

Foliar Fungicide Use in Soybean

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Soybean foliar diseases are described and illustrated: Brown spot, Cercospora blight, frogeye leaf spot, and soybean rust. A table of fungicides for disease control is included.

Integrated Pest Management

Soybean foliar diseases have been in greater focus since soybean rust (SBR) was confirmed in the continental U.S. in 2004. Experience with SBR in the U.S. has revealed it will not be a problem every year, but may occur sporadically in Nebraska. However, it is important to understand how to recognize, differentiate, and control SBR and other yield-reducing foliar fungal diseases. As part of an integrated pest management (IPM) program, it is best to consider foliar disease management at planting time by selecting varieties that are resistant to diseases that have been observed in previous years. Also, crop rotation should be a disease management strategy since inoculum can build up in crop residue under continuous soybean production.

Disease Identification

Despite these preventive strategies, foliar diseases can still reduce soybean yields. Currently, four foliar fungal diseases can cause significant yield loss in Nebraska. Identifying which disease(s) are present in your field is the first step in proper disease management. Brown spot (*Septoria glycines*), Cercospora blight (*Cercospora kikuchii*), frogeye leaf spot (*Cercospora sojina*), and soybean rust (*Phakopsora pachyrhizi*) are foliar fungal diseases that should be monitored in Nebraska. Varieties will vary in their response to these diseases and each can significantly impact yield when conditions are favorable for disease development. Since fungicides can vary in their ability to control these diseases, it is important to properly identify which is present in the field. For example, bacterial pustule can easily be confused with SBR and fungicides will not control bacterial pustule in soybeans. Making an incorrect identification could result in the wrong treatment for the disease.

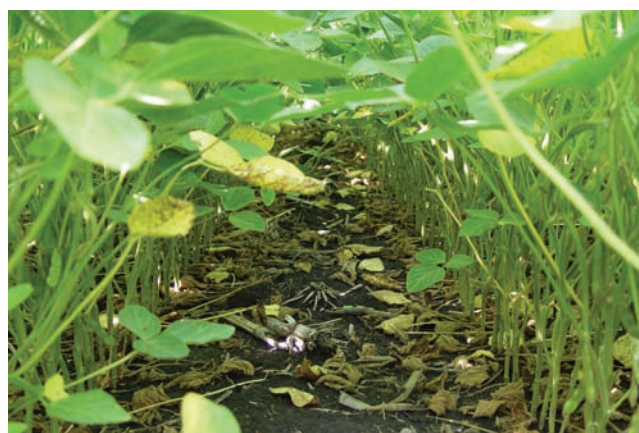


Figure 1. Brown spot on soybeans.

Brown spot (Figure 1): Brown spot typically begins in the lower canopy during periods of high moisture or humidity. It is characterized by angular lesions with chlorotic margins. Lesions can merge together to form large necrotic spots. Yield losses typically range from 8 percent to 15 percent in severely affected fields. There are no known sources of genetic resistance, though some varieties may be more tolerant to brown spot than others. The best management strategy for brown spot is crop rotation.



Figure 2. Cercospora blight on soybeans.

Cercospora blight (Figure 2): Cercospora blight affects leaves in the upper canopy. It is favored by hot temperatures and is characterized by a general bronzing or purpling of the upper leaf surface. Lesions are reddish purple. Necrotic blotches form when the lesions coalesce. Yield losses from Cercospora blight can range from 15 percent to 30 percent. The fungus causing Cercospora blight also causes purple seed stain that can reduce seed quality and contribute to economic losses. Seed companies may have information on Cercospora blight susceptibility for individual varieties.



Figure 3. Frogeye leaf spot on soybeans.

Frogeye leaf spot (Figure 3): Frogeye leaf spot typically forms on younger leaves in the upper canopy. Lesions

are circular with purple or reddish margins. Older lesions may develop dark centers where the fruiting bodies of the fungus are visible. Yield losses can be as much as 30 percent in the U.S. Crop rotation is an effective management practice. Resistant varieties also are available.



Figure 4. Underside of soybean leaf with soybean rust pustules present.



Figure 5. Soybean canopy with severe rust development.

Soybean rust (Figures 4 and 5): Soybean rust begins in the lower canopy as small lesions. Lesions can be reddish-brown or tan in color and are surrounded by chlorotic halos in some varieties. On the lower side of the leaf, mature lesions will have a raised volcano-like pustule where spores are released. In the southern U.S., soybean rust has caused yield losses up to 30 percent. However, in Brazil soybean rust can reduce yields by as much as 80 percent. There is no genetic resistance to soybean rust available in current soybean varieties. Currently, the only management strategy available to manage soybean rust is timely fungicide applications. Soybean rust overwinters on living plants in Gulf states and Central America and has to spread north each year. Producers and crop managers can observe the spread of soybean rust during

the growing season at with the National Soybean Rust Web site (www.sbrusa.net).

Disease Control

Many foliar fungal diseases on soybean have similar life cycles, which means controlling one disease may help control other diseases. For example, most of the disease-causing organisms discussed here produce spores that overwinter in soybean residue. If crop rotation is used to manage frogeye leaf spot, incidence of brown spot also will be reduced the next time soybeans are grown in the field. Please refer to *Table I* for disease response to specific management practices.

Crop Rotation: Crop rotation, rotating to a non-host crop after soybeans, will interrupt the life cycle of the fungus and reduce the amount of inoculum in the field for the next soybean crop.

