

CORN, CEREALS, AND GRASSES GROWN FOR SEED:

Managing Crop Diseases with Fungicides

Kay Ruden Brad Ruden
 Research/Extension Associate Extension Associate
 Extension Plant Pathology
 South Dakota State University

Disease management in cereal grains requires a multi-faceted approach. Fungicides can be an effective strategy for disease management when other less costly options provide insufficient disease control.

Crop rotation and residue management are critical in dealing with residue-borne diseases such as tan spot and the Septoria complex on wheat, net blotch and spot blotch on barley, and similar diseases on oats and rye.

Rust diseases are not affected by rotation and tillage practices, so variety selection for host resistance and fungicides is an additional management approach.

The cost of fungicide application varies from a few dollars per acre for low rates of the least expensive products to nearly \$20 per acre for high rates of the most costly fungicide brands. Check your local dealer for prices that reflect your local market.

Typically, we expect that a 10–20% yield increase is attainable with a foliar fungicide application to small grains when diseases are present. Similar responses have been shown for leaf rust on wheat in South Dakota and for other diseases during epidemic years.

We can estimate the return from a fungicide application by considering the expected yield for the field in question, expected increase in yield (10–20%), and expected selling price to give an expected gross return in dollars per acre. The net return can be calculated by subtracting the product and application cost. Commercial ground application costs are about \$4.30 and aerial costs about \$5.75 in South Dakota, based on a statewide survey in 2004.

You will need to consider the number of applications. Repeated applications increase cost. In some no-till systems with frequent cropping of wheat in heavy residue, up to three applications (at seedling stage, flag leaf emergence, and flowering) may be considered. Typically, we do not see an economic return on three applications, but one or two treatments can be profitable.

A reduced rate is often applied at the seedling stage along with post emergence herbicides and a full rate as the flag leaf emerges. In recent years we also have been able to apply a full rate of a specifically labeled fungicide at flowering if there is a risk of Fusarium head blight or if we need to gain protection from late season rust. No products have full labeling for application at all growth stages, so you must know the label and its restrictions.

Expected yield (bu/A)	×	Expected yield increase (10–20%)	×	Expected selling price (\$/bu)	=	Expected Gross Return (\$/A)
Expected Gross Return (\$/A)	–	Fungicide and Application Costs (\$/A)	=	Expected Net Return (\$/A)		

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Early (or seedling) applications often do not offer as large a return as protection applied to the flag leaf. Seed treatments and seedling stage applications often return no more than 5% increase in yield, but they may delay epidemics of residue-borne diseases.

Seed treatments and seedling applications also may be more profitable in no-till or reduced tillage systems where there is a greater inoculum potential in the field due to increased residue.

Corn in South Dakota has shown best yield response when the fungicide is applied at about tasseling and before silks turn brown. This protects the ear leaf from any number of foliar diseases. Gray leaf spot appears to be the most damaging leaf disease of corn in South Dakota but only on susceptible hybrids.

If you are growing cereals and native grasses for seed, there generally will be greater benefit to treating these seed crops due to their higher market price and the potential to increase seed quality.

Following are the fungicides currently labeled for use in South Dakota. The list is dynamic and prone to frequent modification. Always check the list of products currently registered with the South Dakota Department of Agriculture for legality of use in the state.

Resistance to certain fungicides can develop as selection pressure is placed on the population of the fungal plant pathogens in the environment. We exert this selection pressure by frequent or repeated use of the same fungicide or a fungicide with the same mode of action, especially when repeating applications in the same growing season.

To manage the risk of fungicides losing effectiveness, adopt a fungicide resistance management strategy. Many factors can affect how rapidly resistance develops, but a general scheme is described.

To minimize the risk of developing fungicide resistance to strobilurin fungicides follow these recommendations if the crop receives more than three fungicide applications:

- Only use strobilurins preventatively.
- Apply only at manufacturer's recommended rates.
- Do not exceed 30–50% of the total number of applications with strobilurins.
- Continue alternating fungicide modes of action with successive crops.

