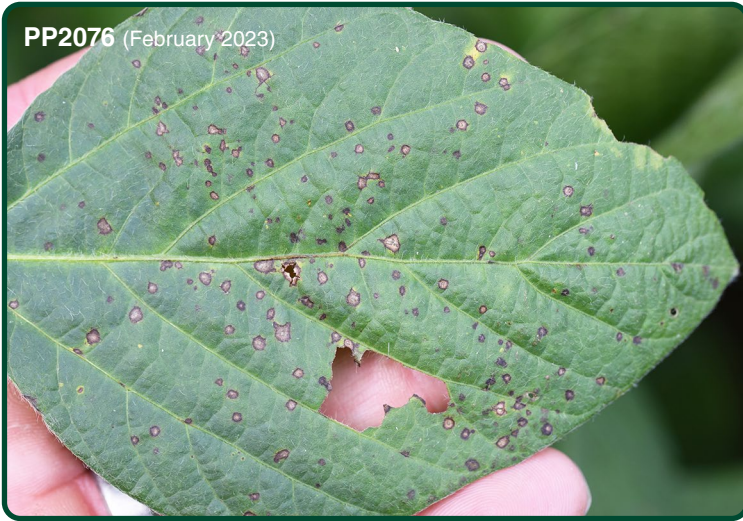


PP2076 (February 2023)



Frogeye Leaf Spot of Soybean

Figure 1. Frogeye leaf spot lesions on the upper side of the leaf. Lesions at varying stages of infection. Younger lesions appear as small dark, water-soaked spots. Mature lesions develop into irregular or circular lesions surrounded by a narrow red or purple border. (Sam Markell, NDSU)

Frogeye leaf spot of soybean is a foliar disease found in soybean growing regions throughout the United States and first identified in North Dakota in 2020. To date, yield loss has not yet been reported in North Dakota, but southern U.S. regions that frequently experience favorable conditions for disease development have reported yield losses greater than 30%. Consequently, scouting is important to monitor occurrence of the disease and to make informed management decisions if needed.

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Causal Organism, Survival and Spread

Frogeye leaf spot of soybean is caused by the fungal pathogen *Cercospora sojina*. The fungus can survive for at least two years as filamentous fungal growth, overwintering in infested soybean residue. It can also survive in infected seed, although seed transmission is rarely observed in the field. It is also believed that the fungus can overwinter in North Dakota, although the level of survival is unknown. Warm temperatures between 70 and 80 F and humid conditions promote spore production from the infested residue, leading to spread, infection and disease development. The infection process begins when fungal spores are disseminated to healthy plant tissue through wind and rain splash. Once spores infect tissue, small lesions will develop at the point of infection. Lesions are often not visible until two weeks after infection. As lesions expand, the pathogen will begin producing new spores on the infected tissue. Spore production can occur within 48 hours of visible symptoms under favorable conditions, and when infection occurs early in the growing seasons, an explosive epidemic may occur. *Cercospora sojina* can infect soybean at any growth stage; however, younger leaves are more susceptible than older leaves. In soybean producing areas where the disease is more common and more severe, symptoms are most frequently observed after flowering (R1). At the time of this printing, frogeye leaf spot has only been observed in North Dakota late in the growing season.

Signs and Symptoms

Frogeye leaf spot lesions are often first observed on the upper side of the leaves. Initially, lesions appear as small dark, water-soaked spots that develop into irregular or circular lesions approximately ¼ inch in diameter (Figure 1). As the lesions mature, the center of the lesions gradually progress in color from gray to brown to tan surrounded by a narrow red or purple border (Figure 2A). Depending on soybean variety, a light-green or yellow (chlorotic) halo surrounding the lesion may also develop. Under favorable conditions, the center of the lesions may sporulate resulting in a fuzzy gray appearance on the underside of the leaf (Figure 2B). As lesions continue to enlarge, they may coalesce on the leaf (Figure 3). In severe

