

# DETERMINING FUNGICIDE EFFICACY

Efficacy Ratings for Common Soybean Seed Treatments and Foliar Fungicides



Plant pathologists from across the United States developed ratings for how well fungicide seed treatments control soybean seedling diseases and how well foliar fungicides control major foliar soybean diseases in the U.S. Efficacy ratings for each fungicide and fungicide active ingredient listed in the table were determined by field testing the materials over multiple years and locations. Each rating is based on the fungicide's level of disease control, and does not necessarily reflect efficacy of fungicide active ingredient combinations and/or yield increases obtained from applying the active ingredient. A number of different *Pythium* and *Fusarium* species affect seed and seedling health in soybean. Therefore, wide ranges in efficacy may be observed in active ingredients in the table. **Efficacy depends upon proper application timing, rate and application method to achieve optimum effectiveness of the fungicide as determined by labeled instructions and overall level of disease in the field at the time of application.**

The list includes the most widely marketed products available. It is not intended to be a list of all labeled active ingredients and products. Additional active ingredients may be available, but have not been evaluated in a manner allowing a rating. Products listed are the most common products available as of the release date of the table; all available products may not be listed. Additional active ingredients may be included in some products for insect and nematode control; however, only active ingredients for pathogen control are listed and rated.

## FUNGICIDE SEED TREATMENT EFFICACY FOR CONTROL OF SOYBEAN SEEDLING DISEASES

Fungicide Active Ingredient	<i>Pythium</i> Sp. <sup>1</sup>	Phytophthora Root Rot	<i>Rhizoctonia</i> Sp.	<i>Fusarium</i> Sp. <sup>1,3</sup>	Sudden Death Syndrome ( <i>Fusarium virguliforme</i> )	<i>Phomopsis</i> Sp.
Azoxystrobin	P-G	NS	VG	F-G	NR	P
Carboxin	U	U	G	U	NR	U
Ethaboxam	E	E	NR	NR	NR	NR
Fludioxonil	NR	NR	G	F-VG	NR	G
Fluopyram	NR	NR	NR	NR	VG	NR
Fluxapyroxad	U	U	E	G	NR	G
Ipconazole	P	NR	F-G	F-E	NR	G
Mefenoxam	E <sup>2</sup>	E	NR	NR	NR	NR
Metalaxyl	E <sup>2</sup>	E	NR	NR	NR	NR
Oxathioprolin	P-G	E	NR	NR	NR	NR
PCNB	NR	NR	G	U	NR	G
Penflufen	NR	NR	G	G	NR	G
Prothioconazole	NR	NR	G	G	NR	G
Pyraclostrobin	P-G	NR	F-G	F	NR	G
Sedaxane	NR	NR	E	NS	NR	G
Thiabendazole	NR	NR	NS	NS	P	G
Trifloxystrobin	P	P	F-E	F-G	NR	P-F

<sup>1</sup>Products may vary in efficacy against different *Fusarium* and *Pythium* species.

<sup>2</sup>Areas with mefenoxam- or metalaxyl-insensitive populations may see less efficacy with these products.

<sup>3</sup>Listed seed treatments do not have efficacy against *Fusarium virguliforme*, causal agent of sudden death syndrome.

**Efficacy categories:** P = Poor. F = Fair. G = Good. VG = Very Good. E = Excellent. NS = Not Specified on product label. NR = Not Recommended. U = Unknown efficacy or insufficient data to rank product.

Please note: Efficacy ratings may be dependent on the rate of the fungicide product on seed.

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Product/Trade Name	Active Ingredient
Acceleron®	DX-612 Fluxapyroxad DX-309 Metalaxyl DX-109 Pyraclostrobin
Allegiance® FL	Metalaxyl
Allegiance® LS	Metalaxyl
Apron XL® LS	Mefenoxam
ApronMaxx® RFC	Fludioxonil Mefenoxam
ApronMaxx® RTA	Fludioxonil Mefenoxam
CruiserMaxx®	Fludioxonil Mefenoxam
Cruiser Maxx® Advanced or Cruiser Maxx® Plus	Fludioxonil Mefenoxam
CruiserMaxx® Vibrance or CruiserMaxx® Vibrance Trio	Fludioxonil Mefenoxam Sedaxane
Dynasty®	Azoxystrobin
EverGol® Energy SB	Metalaxyl Penflufen Prothioconazole
ILeVO®	Fluopyram
Inovate® Pro	Ipconazole Metalaxyl
Intego®	Ethaboxam
Lumisena®	Oxathioprolin Metalaxyl
Maxim® 4FS	Fludioxonil
Mertect® 340F	Thiabendazole
Prevail®	Carboxin Metalaxyl PCNB
Trilex® 2000	Metalaxyl Trifloxystrobin
Vibrance®	Sedaxane
Warden® CX	Fludioxonil Mefenoxam Sedaxane
Warden® RTA	Fludioxonil Mefenoxam