Strobilurin fungicides include:

azoxystrobin (**Quadris**),
pyraclostrobin (**Headline**),
trifloxystrobin with propiconazole (**Stratego**), and
azoxystrobin with propiconazole (**Quilt**)

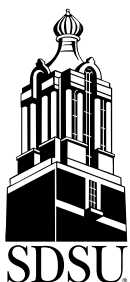
Triazole fungicides all have a similar mode of action by inhibiting the production of sterol compounds in the fungus and include:

propiconazole (**Tilt, PropiMax, and Bumper**),
prothioconazole (**Proline**) and
tebuconazole (**Folicur, Orius, TebuStar, Embrace, Tebuzol, and Toledo**).

The development of resistance to protectant fungicides such as the carbamates is very rare among plant pathogenic fungi:

mancozeb (**Dithane, Manzate, Penncozeb**),
the organic aromatic compound chlorothalonil (**Bravo**), and the inorganic copper and sulfur fungicides.

Most fungicides in South Dakota are applied by air or ground. For specific information uses on applying by chemigation, please consult the label.



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FOLIAR FUNGICIDES FOR WHEAT

Disease	Fungicide	Dosage and Interval	Limitations	Special Notes
Rust diseases Leaf rust (<i>Puccinia triticina</i>) Stem rust (<i>Puccinia graminis</i> f.sp. <i>Tritici</i>) Stripe rust (<i>Puccinia striiformis</i>)	azoxystrobin Quadris Flowable Fungicide	4–12 fl oz/A Apply prior to disease development from jointing (Feekes growth stage 6) until late head emergence (Feekes growth stage 10.5).	Do not harvest treated wheat for forage. Do not apply within 14 days of harvest for hay. Do not apply within 45 days of harvest for grain and straw.	Pathogen resistance management: Do not apply more than 24.5 fl oz of product/A per season. Do not make more than two applications of strobilurin fungicides in one year to minimize resistance issues. A crop oil concentrate adjuvant may be added at 1.0% V/V to optimize efficacy.
	copper *Various copper products	See individual product labels. Typically applied at 7–10 day intervals beginning at early boot stage.	No limitations.	More effective on Septoria diseases, spot blotch and net blotch than on rusts.
	mancozeb Dithane M-45 Manzate Flowable Penncozeb 4FL Penncozeb 75 DF Penncozeb 80 WP	2 lbs/A 1.6 qts/A 0.8–1.6 qts/A 1–2 lbs/A 1–2 lbs/A Start applications at disease onset or when crop is in the tillering to jointing stage and repeat at 7–10 day intervals.	Do not make more than three applications during the season. Do not apply after Feekes growth stage 10.5 or heading, and not less than 26 days before harvest. Do not graze livestock in treated areas prior to harvest. Do not apply more than 4.8 qts (Manzate Flowable), 6 lbs (Penncozeb 80VWP), or 6.4 lbs (Penncozeb 75DF) of product per acre per season.	Use Latron CS-7 surfactant to improve product performance. Mancozeb products are not specifically labeled for stripe rust or stem rust, only for leaf rust. Low rates are intended for use at the tillering stage when the crop canopy volume is relatively small.
	mancozeb + surfactant Dithane DF Rainshield Dithane F-45 Rainshield Manzate Pro-Stick	2.1 lbs/A 1.6 qts/A 2 lbs/A Start applications at disease onset or when crop is in the tillering to jointing stage and repeat at 7–10 day intervals.	Do not make more than three applications during the season. Do not apply after Feekes growth stage 10.5 or heading, and not less than 26 days before harvest. Do not graze livestock in treated areas prior to harvest.	Use Latron CS-7 surfactant to improve product performance. Mancozeb products are not specifically labeled for stripe rust or stem rust, only for leaf rust.
	propiconazole Tilt PropiMax EC Bumper	4 fl oz/A Apply Tilt up to 50% flowering. Apply PropiMax and Bumper until the ligule of the flag leaf has emerged (Feekes growth stage 9).	If using Tilt do not apply within 30 days of harvest for forage, 40 days before harvest for grain and straw and 45 days before harvest for hay. If using PropiMax or Bumper do not graze or feed livestock treated forage or cut the green crop for hay or silage. After harvest, the straw may be used for bedding or feed.	Apply a minimum of 5 gal/A by air or 15 gal/A ground (PropiMax), 5 gal/A by air or 10 gal/A ground (Bumper), 2 gal/A by air or 10 gal/A ground (Tilt). Do not apply more than 4 fl oz/A per season of Tilt if forage or hay will be harvested. Do not apply more than 4 fl oz (PropiMax, Bumper) or 8 fl oz (Tilt) of product/A per season.

