WWW.MSSOY.ORG ⇒ MSPB WEBSITE WITH UP-TO-DATE SOYBEAN PRODUCTION INFORMATION

GUIDELINES AND RESOURCES FOR MANAGING SOYBEAN DISEASES

Diseases can and do cause economic losses in midsouthern U.S. soybeans. Until the early 2000's, many diseases could only be managed with resistant varieties or with cultural practices that were marginally effective. Fortunately, there are now preventive and/or curative management practices available for most major diseases of soybeans. A list of soybean diseases and how they can be managed, prevented, or controlled is shown in **Table 1**.

Several important diseases [sudden death syndrome (SDS), stem canker, Phytophthora root rot (PRR), charcoal rot, seed and seedling diseases] of soybeans have no curative control; i.e., these diseases may be prevented but not cured once present. SDS and stem canker can be managed or avoided by using less-susceptible or resistant varieties, or rotation to a non-host crop in a field that has a history of a problematic infestation by one of these diseases. PRR can be managed by using resistant varieties. However, PRR appears to be a relatively rare disease and typically only occurs on clay soils that hold excessive water when saturated or near-saturated.

Seed and seedling diseases [caused by numerous fungi that likely comprise a "complex" of fungi that includes but is not limited to *Cercospora, Fusarium, Phomopsis, Pythium, Phytophthora,* and *Rhizoctonia*] can be effectively prevented by using the proper fungicide seed treatment. However, this is not to suggest that they will be eliminated with the use of a properly labeled seed treatment. The environment at time of planting or shortly thereafter dictates whether or not a seedling disease will occur.

There are no known resistant varieties [only moderately resistant germplasm and some tolerant varieties] or fungicides for charcoal rot management. Additionally, it is likely that the majority of germinating seed are infected with the causal organism [*Macrophomina phaseolina*] shortly after the cotyledon emerges from the planted seed. Charcoal rot will manifest itself in infected plants if and when a condition such as drought or poor irrigation management causes stress to plants. Thus, it is the disease that is presently considered one of the most problematic.

Foliar fungicides can be applied to prevent several prominent soybean diseases. Preventive fungicides [i.e. strobilurins (QoIs) such as azoxystrobin (Quadris) or pyraclostrobin (Headline)] are most effective when applied prior to or at the earliest appearance of a disease. The general recommendation is that the first application of a foliar fungicide should be made at R3 or beginning of podset even if diseases are not present. Fungicide application during early reproductive development to prevent foliar diseases in soybeans has been proven over the past decade to be an economical management practice in the midsouthern U.S. However, resistance to some classes of fungicides has developed in some fungal species, which makes the practice of the automatic application even when targeted fungal species are absent an untenable practice.

Soybean rust can be managed with preventive and curative–i.e. triazoles [demethylation inhibitors (DMI) such as flutriafol (Topguard) or tetraconazole (Domark)] –applications of foliar fungicides timed according to occurrence of rust in soybean-growing areas. Based on past experience, soybean rust may be avoided in the Midsouth by planting early-maturing varieties early so that R6 or full seed stage is reached before August 1. Additionally, the R3/R4 fungicide application utilized in Midsouth production systems has likely provided some prevention of soybean rust in areas where the disease has occurred. Click here for a map that shows the occurrence of soybean rust in the soybean-producing regions of the U.S. Keep in mind that there is no longer an official soybean rust monitoring program, and that soybean sentinel plots to detect rust occurrence in Mississippi are no longer in place. Most scouting for rust occurrence is being done at random, and most states no longer have a designated person to monitor the presence of this disease.

Scouting should be used to detect the first occurrence of disease(s) or to accurately determine the reproductive stage recommended for the most effective application of a preventive fungicide prior to disease presence. A May 2016 Plant Management Network [PMN] webinar titled "Integrated Approaches to Fungicide Applications in Soybean" by Dr. Hillary L. Mehl of Virginia Tech Univ. provides coverage of the when's and how's of scouting for foliar diseases.