CLASS	FUNGICIDE(S)			FOLIAR DISEASES									
	Active Ingredient (%)	Product/Trade Name	Rate/Acre (fl. oz.)	Aerial Web Blight	Anthracnose	Brown Spot <sup>1</sup>	Cercospora Leaf Blight <sup>2</sup>	Frogeye Leaf Spot <sup>3</sup>	Diaporthe (Pod and Stem Blight)	Soybean Rust	Target Spot	White Mold <sup>4</sup>	Harvest Restriction <sup>5</sup>
Mixed Mode of Action (continued)	Pyraclostrobin 28.58% Fluxapyroxad 14.33%	Priaxor® 4.17 SC	4.0 - 8.0	E	VG	G-VG	P-G	P-F	U	VG	F-G	P	21 days
	Pyraclostrobin 28.58% Fluxapyroxad 14.33% Tetraconazole 20.50%	Priaxor® D 4.17 SC 1.9 SC	4.0 (each component)	U	U	VG	P-G	G-VG	G	VG-E	U	P	21 days R5
	Trifloxystrobin 32.3% Prothioconazole 10.8%	Stratego® YLD 4.18 SC <sup>10</sup>	4.0 - 4.65	VG	VG	VG	F	F-G	U	VG	P	NL	21 days
	Tetraconazole 7.48% Azoxystrobin 9.35%	Affiance® 1.5 SC	10.0 - 14.0	U	VG	VG	F	G-VG	U	U	U	U	14 days R5
	Tetraconazole 17.76% Fluoxastrobin 17.76%	Zolera FX® 3.34 SC	4.4 - 6.8	U	U	U	U	G-VG	U	U	U	U	30 days R5
	Thiophan- atemethyl 21.3% Tetraconazole 4.2%	Acropolis®	20.0 - 23.0	NL	U	U	U	VG	U	VG-E	U	U	R5

**Efficacy categories:** P = Poor. F = Fair. G = Good. VG = Very Good. E = Excellent. NL = Not Labeled for use against this disease. NR = Not Recommended. U = Unknown efficacy or insufficient data to rank product.

<sup>1</sup>Qol fungicides may provide poor control in areas where there are Qol fungicide-resistant isolates of the brown spot pathogen.

<sup>2</sup>Cercospora leaf blight efficacy relies on accurate application timing, and standard R3 application timings may not provide adequate disease control. Fungicide efficacy may improve with later applications; however, efficacy has been inconsistent with some products. Fungicides with a solo or mixed Qol or MBC mode of action may not be effective in areas where Qol or MBC resistance has been detected in the fungal population that causes Cercospora leaf blight.

<sup>3</sup>In areas where Qol fungicide-resistant isolates of the frogeye leaf spot pathogen are not present, Qol fungicides may be more effective than indicated in this table.

<sup>4</sup>White mold efficacy is based on R1-R2 application timing, and lower efficacy is obtained at R3 or later application timings, or if disease symptoms are already present at the time of application.

<sup>5</sup>Harvest restrictions are listed for soybean harvested for grain. Restrictions may vary for other types of soybean (edamame, etc.) and soybean for other uses such as forage or fodder.

<sup>6</sup>Multiple generic products containing this mode of action may also be labeled in some states.

<sup>7</sup>Proline® has a supplemental label (2ee) for white mold in NY.

<sup>8</sup>Rating is based on two applications of a 9 fl. oz./acre rate of Aproach® at R1 and R3.

<sup>9</sup>Propulse® is not labeled for use on soybean in all states as of January 2018.

<sup>10</sup>Stratego® YLD has a supplemental label (2ee) for white mold on soybean only in IL, IN, IA, MI, MN, NE, ND, OH, SD and WI.

For more information and additional resources on fungicide-resistance management, visit [www.IWillTakeAction.com](http://www.IWillTakeAction.com).

Technical editing for this publication was led by Kiersten Wise, Ph.D., University of Kentucky. Many active ingredients and their products have specific use restrictions. Read and follow all use restrictions before fungicide use. This information is provided only as a guide. It is the applicator's and user's legal responsibility to read and follow all current label directions. Reference in this publication to any specific commercial product, process or service, or the use of any trade, firm or corporation name, is for general informational purposes only and does not constitute an endorsement, recommendation or certification of any kind by members of the United Soybean Board or Take Action's Fungicide-Resistance Management program. Individuals using such products assume responsibility for their use in accordance with current directions of the manufacturer.