Tillage: Tillage after harvest will bury fungal infested residue that will break down more rapidly with soil contact.

Variety Selection: Many seed companies screen their genetic lines against specific diseases. Planting a variety resistant to a disease may greatly reduce potential yield losses. Ask your seed company representative for information concerning disease resistance in their varieties.

Table I. Recommended control methods for foliar fungal diseases.

	Control Method			
	Crop Rotation	Tillage	Variety Selection	Fungicide*
Brown spot	YES	YES	NO	YES
Cercospora blight	YES	YES	YES	YES
Frogeye leaf spot	YES	YES	YES	YES
Soybean rust	NO	NO	NO	YES

*Please follow fungicide label for appropriate rates and timings of product for effective control of each specific disease.

Fungicide Selection: These diseases do not typically cause an economic yield loss with the exception of soybean rust. However, each is capable of reducing yield when conditions for disease development are favorable. When market prices are higher, preventing small yield losses with a fungicide application may increase profitability. Two families of fungicides are primarily used for foliar disease control

in soybeans in Nebraska. Strobilurin fungicides are most effective when they are applied before infection takes place or at the very early stages of disease development. Triazole fungicides can be applied after infection takes place but are most effective when applied at early stages of disease development.

Some fungicides contain both a strobilurin and triazole product in the active ingredients. These products are useful for broad spectrum disease control and help reduce the probability of the development of resistance to a particular class (or family) of fungicides. Please refer to *Table II* for efficacy information regarding different products on specific foliar diseases.

Many product labels recommend beginning fungicide application no earlier than the R1 (beginning flower) growth stage. In Nebraska, foliar diseases typically do not become a problem until the R3 (beginning pod) growth stage. Final applications should not be made any later than the R6 (full seed) growth stage because it violates the pre-harvest interval for many fungicides and yield typically cannot be regained at this growth stage. Yield loss caused by foliar diseases primarily occurs from premature leaf drop, reducing photosynthetic area and the amount of material the plant can produce to form grain. It will do little good to apply a fungicide after R6 because leaves begin to drop at that stage naturally.

Fungicide placement is critical when controlling diseases in the lower canopy. It is generally recommended to use a spray nozzle and pressure combination that produces medium to fine droplets. In contrast, herbicides work best using larger droplets. Large droplets do not penetrate the canopy as well as smaller droplets. Therefore, the nozzle and pressure combination used for herbicides should not be used when applying fungicides. Some spray nozzle manufacturers have developed special nozzles for controlling soybean rust. These nozzles also work well for other foliar diseases.

It is important to follow fungicide label guidelines. Some fungicides currently on the market can only be used for soybean rust control. Many Section 18 labels in Nebraska are either expiring or being converted into full Section 3 labels. Section 3 labels allow use on other soybean diseases in addition to soybean rust. Since the guidelines in product labels and their supplemental labels may change frequently, it is important to always consult the label before purchasing and applying fungicides.

Table II. Relative efficacies of fungicides on foliar diseases that may occur in Nebraska.

<i>Product</i>	<i>Fungicide Class</i>	<i>Fungicide Active Ingredient</i>	<i>Rate/A^w</i>	<i>Brown spot (Septoria glycines)^x</i>	<i>Cercospora blight (Cercospora kikuchii)^x</i>	<i>Frogeye leaf spot (Cercospora sojina)^x</i>	<i>Soybean rust (Phakopsora pachyrhizi)^x</i>
Headline 2 EC	Strobilurin	Pyraclostrobin	6 fl oz.	G ^y	VG	E	VG
Quadris 2 SC	Strobilurin	Azoxystrobin	6-9 fl oz.	F	G	VG	E
Domark 230 ME	Triazole	Tetraconazole	4-5 fl oz.	NR	—	VG	E
Folicur 3.6 F ^z	Triazole	Tebuconazole	4 fl oz.	F	G	G	VG
Laredo 2 EC	Triazole	Myclobutanil	7-8 fl oz.	NR	F	F	E
Punch EC ^z	Triazole	Flusilazole	4 fl oz.	NR	G	VG	E
Topguard 1.25 SC ^z	Triazole	Flutriafol	7 fl oz.	F	VG	G	E
Quilt	Strobilurin + Triazole	Azoxystrobin + Propiconazole	14 fl oz.	G	G	VG	VG
Stratego 2 EC	Strobilurin + Triazole	Trifloxystrobin + Propiconazole	7-10 fl oz.	NR	F	VG	VG

^wAlways consult the pesticide label for appropriate rates and timings of application.

^xData from 5 trials in Indiana, Ohio, Oklahoma, North Dakota, and Mississippi (brown spot); 7 trials in Virginia, Louisiana, and Alabama (Cercospora blight); 8 trials in Louisiana, Mississippi, Virginia, Indiana, and Georgia (frogeye leaf spot); 13 trials in Louisiana, Georgia, Alabama, and Florida (soybean rust).

^yRating of product efficacy: NR = Not Recommended; F = Fair; G = Good; VG = Very Good; E = Excellent; — = No data.

^zCurrently, these products have Section 18 Exemptions for soybean rust **only**. They cannot be used to control a foliar soybean disease **other than** soybean rust in the state of Nebraska. As of Nov. 10, 2007 Folicur has no Section 18 or Section 3 label in Nebraska and **cannot** be used for application on soybeans.

This publication has been peer reviewed.

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