Click here for the "Mississippi Soybean Scouting Guide" on this website. This reference provides guidance on scouting practices, details about common disease and nematode pests of soybeans, and information that will help identify and treat disease problems that occur in Midsouth soybean fields.

Cost and effectiveness of fungicide products should be evaluated when choosing options for disease management. Resistant varieties should be chosen based on level of pest tolerance and yield when grown in areas with a known history of a particular disease [e.g. frogeye leaf spot (FLS)]. Information in **Table 1** provides a summary of the important points for managing prominent soybean foliar diseases.

Recent surveys indicate that losses to several of the diseases in **Table 1** are significant in most years. However, some portion of the losses to these diseases can be prevented every year if available controls are used. Keep in mind that the manifestation of plant diseases will be most dependent on the environment that is encountered each growing season as well as the over-wintering potential for organisms such as the soybean rust fungus that has to blow into the Midsouth soybean production area from more southern locations each year. Click here for an example of how conducive environmental conditions can affect the prevalence of a specific disease in soybeans.

To better assist in selecting foliar fungicides for control of diseases, the North Central Regional Committee on Soybean Diseases [NCERA-137] developed information about foliar fungicide efficacy for control of major foliar soybean diseases in the United States. Results from that compilation are in **Table 2**.

Specific considerations for soybean fungicide management are:

- An R3/R4 strobilurin or strobilurin + triazole fungicide application is made at this stage regardless of the presence of disease. This automatic application produces best results when applied in a potentially high-yielding soybean crop [e.g. early planted, irrigated soybean following soybean]. **However, this approach will hasten the development of fungicide resistance**.
- Applying a product that contains a stand-alone triazole should be delayed until foliar disease is present. Fungicides in this group should be relied on for managing against yield loss as a result of FLS or soybean rust infestations.
- Fungicides in the strobilurin class are best suited for use when diseases are not present; i.e., used on a preventive basis. The residual effect in this case should be about 21 days.
- Even though triazole fungicides have the ability of being curative and can be applied to manage a disease that is present, they perform best when applied prior to the onset of visible disease symptoms. Their residual effect generally lasts about 14 days.
- The systemic activity of both strobilurin and triazole fungicides is limited to movement around the area of the leaf where a spray droplet is deposited. Fungicides in both classes should not be considered to move throughout the plant from the point of entry.
- Growing varieties that are susceptible to FLS may increase the likelihood of developing fungicide-resistant FLS biotypes since fungicides will be the only option available for control of FLS in these susceptible varieties.

If an FLS-tolerant/resistant variety is grown, relying on a stand-alone strobilurin fungicide is an acceptable practice to manage other diseases or as an automatic fungicide application.

- If an FLS-susceptible variety is grown and FLS has been detected, applying a labeled triazole fungicide could reduce yield loss.
- With the onset of strobilurin-resistant FLS, triazoles should be considered to manage the disease.

Dr. Heather Kelly with UT Extension posted Scouting for Soybean Diseases and Deciding on Fungicides on the UTcrops.com website. She has also published a Soybean Disease and Nematode Identification Guide that is available from UT Extension. This guide describes soybean disease symptoms [with accompanying pictures] and management options for those diseases. Dr. Kelly has also posted a soybean disease photo gallery, and has designed an online interactive soybean disease management guide that includes videos to help with identifying symptoms of the various diseases that affect soybeans.

Drs. Faske, Kirkpatrick, Zhou, and Tzanetakis of the Univ. of Ark. Division of Agriculture, Research and Extension, published Soybean Diseases, a thorough guide to identification and management of diseases that affect soybean.