FOLIAR FUNGICIDES FOR WHEAT

Disease	Fungicide	Dosage and Interval	Limitations	Special Notes
Rust diseases Leaf rust (<i>Puccinia triticina</i>) Stem rust (<i>Puccinia graminis</i> f.sp. <i>Tritici</i>) Stripe rust (<i>Puccinia striiformis</i>) (CONTINUED)	propiconazole + azoxystrobin Quilt	10.5–14 fl oz/A Apply up to full head emergence (Feekes growth stage 10.5).	Do not apply more than 2 applications in a single growing season. Allow at least 14 days between applications. 45 days PHI	Quilt may be applied by ground, air, or chemigation. Do not harvest wheat for forage. Do not graze or feed livestock treated forage or cut green crop for hay or silage. Do not apply more than 20.5 fl oz/A of Quilt/year.
	propiconazole + trifloxystrobin Stratego	10 fl oz/A Begin preventative applications when conditions favor disease development. Reapply in 14 days if disease persists or if weather conditions favor continued disease.	If 20 fl oz/A are applied (two applications), do not graze and do not cut for forage or hay. If one application (10 fl oz/A), do not graze or feed livestock treated forage for 30 days or harvest for hay 45 days after application.	Do not apply after full head emergence (Feekes growth stage 10.5). Apply a minimum of 5 gal/A by air or 10 gal/A ground. Do not apply within 35 days of harvest. Do not apply more than 20 fl oz of product per acre per season.
	prothioconazole Proline	4.3-5 fl oz/A Start applications at disease onset and repeat at a 14 day interval if conditions remain favorable for disease development. Apply when up to 50% of the heads on the main stem are in flower (Feekes growth stage 10.52).	Apply up to 2 applications per year. Do not apply more than 9.37 fl oz/A/season. Do not apply within 30 days of harvest.	Apply a minimum of 5 gal/A by air or 10 gal/A ground.
	pyraclostrobin Headline	6–9 fl oz/A	Maximum of two applications. 14 days PHI for wheat hay.	Apply no later than the beginning of flowering (Feekes growth stage 10.5). Do not apply more than 18 fl oz/A per season.
Leaf spotting diseases Septoria leaf diseases (<i>S. nodorum</i> , <i>S. tritici</i> , and <i>S. avenae</i> f.sp. <i>triticea</i>) Septoria glume blotch (<i>S. nodorum</i>) Tan spot (<i>Pyrenophora tritici-repentis</i>) Spot blotch (<i>Helminothosporium sativum</i>)	azoxystrobin Quadris Flowable Fungicide	4–12 fl oz/A Apply prior to disease development from jointing (Feekes growth stage 6) until late head emergence (Feekes growth stage 10.5).	Do not harvest treated wheat for forage. Do not apply within 14 days of harvest for hay. Do not apply within 45 days of harvest for grain and straw. Quadris is not specifically registered for spot blotch.	Pathogen resistance management: Do not apply more than 24.5 fl oz of product/A per season. Do not make more than two applications of strobilurin fungicides in one year to minimize resistance issues. A crop oil concentrate adjuvant may be added at 1.0% V/V to optimize efficacy.
	copper *Various copper products	See individual product labels. Typically applied at 7–10 day intervals beginning at early boot stage.	No limitations	Coppers are most effective on Septoria diseases, spot blotch, and net blotch.

