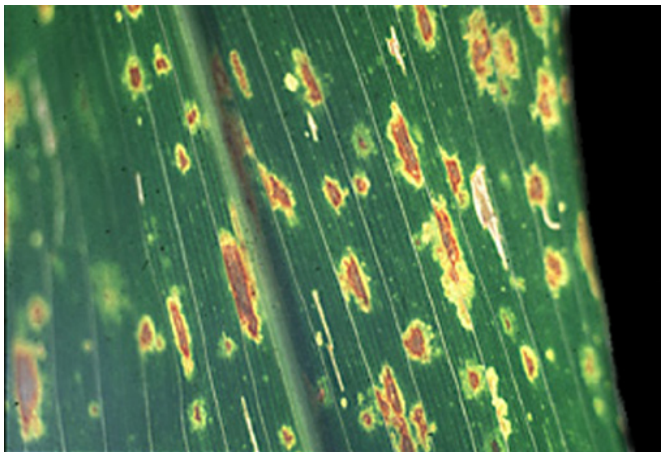

Fig. 3. Early symptoms of gray leaf spot disease as seen by transmitted light.

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leaves but also reduces the amount of photosynthate (sugars) required for ear fill. Depending on the severity and level of hybrid resistance, losses in grain yield may range from 5 to 70 bushels per acre.

Fig. 4. Corn plants lodged due to severe blighting caused by gray leaf spot.

Disease Cycle

Cercospora zeae-maydis, like many other foliar fungal pathogens of corn, is a poor competitor in the soil and can survive only as long as infested corn debris is present. Infested corn debris on the soil surface is the source of primary inoculum for the next corn crop. The fungus colonizing this debris produces conidia (spores) as early as May. These airborne spores are the means by which the fungus infects the new corn crop.

Gray leaf spot is a highly weather-dependent disease. The pathogen requires long periods of high relative humidity and free moisture (dew) on the leaves for infection to occur. The lower leaves of the corn plant are most often the sites of initial infections. When conditions are favorable for disease development, conidia are pro-duced in lesions on the lower leaves and serve as inoculum for the upper leaves. If conditions are not favorable for di-sease, the fungus can remain "dor-mant" during the dry part of summer and then become active when favorable conditions return. Under periods of prolonged favorable conditions, severe blighting can occur. This blighting may extend to the leaf sheath, which remains on the cut stalk after harvest. Sheath lesions (Fig. 5) are likely to serve as a source of fungal inoculum the following spring.

Fig. 5. Typical gray leaf spot lesion on leaf sheath.

Control

An effective gray leaf spot disease control program involves the integration of a number of cultural practices. Growers who have experienced the disease would be wise to critically re-evaluate their corn production practices in order to avoid significant yield losses.

Tillage Practices

Tillage, the turning of corn residues, is beneficial in reducing pathogen survival and inoculum for the succeeding corn crop. The burial of infested debris facilitates rotting and deprives the fungus of a food base. The fungus is unable to survive freely within the soil. It can only overwinter within and on dead corn tissue remaining on or above the soil surface. Disking does not sufficiently bury the infested debris. Mold board plowing does, but it may not be advisable in some fields because of increased erosion potential. Erosion potential can be reduced by fall plowing and seeding to a winter cover crop, followed by no-till planting of corn in the spring. Burial of infested debris, however, may not provide an effective means of reducing gray leaf spot inoculum in regions where widespread use of conservation tillage is practiced because the pathogen may blow into a field from adjacent fields.

Crop Rotation

Taking a field out of corn production or rotating to a non-host crop for one year can reduce gray leaf spot severity. The fungus is unable to survive more than one season in infested corn debris. Corn is the only crop this fungus is known to attack. However, the potential for herbicide carryover may restrict the selection of crops in the rotation scheme.

Corn Silage Production

Growing corn ensilage significantly reduces the amount of inoculum available for infecting the next corn crop in two ways. First, silage corn is usually harvested before significant blighting from gray leaf spot occurs, thereby reducing the amount of the pathogen available to survive the winter months. Secondly, removal of corn for ensilage leaves only about six inches of stalk in the ground. This practice leaves little, if any, infested debris for overwintering of the fungus.

Hybrid Selection

Losses from gray leaf spot can be reduced by planting hybrids less susceptible or more tolerant to this disease. No hybrid currently available to the grower is immune to gray leaf spot. Evaluations of commercially available hybrids for resistance or tolerance are made each year, and these results are made available through Virginia Cooperative Extension. A list of hybrids recommended for areas where gray leaf spot is a problem is provided each year in the Virginia Pest Management Guide for Field Crops (VCE Publication 456-016), *http://pubs.ext.vt.edu/456-016/*.

Effective prevention of yield loss to gray leaf spot requires attention to production practices and the ways in which they affect the development of the disease. Employing as many of the control practices mentioned as possible will ensure a more consistent corn yield year after year.

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Selected References

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