PMN's Soybean Fungicide Resistance Hub is a central destination for information on soybean fungicide use and management practices that should be considered to ensure the prolonged effectiveness of present and forthcoming fungicide products. The hub includes a "Featured Webcasts" section with open-access videos on fungicide resistance [FR] management, a "Fungicide Resistance Tracking" section with maps of yearly distribution of FR plant diseases, and a "Fungicide Resistance Resources" section which contains information on FR management in soybean.

The United Soybean Board [USB] has provided a fungicide classification chart, and the FRAC code and mode of action of soybean fungicides has been compiled by the Fungicide Resistance Action Committee [FRAC]. Fungicide Resistance in the Cercospora Leaf Blight and Purple Seed Stain Pathogen of Soybean is a PMN webcast presented by Dr. Trey Price with the LSU AgCenter. In his presentation, Dr. Price discusses the symptoms of the disease caused by the *Cercospora kikuchii* pathogen, and how the symptoms are

manifested in the foliar and mature seed stages. Severe infections in soybean can result in defoliation [Cercospora leaf blight–CLB] and poor seed quality [purple seed stain] that will result in dockage at the elevator. He also shows how fungicide efficacy against this pathogen has declined over the years to the point that the various classes of fungicides that are available now provide only limited efficacy against the pathogen, and no yield protection. Finally, he states that control measures for CLB consist of choosing tolerant varieties based on ratings taken in field trials, and early planting.

Principles of Fungicide Resistance is a PMN webcast authored by Dr. Carl Bradley [Univ. Of Kentucky], Dr. Clayton Hollier [LSU AgCenter], and Dr. Heather Kelly [UT Extension]. The authors define fungicide resistance and describe how disease resistance to fungicides develops followed by the subsequent loss of fungicide efficacy. They also discuss factors that affect FR development in fungal pathogens. They show the primary chemical classes of fungicides commonly applied to soybean, and how the FRAC code can be used to distinguish these different fungicide classes as well as determine the risk level of FR developing to each of the fungicide groups [**Table 3 below**]. And finally, they present management practices that will prevent or delay FR development in order to retain fungicide efficacy over a long period of time.

Dr. Tom Allen, Extension Plant Pathologist at MSU-DREC, posted an article titled "Navigating Fungicide Active Ingredients" on the MCS blog site in June 2017. The article contains information about fungicide products in FRAC Codes 11 [QoI fungicides], 3 [DMI or triazole fungicides], 7 [SDHI fungicides], and 1[MBC fungicides] that are marketed for soybeans. The article contains a link to a table that provides guidance for selecting fungicides for automatic applications or applications that are made to protect plants when a particular disease is detected in a given soybean field. These two resources are combined into one document that can be accessed here.

With the advent of auxin herbicides being applied to auxin herbicide-tolerant soybean, much has been written about the requirement that growers utilize drift-reduction nozzles to apply these herbicides. However, fungicide applications typically have been applied with nozzles that produce fine-sized droplets to provide greater coverage. In a "Focus on Soybean" webcast, Mr. Shawn Butler at the Univ. of Tennessee discusses "Droplet Size Effects on Foliar Fungicide Efficacy in Soybean". In his presentation based on both small- and field-scale experiments, Mr. Butler talks about the need to balance issues related to drift reduction with issues related to fungicide efficacy. The following points are highlighted from his presentation.

- Use the fungicide label to select the nozzle type that will provide the recommended coverage of the applied product.
- Droplet size should be geared toward whether or not an applied fungicide functions by contact or systemic mechanisms.
- Droplet size should be geared toward providing the best potential coverage based on the location of the pathogen and its effect in the soybean canopy–i.e. is the major presence and effect of the pathogen in the upper or lower plant canopy.
- Systemic fungicide effect on FLS was not significantly affected by droplet sizes used in the studies discussed in the presentation.

Table 1. Major midsouthern soybean diseases and potential methods of management.