FOLIAR FUNGICIDES FOR WHEAT

Disease	Fungicide	Dosage and Interval	Limitations	Special Notes
Leaf spotting diseases Septoria glume blotch (<i>S. nodorum</i>) Tan spot (<i>Pyrenophora tritici-repentis</i>) Spot blotch (<i>Helminothosporium sativum</i>) Septoria leaf diseases (<i>S. nodorum</i> , <i>S. tritici</i> , and <i>S. avenae</i> f.sp. <i>triticea</i>)	mancozeb			
	Dithane M-45	2 lbs/A	Do not make more than three applications during the season.	Use Latron CS-7 surfactant to improve product performance.
	Manzate Flowable	1.6 qts/A	Do not apply after Feekes growth stage 10.5 or heading, and not less than 26 days before harvest.	Low rates are intended for use at the tillering stage when the crop canopy volume is relatively small.
	Penncozeb 4FL Penncozeb 75 DF Penncozeb 80 WP	0.8–1.6 qts/A 1–2 lbs/A 1–2 lbs/A	Start applications at disease onset or when crop is in the tillering to jointing stage and repeat at 7–10 day intervals.	Do not graze livestock in treated areas prior to harvest. Do not apply more than 4.8 qts (Manzate Flowable), 6 lbs (Penncozeb 80VWP), or 6.4 lbs (Penncozeb 75DF) of product per acre per season.
(CONTINUED)	mancozeb + surfactant			
	Dithane DF Rainshield	2.1 lbs/A	Do not make more than three applications during the season.	Use Latron CS-7 surfactant to improve product performance.
	Dithane F-45 Rainshield	1.6 qts/A	Do not apply after Feekes growth stage 10.5 or heading, and not less than 26 days before harvest.	
	Manzate Pro-Stick	2 lbs/A	Do not graze livestock in treated areas prior to harvest.	
		Start applications at disease onset or when crop is in the tillering to jointing stage and repeat at 7–10 day intervals.		
	propiconazole			
	Tilt	2–4 fl oz/A	If using Tilt do not apply within 30 days of harvest for forage, 40 days before harvest for grain and straw and 45 days before harvest for hay.	Apply a minimum of 5 gal/A by air or 15 gal/A ground (PropiMax), 5 gal/A by air or 10 gal/A ground (Bumper), 2 gal/A by air or 10 gal/A ground (Tilt).
	PropiMax EC	Apply PropiMax and Bumper until the ligule of the flag leaf has emerged (Feekes growth stage 9).	If using PropiMax or Bumper do not graze or feed livestock treated forage or cut the green crop for hay or silage. After harvest, the straw may be used for bedding or feed.	Do not apply more than 4 fl oz/A per season of Tilt if forage or hay will be harvested.
	Bumper			Do not apply more than 4 fl oz (PropiMax, Bumper) or 8 fl oz (Tilt) of product/A per season.
				2 fl oz/A rate is for early season tan spot control.
propiconazole + azoxystrobin				
Quilt	10.5–14 fl oz/A Apply up to full head emergence (Feekes growth stage 10.5). Use the 7–14 fl oz/A rate for early season disease suppression.	Do not apply more than 2 applications in a single growing season. Allow at least 14 days between applications. 45 days PHI Do not apply more than 20.5 fl oz/A of Quilt/year.	Quilt may be applied by ground, air, or chemigation. Do not harvest wheat for forage. Do not graze or feed livestock treated forage or cut green crop for hay or silage. Low rates are intended for use at the tillering stage when the crop canopy volume is relatively small.	