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## FOLIAR FUNGICIDE EFFICACY FOR CONTROL OF FOLIAR SOYBEAN DISEASES

FUNGICIDE(S)		FOLIAR DISEASES											
CLASS	Active Ingredient (%)	Product/Trade Name	Rate/Acre (fl. oz.)	Aerial Web Blight	Anthraco-nose	Brown Spot <sup>1</sup>	Cercospora Leaf Blight <sup>2</sup>	Frogeye Leaf Spot <sup>3</sup>	Diaporthe (Pod and Stem Blight)	Soybean Rust	Target Spot	White Mold <sup>4</sup>	Harvest Restriction <sup>5</sup>
<b>GROUP 1</b> MBC Thiophanates	Thiophanate-methyl	Topsin-M <sup>®</sup> Multiple Generics	10.0 - 20.0	U	U	U	F	VG	U	G	U	F	21 days
	Cyproconazole 8.9%	Atto <sup>®</sup> 100SL	2.75 - 5.5	U	U	VG	F	F	U	VG	U	NL	30 days
<b>GROUP 3</b> DMI Triazoles	Flutriafol 11.8%	Topguard <sup>®</sup> 1.04 SC	7.0 - 14.0	U	VG	VG	P-G	VG	U	VG-E	P	F	21 days
	Propiconazole 41.8%	Tilt <sup>®</sup> 3.6 EC Multiple Generics <sup>4</sup>	4.0 - 6.0	P	VG	G	NL	F	NL	VG	U	NL	R5 (beginning seed)
	Prothioconazole 41.0%	Proline <sup>®</sup> 480 SC <sup>7</sup>	2.5 - 5.0	NL	NL	NL	NL	G-VG	NL	VG	U	F	21 days
	Tetraconazole 20.5%	Domark <sup>®</sup> 230 ME	4.0 - 5.0	NL	VG	VG	P-G	G-VG	U	VG-E	P	F	R5 (beginning seed)
<b>GROUP 7</b> SDHI Carboxamides	Azoxystrobin 25.3% Flutriafol 18.63%	Topguard <sup>®</sup> EQ 4.29SC	5.0 - 7.0	U	U	VG	U	G-VG	U	U	P	U	21 days
	Boscalid 70%	Endura <sup>®</sup> 0.7 DF	3.5 - 11.0	U	NL	VG	U	P	NL	NL	U	VG	21 days
<b>GROUP 11</b> QoI Strobilurins	Azoxystrobin 22.9%	Quadris <sup>®</sup> 2.08 SC Multiple Generics <sup>4</sup>	6.0 - 15.5	VG	VG	P-G	P	P	U	G-VG	P-F	P	14 days
	Fluoxastrobin 40.3%	Aftershock <sup>®</sup> 480 SC Evito <sup>®</sup> 480 SC	2.0 - 5.7	VG	G	P-G	P	P	U	U	U	NL	30 days R5 (beginning seed)
	Picoxystrobin	Aproach <sup>®</sup> 2.08 SC	6.0 - 12.0	VG	G	P-G	P	P	U	G	U	G-VG <sup>8</sup>	14 days
	Pyraclostrobin 23.6%	Headline <sup>®</sup> 2.09 EC/SC	6.0 - 12.0	VG	VG	P-G	P	P	U	VG	P-F	NL	21 days
<b>GROUP 29</b> 2,6-dinitro-anilines	Fluazinam 40.0%	Omega <sup>®</sup> 500 DF	0.75 - 1.0 pints	NL	NL	NL	NL	NL	NL	NL	U	G	R3 (beginning pod)

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<b>Mixed Mode of Action</b>	Azoxystrobin 18.2% Difenoconazole 11.4%	Quadris Top <sup>®</sup> 2.72 SC	8.0 - 14.0	U	U	G-VG	P-G	VG	F-G	VG	P	NL	14 days
	Azoxystrobin 19.8% Difenoconazole 19.8%	Quadris Top <sup>®</sup> SBX 3.76 SC	7.0 - 7.5	U	U	G-VG	P-G	VG	F-G	VG	F-G	U	14 days
	Azoxystrobin 7.0% Propiconazole 11.7%	Quilt <sup>®</sup> 1.66 SC Multiple Generics <sup>4</sup>	14.0 - 20.5	U	U	G	F	F	U	VG	U	NL	21 days
	Azoxystrobin 13.5% Propiconazole 11.7%	Quilt Xcel <sup>®</sup> 2.2 SE	10.5 - 21.0	E	VG	G	F	F	U	VG	P	NL	R6
	Benzovindiflupyr 2.9% Azoxystrobin 10.5% Propiconazole 11.9%	Trivapro <sup>®</sup>	13.7 - 20.7	E	U	VG	P-G	G	G	VG-E	U	NL	14 days R6
	Cyproconazole 7.17% Picoxystrobin 17.94%	Aproach <sup>®</sup> Prima 2.34 SC	5.0 - 6.8	U	U	G	P-G	F-G	U	VG	F-G	NL	14 days
	Fluopyram 17.4% Prothiconazole 17.4%	Propulse <sup>®</sup> 3.34 SC	6.0 - 10.2	NL	NL	U	NL	U	U	U	NL	G	21 days
	Flutriafol 26.47% Bixafen 15.5%	Lucento <sup>®</sup> 4.17 SC	3 - 5.5	U	U	VG	U	VG	U	U	U	U	21 days
	Flutriafol 19.3% Fluoxastrobin 14.84%	Fortix <sup>®</sup> SC Preemptor <sup>®</sup> SC	4.0 - 6.0	U	U	G-VG	P-G	VG	U	U	P	U	R5
	Prothioconazole 16.0% Trifloxystrobin 13.7%	Delaro <sup>®</sup> 325 SC	8.0 - 11.0	U	U	VG	U	G-VG	U	U	NL	NL	21 days
Pydiflumetofen 6.9% Difenoconazole 11.5%	Miravis Top <sup>®</sup> 1.67 SC	13.7	U	U	VG	P-G	VG	G	U	U	U	14 days	

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