Disease*	Varietal resistance	Foliar Fung.**	Additional information
Anthracnose	No	Yes	Use seed treatment to reduce damping off.
Soybean rust	Yes	Yes	Resistant germplasm has been identified; however, there are presently only a few commercially-available soybean varieties with such resistance.
Cercospora leaf blight, purple seed stain	No	Yes	Use seed treatment to reduce early season damping off. Foliar fungicides not very efficacious and provide no yield protection; where severe in late season, this disease will accelerate maturation, thus reducing pod fill and seed quality.
Charcoal rot	No	No	Prevent/reduce plant stress; some tolerant varieties may be commercially available.
Frogeye leaf spot [FLS]	Yes	Yes	Plant resistant varieties. Resistance to strobilurin fungicides is now widespread. Rotate fungicide chemistries and apply mixed mode of action products to susceptible varieties.
Phytophthora root rot	Yes	No	Use seed treatment [early season].
Phomopsis seed decay [PSD]	No	Yes	Use seed treatment to prevent early season seedling disease as a result of *Phomopsis*-infested seed
Pod and stem blight	Yes	Yes	Fungicides, although labeled, may not be as effective.
Pythium seed decay, damping off	No	No	Use seed treatment.
Aerial blight	No	Yes	Use less-susceptible varieties if available.
Southern Blight	No	No	All soybean varieties are susceptible. Rotation with grain crops [corn, grain sorghum, wheat] for 2 years can reduce fungal population in soil. Disease development is favored by hot humid conditions. This is usually a minor disease.
Stem canker	Yes	No	Varietal resistance is very effective.
Sudden death syndrome	Yes	No	Use less-susceptible varieties. Monitor for the presence of soybean cyst nematode [SCN]. Use labeled seed treatment for early-season control.
Septoria brown spot	No	Yes	Minimize crop residue, and plant less susceptible varieties. Use a seed seed treatment for early-season control. A variable yield response to foliar fungicide application is likely. Where severe in late season, this disease will accelerate maturation, thus reducing pod fill and seed quality.
Taproot decline	Maybe	??	Management/control measures are being developed for this newly-identified disease.
Target Spot	Yes	No	Foliar fungicide use is not economical or of unknown efficacy.

*Click on each disease in Referenced Items section of this resource to find details about that disease.
**Click here [Univ. of Ark. MP154] for list of fungicides that control indicated diseases in this table.
Click here for Crop Protection Network publication library to access additional articles about soybean diseases.

Table 2. Fungicide efficacy for soybean disease management [Crop Protection Network–2024]. NR = not recommended; NL = not labeled; P = poor; F = fair; G = good; VG = very good; E = excellent; U = unknown; L = control indicated on label. Check product label for company information about diseases controlled by each product.