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Disease	Fungicide	Dosage and Interval	Limitations	Special Notes
Leaf spotting diseases Septoria glume blotch (<i>S. nodorum</i>) Tan spot (<i>Pyrenophora tritici-repentis</i>) Spot blotch (<i>Helminothosporium sativum</i>) Septoria leaf diseases (<i>S. nodorum</i> , <i>S. tritici</i> , and <i>S. avenae</i> f.sp. <i>triticea</i>) (CONTINUED)	propiconazole + trifloxystrobin Stratego	4–10 fl oz/A Use lower rates for early season applications. Begin preventative applications when conditions favor disease development. A second application may be made at least 14 days following the first.	If 20 fl oz/A are applied (two applications), do not graze and do not cut for forage or hay. If one application is/or a total of 10 fl oz/A, do not graze or feed livestock treated forage for 30 days or harvest for hay 45 days after application.	Apply a minimum of 5 gal/A by air or 10 gal/A ground. Do not apply within 35 days of harvest. Do not apply more than 20 fl oz of product per acre per season. Do not apply after full head emergence (Feekes growth stage 10.5)
	prothioconazole Proline	4.3-5 fl oz/A Start applications at disease onset and repeat at a 14 day interval if conditions remain favorable for disease development. Apply when up to 50% of the heads on the main stem are in flower (Feekes growth stage 10.52).	Apply up to 2 applications per year. Do not apply more than 9.37 fl oz/A/season. Do not apply within 30 days of harvest.	Apply a minimum of 5 gal/A by air or 10 gal/A ground.
	pyraclostrobin Headline	3–9 fl oz/A 3–6 fl oz/A applied early season with herbicide or 6–9 fl oz/A applied from Feekes growth stage 6 to Feekes growth stage 10.5 If conditions favor disease, apply higher rate.	Maximum of two applications. Do not apply more than 18 fl oz/A per season. 14 days PHI for wheat hay.	Apply no later than the beginning of flowering (Feekes growth stage 10.5).
Powdery mildew (<i>Erysiphe graminis</i> f.sp. <i>hordei</i>)	azoxystrobin Quadris Flowable Fungicide	7.5–11 fl oz/A Apply prior to disease development from jointing (Feekes growth stage 6) until late head emergence (Feekes growth stage 10.5).	Do not harvest treated wheat for forage. Do not apply within 14 days of harvest for hay. Do not apply within 45 days of harvest for grain and straw.	Pathogen resistance management: Do not apply more than 24.5 fl oz of product/A per season. Do not make more than two applications of strobilurin fungicides in one year. A crop oil concentrate adjuvant may be added at 1.0% V/V to optimize efficacy.
	propiconazole Tilt PropiMax EC Bumper	2-4 fl oz/A 4 fl oz/A 4 fl oz/A Apply Tilt up to 50% flowering. Apply PropiMax and Bumper until the ligule of the flag leaf has emerged (Feekes growth stage 9).	If using Tilt do not apply within 30 days of harvest for forage, 40 days before harvest for grain and straw and 45 days before harvest for hay. If using PropiMax or Bumper do not graze or feed livestock treated forage or cut the green crop for hay or silage. After harvest, the straw may be used for bedding or feed.	Apply a minimum of 5 gal/A by air or 15 gal/A ground (PropiMax), 5 gal/A by air or 10 gal/A ground (Bumper), 2 gal/A by air or 10 gal/A ground (Tilt). Do not apply more than 4 fl oz/A per season of Tilt if forage or hay will be harvested. Do not apply more than 4 fl oz (PropiMax, Bumper) or 8 fl oz (Tilt) of product/A per season. Low rates are intended for use at the tillering stage when the crop canopy volume is relatively small.

FOLIAR FUNGICIDES FOR WHEAT

Disease	Fungicide	Dosage and Interval	Limitations	Special Notes
Powdery mildew (<i>Erysiphe graminis</i> f.sp. <i>hordei</i>) (CONTINUED)	propiconazole + azoxystrobin Quilt	10.5–14 fl oz/A Apply up to full head emergence (Feekes growth stage 10.5). Use the 7–14 fl oz/A rate for early season disease suppression.	Do not apply more than 2 applications in a single growing season. Allow at least 14 days between applications. 45 days PHI Do not apply more than 20.5 fl oz/A of Quilt/year.	Quilt may be applied by ground, air, or chemigation. Do not harvest wheat for forage. Do not graze or feed livestock treated forage or cut green crop for hay or silage. Low rates are intended for use at the tillering stage when the crop canopy volume is relatively small.
	propiconazole + trifloxystrobin Stratego	10 fl oz/A Begin preventative applications when conditions favor disease development. A second application may be made at least 14 days following the first. For early season disease suppression of powdery mildew use 6-8 fl oz/A.	If 20 fl oz/A are applied (two applications), do not graze and do not cut for forage or hay. If one application (10 fl oz/A), do not graze or feed livestock treated forage for 30 days or harvest for hay 45 days after application.	Apply a minimum of 5 gal/A by air or 10 gal/A ground. Do not apply within 35 days of harvest. Do not apply more than 20 fl oz of product per acre per season. Do not apply after full head emergence (Feekes growth stage 10.5).
	pyraclostrobin Headline	6–9 fl oz/A	Maximum of two applications. Do not apply more than 18 fl oz/A per season. 14 day PHI for wheat hay.	Do not apply after the end of flowering (Feekes growth stage 10.5).
	sulfur *Various sulfur products are available.	See individual product labels.	No PHI listed.	Elemental sulfur is used primarily for powdery mildew control. Avoid application during periods of high temperature or plant injury may occur.