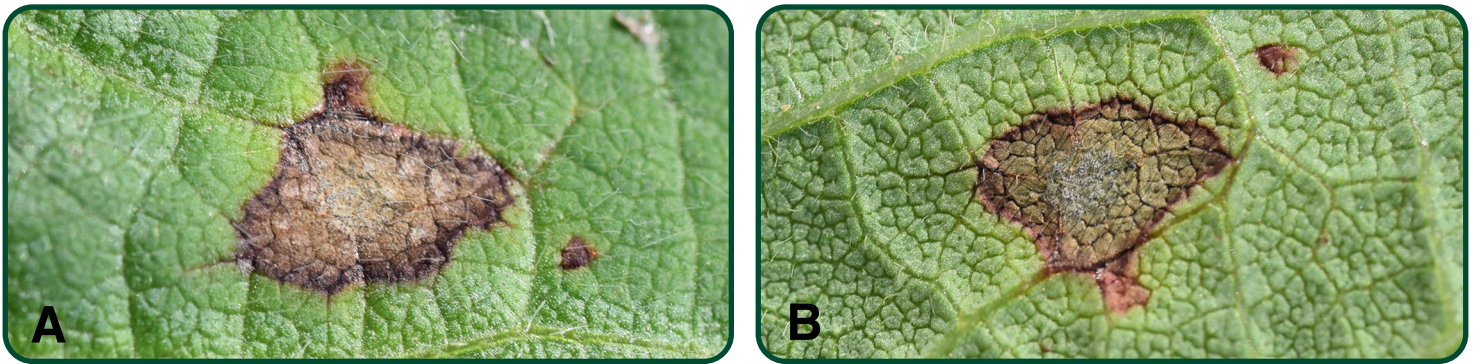


Figure 2. Comparison of lesions at varying stages of infection on (A) the upper side of the leaf and on (B) the underside of the leaf. In larger lesion, note the circular to irregular gray center surrounded by dark purple halo on the top side of the leaf and fuzzy gray sporulation in the center of the lesion on the underside of the leaf. (Sam Markell, NDSU)

cases, this can result in premature defoliation. Lesions can also appear on the stems, pods and seeds in highly conducive conditions. However, stem and pod symptoms differ from foliar symptoms and can be difficult to identify. Symptoms on the stem often appear as long, discolored lesions. Pod lesions can often resemble foliar lesions and appear to have an oblong shape. Pods that are severely infected may also lead to infected seed. Infected seed may be symptomless or have a purple or gray discoloration.

Management

Crop Rotation

Crop rotation, in general, is highly recommended for disease management. It is believed the fungus can survive in infested soybean residue up to two years. Therefore, two-year crop rotations of non-host crops, such as corn and small grains, are recommended to reduce levels of residue that may contain the fungus.

Tillage

Cultural practices that encourage residue decomposition, such as tillage, may reduce the amount of residue where the fungus overwinters.

Resistant Varieties

Genetic resistance to the pathogen is known; however, it does not provide complete resistance, and it may not be incorporated in varieties available in North Dakota. If frogeye leaf spot is a problem, consult the most up-to-date information on resistance in soybean varieties.

Foliar Fungicide and Fungicide Resistance Management

Effective fungicides are available and useful if the disease begins early enough in the growing season. In soybean producing areas where frogeye leaf spot is prevalent and damaging, scouting at R1 and R2, followed by an application (if needed) during pod development (R3-R4) has been found to be most effective at protecting yield. Fungicide resistance to quinone outside inhibitor (FRAC 11; strobilurins) has been reported in North Dakota. Consequently, if fungicides are needed, multiple modes of actions should be used to ensure adequate efficacy. In North Dakota, frogeye leaf spot has only been identified late in the growing season and yield loss has not yet been reported.

More information on available fungicides can be found in the most recent version of NDSU Extension publication PP622, "North Dakota Field Crop Plant Disease Management Guide."



Figure 3. Circular to irregular shaped lesions coalescing on soybean leaf. (Sam Markell, NDSU)

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