Product	Rate/acre [fl. oz.]	FRAC code	Class–mode of action	Aerial web blight	Anthrac-nose	Cercospora leaf blight	Frogeye leaf spot	Brown spot	Target spot	Pod/stem blight	Soybean rust	PHI*
Aftershock 480 SC, Evito 480SC	2.0-5.7	11	Strobilurins-QoI	VG	G	P	P	P-G	U	U	U	R5-30 d
Aproach 2.08 SC	6.0-12.0	11		VG	G	P	P	P-G	U	U	G	14 days
Headline 2.09 EC/SC	6.0-12.0	11		VG	VG	P	P	P-G	P-F	U	VG	21 days
Quadris 2.08 SC, multiple generics	6.0-15.5	11		VG	VG	P	P	P-G	P-F	U	G-VG	14 days
Endura 0.7 DF	3.5-11.0	7	SDHI	U	NL	U	P	VG	U	NL	NL	21 days
Alto 100SL	2.75-5.5	3	Triazoles-DMI	U	U	F	F	VG	U	U	VG	30 days
Domark 230 ME, multiple generics	4.0-5.0	3		NL	VG	P-G	F-G	VG	P	U	VG-E	R5
Proline 480 SC	2.5-5.0	3		NL	NL	NL	G-VG	NL	U	NL	VG	21 days
Tilt 3.6 EC, multiple generics	4.0-6.0	3		P	VG	NL	F	G	U	NL	VG	R5
Topguard 1.04 SC	7.0-14.0	3		U	VG	P-G	G-VG	VG	P	U	VG-E	21 days
Topsin-M, multiple generics	10.0-20.0	1	Thiophanates-MBC	U	U	F	VG	U	U	U	G	21 days
Acropolis	20.0-23.0	1+3		NL	U	U	VG	U	U	U	E	R5
Affiance 1.5 SC	10.0-14.0	3+11		U	VG	F	F-G	VG	P	U	U	R5-14 d
Aproach Prima 2.34 SC	5.0-6.8	3+11		VG	U	P-G	F-G	G	F-G	U	VG-E	14 days
Delaro 325 SC	8.0-11.0	3+11		VG	U	U	G-VG	VG	NL	U	U	21 days
Veltyma	7.0-10.0	3+11		L	L	L	G-VG	L	U	L	L	21 days
Delaro Complete 380 SC	8.0-11.0	3+7+11		U	U	U	U	VG	NL	U	U	21 days
Fortix SC, Preemptor SC	4.0-6.0	3+11		U	U	P-G	G-VG	G-VG	P	U	U	R5
Zolera FX 3.34 SC	4.4-6.8	3+11		U	U	U	F-G	U	U	U	U	R5-30 d
Lucento 4.17SC	3.0-5.5	3+7		VG	U	F-G	VG	VG	F-G	U	VG-E	21 days
Priaxor 4.17 SC	4.0-8.0	7+11		E	VG	P-G	P-F	G-VG	F-G	U	VG-E	21 days
Priaxor D [A + B]**	4.0 A and B	3+7+11		VG	U	P-G	F-G	VG	F-G	G	VG-E	R5-21 d
Quadris Top 2.72 SC	8.0-14.0	3+11		U	U	P-G	VG	G-VG	P	F-G	VG	14 days
Quadris Top SBX 3.76SC	7.0-7.5	3+11		VG	U	P-G	VG	G-VG	F-G	F-G	VG	14 days
Quilt 1.66 SC, multiple generics	14.0-20.5	3+11		U	U	F	F	G	P	U	VG	21 days
Quilt Xcel 2.2 SE	10.5-21.0	3+11		E	VG	F	F	G	P	U	VG	R6
Stratego YLD 4.18 SC	4.0-4.6	3+11		VG	VG	F	F-G	G	P	U	VG	21 days
Topguard EQ 4.29 SC	5.0-7.0	3+11		VG	U	U	G-VG	VG	P	U	E	21 days
Miravis Top 1.67SC	13.7	3+7		VG	U	F-G	VG	VG	F-G	G	NL	14 days
Revylok	4.5-6.5	3+7										21 days
Trivapro	13.7-20.7	3+7+11		E	U	P-G	F-G	G-VG	U	G	VG-E	R6-14 d
Revytek	8.0-15.0	3+7+11		VG	U	F-VG	VG	VG	F-VG	U	E	21 days

*PHI = pre-harvest interval in days, or no later than shown R stage. **Priaxor D is a combination product that includes: Component A = Priaxor and Component B = Domark. One case of Priaxor D contains a 2.5-gal. jug each of Priaxor and Domark. Labels for above fungicides can be found on the CDMS Labels site.

Table 3. FRAC determination of risk level of fungicide resistance development to commonly used fungicide groups applied as foliar fungicides to soybean.

FRAC code	Fungicide Group	Risk of Resistance Development
1	Methyl benzimidazole carbamates [MBC]	High
3	Dimethylation inhibitors [DMI, includes triazoles]	Medium
7	Succinate dehydrogenase inhibitors [SDHI]	Medium to High
11	Quinone outside inhibitors [QoI, includes strobilurins]	High
M5	Chloronitriles	Low

Research of Measures to Control Frogeye Leaf Spot in Soybeans

According to recent surveys that were conducted to estimate prevalence of soybean diseases, FLS is a foliar disease that has resulted in significant soybean yield loss in past years in the Midsouth. FLS resistance to the quinone outside inhibitor [QoI] or strobilurin group of fungicides [FRAC code 11] is an increasing problem in the Midsouth soybean sector. This has rendered this fungicide class mostly ineffective as a viable management tool for FLS in southern U.S. soybeans. Click here for an article that provides results from research that shows how widespread the FLS resistance is throughout the US soybean-producing states.

The pathogen responsible for FLS, *Cercospora sojina*, is known to overwinter in crop residue. Thus, the practice of burying plant residues by tillage has been promoted for decades to assist in the control of FLS in soybean.

The major shift away from tillage–i.e. increasing use of no-till systems–has likely contributed to the increased prevalence and severity of FLS in soybean, and this has resulted in an increased reliance on foliar fungicides to protect yield when damaging populations of this pathogen are present. Thus, several studies have been conducted in recent years to determine/elucidate effective control measures for this disease. A summary of results from those studies follow.

Dr. Heather Kelly presents summary results in **Table 4** from 2013-2015 FLS field trials using FLS-susceptible varieties. It was determined from these data that there is a strong correlation between percent FLS control and seed yield [R^2 = 0.8923] [Kelly, UTcrops.com, July 2016].

Table 4. Results from 2013-2015 FLS field trials in West Tenn. using FLS-susceptible varieties [Kelly, UTcrops.com, July 2016].

Fungicide [FRAC code]	Rate [fl oz/acre]	% FLS Control*	Yield [bu/acre]
Stratego YLD [3+11]	4.65	55 a	52.3 a
Quadris Top SB [3+11]	8	52 a	51.5 a
Aproach Prima [3+11]	6.8	62 a	51.3 ab
Overrule or Topsin XTR [1+3]	20	59 a	51.1 ab
Priaxor + Domark [3+7+11]	4 + 4	62 a	50.9 ab
Topsin [1]	20	45 a	49.2 ab
Topguard [3]	7	47 a	48.9 ab
Priaxor [7+11]	4	32 b	48.3 abc
Headline [11]	6	22 b	47.8 abc
Bravo [M5]	6	23 b	46.2 bc
Non-treated	---	0	44.5 c
P-value		<0.0001	0.0337

*Treatment values followed by the same letter are not significantly different. Values are weighted by FLS severity in non-treated. All products were tested in 4-row-wide plots that were 30 ft long in randomized plots with 4 replicates in all years at a total of 10 locations with the exception of Priaxor + Domark [tested 2 years at 6 locations], Priaxor [tested 2 years at 8 locations], and Stratego YLD [tested 2 years at 3 locations].

From 2014-2016, a group of scientists conducted studies in West Tenn. to measure FLS severity and soybean yield under tilled and no-till cultivation with and without applications of six different fungicides applied at stages R3 and R5. Results from that study titled "Quantifying the effects of fungicides and tillage on *Cercospora sojina* severity and yield of soybean" by Mengistu et al. are reported in Plant Health Progress, Vol. 19, No. 3, p. 226. Major points from that article follow.

- The objective of the study was to measure FLS severity and soybean yield under tilled and no-till cultivation with and without applications of foliar fungicides.
- Soybean variety Asgrow 4832 that is susceptible to FLS was used in all 3 years of the study.
- The recommended rate of six different fungicides labeled for FLS control was applied at the R3 and R5 growth stages each year. The product name, active ingredient, group name, and FRAC code are shown in **Table 5.**
- Disease severity was recorded weekly from the first appearance of FLS to the last rating period. Maximum FLS severity was used to calculate disease control as [(untreated – treated)/untreated] x 100.
- There was no tillage effect on maximum FLS severity or yield, which indicates that tillage to bury residue was not effective in controlling FLS in this study.

Table 5. Foliar fungicides applied at R3 and R5.

Product Name	Active Ingredient	Fungicide group name	FRAC code
Bravo Weather Stik	Chlorothalonil	Chloronitrile	M5
Headline SC	Pyraclostrobin	QoI/strobilurin	11
Priaxor Xemium	Fluxapyroxad Pyraclostrobin	SDHI QoI/strobilurin	7 11
Quadris TOP SBX	Difenoconazole Azoxystrobin	DMI/triazole QoI/strobilurin	3 11
Topsin 4.5FL	Thiophanate-methyl	MBC thiophanate	1
Topguard	Flutriafol	DMI/triazole	3

Fungicide significantly affected FLS control (**Table 6**].

Table 6. Percentage frogeye leaf spot [FLS] control* based on the maximum disease severity index {calculated as [(untreated-treated]/untreated] x 100} [From Mengistu et al., PHP, Vol. 19, No. 3, p. 226].

Fungicide [FRAC code]	2014	2015	2016	Average
Bravo [M5]	45 b	24 b	22 b	30
Headline SC [11]	50 b	14 a	18 b	27
Priaxor Xemium [7+11]	75 c	43 c	47 c	55
Quadris TOP SBX [3+11]	95 c	67 d	51 c	71
Topsin [1]	85 c	62 d	73 d	73
Topguard [3]	90 c	81 c	76 d	82

*Treatment values followed by the same letter are not significantly different.

- Both Headline SC [FRAC code 11] and Bravo Weather Stik [FRAC code M5] provided poor FLS control [<30%] every year compared to other fungicide treatments.
- Quadris TOP SBX [FRAC codes 3+11], Topsin [FRAC code 1], and Topguard [FRAC code 3] provided the best disease control [>70%] across the 3 years.

Fungicide significantly affected yield [**Table 7**].

Table 7. Percentage yield increase of Asgrow 4832 soybean protected from frogeye leaf spot [FLS] as a result of application of indicated fungicides in indicated years in West Tenn. experiments {calculated as [(treated-untreated)/treated] x 100} [From Mengistu et al., PHP, 2018, Vol. 19, No. 3, p. 226].

Fungicide [FRAC code]	2014	2015	2016	Average
Bravo [M5]	4%	10%	9%	8%
Headline SC [11]	11%	7%	14%	11%
Priaxor Xemium [7+11]	17%	6%	13%	12%
Quadris TOP SBX [3+11]	18%	15%	16%	16%
Topsin [1]	20%	16%	15%	17%
Topguard [3]	16%	10%	13%	13%

Across the three years of the study, Quadris TOP SBX [FRAC codes 3+11] and Topsin [FRAC code 1] fungicides provided the consistently greatest yield protection. Yields resulting from these treatments were 15-20% greater than those from the untreated check treatments that ranged from 49-50.5 bu/acre. Thus, these results indicate that these two fungicides may be used to protect soybean yield from the QoI-resistant strains of *Cercospora sojina*.

Take-Home Message from Above Research Results

- Using Topsin [MBC group–FRAC code 1] alone for FLS control is a high-risk practice since the potential for resistance development to this group of fungicides is high [see **Table 3** above]. Thus, mixing Topsin with a fungicide from another group with a different mode of action [such as DMI (Group 3) with medium risk of resistance development] is recommended.
- Control of FLS can be achieved by using selected fungicides with multiple modes of action. Click here for results from 2018 evaluations in Iowa that verify this with available fungicides.
- Combination fungicide products are the most effective in controlling FLS and protecting yield. Long-term use of fungicides with the same modes of action may result in selection for FR.
- To lower the risk of FR development in the FLS pathogen, using effective fungicides should be coupled with selecting soybean varieties that have a significant level of resistance to the pathogen.

Composed by Larry G. Heatherly, Revised/Updated Nov. 2024, larryh91746@gmail.com