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Disease	Fungicide	Dosage and Interval	Limitations	Special Notes
Head Blight/Scab (<i>Fusarium graminearum</i> and others)	prothioconazole Proline	4.3-5.7 fl oz/A Apply when at least 75% of the wheat heads on the main stem are fully emerged (Feekes growth stage 10.4) to when 50% of the heads on the main stem are in flower (Feekes growth stage 10.52).	Do not apply more than 9.37 fl oz/A/season. Do not apply within 30 days of harvest.	Apply a minimum of 5 gal/A by air or 10 gal/A ground.
	propiconazole Tilt	4 fl oz/A Apply Tilt up to 50% flowering.	Do not apply within 30 days of harvest for forage, 40 days before harvest for grain and straw and 45 days before harvest for hay.	Apply a minimum of 2 gal/A by air or 10 gal/A ground. Do not apply more than 4 fl oz/A per season if forage or hay will be harvested. Do not apply more than 8 fl oz of product/A per season.

FOLIAR FUNGICIDES FOR BARLEY

Disease	Fungicide	Dosage and Interval	Limitations	Special Notes	
Leaf rust (<i>Puccinia hordei</i>) Septoria blotch (<i>S. passerinii</i> and <i>S. avenae</i> f.sp. <i>triticea</i>) Spot blotch (<i>Helminothosporium sativum</i>) Net blotch (<i>Pyrenophora teres</i>) Scald (<i>Rhynchosporium secalis</i>)	copper *Various copper products	See individual product labels. Typically applied at 7–10 day intervals beginning at early boot stage.	No PHI listed.	Most effective on Septoria diseases, spot blotch, and net blotch.	
	mancozeb Dithane M-45 Manzate Flowable Penncozeb 4FL Penncozeb 75 DF Penncozeb 80 WP	2 lbs/A 1.6 qts/A 0.8–1.6 qts/A 1–2 lbs/A 1–2 lbs/A	Start applications at disease onset or when crop is in the tillering to jointing stage and repeat at 7–10 day intervals.	Do not make more than three applications during the season. Do not apply after Feekes growth stage 10.5 or heading, and not less than 26 days before harvest. Do not graze livestock in treated areas prior to harvest. Do not apply more than 4.8 qts (Manzate Flowable), 6 lbs (Penncozeb 80WP), or 6.4 lbs (Penncozeb 75DF) of product per acre per season.	Use Latron CS-7 surfactant to improve product performance. Low rates are intended for use at the tillering stage when the crop canopy volume is relatively small.
	mancozeb + surfactant Dithane DF Rainshield Dithane F-45 Rainshield Manzate Pro-Stick	2.1 lbs/A 1.6 qts/A 2 lbs/A	Start applications at disease onset or when crop is in the tillering to jointing stage and repeat at 7–10 day intervals.	Do not make more than three applications during the season. Do not apply after Feekes growth stage 10.5 or heading, and not less than 26 days before harvest. Do not graze livestock in treated areas prior to harvest.	Use Latron CS-7 surfactant to improve product performance.
	azoxystrobin Quadris Flowable Fungicide	6-12 fl oz/A (Leaf rust) 9-12 fl oz/A (Net blotch) Apply prior to disease development from jointing (Feekes growth stage 6) until late head emergence (Feekes growth stage 10.5).		Do not harvest treated barley for forage. Do not apply within 14 days of harvest for hay. Do not apply within 45 days of harvest for grain and straw.	Pathogen resistance management: Do not apply more than 24.5 fl oz of product/A per season. Do not make more than two applications of strobilurin fungicides in one year. A crop oil concentrate adjuvant may be added at 1.0% V/V to optimize efficacy.
	propiconazole Tilt PropiMax EC Bumper	4 fl oz/A Apply Tilt up to 50% flowering. Apply PropiMax and Bumper until the ligule of the flag leaf has emerged (Feekes growth stage 9).		If using Tilt do not apply within 30 days of harvest for forage, 40 days before harvest for grain and straw and 45 days before harvest for hay. If using PropiMax or Bumper do not graze or feed livestock treated forage or cut the green crop for hay or silage. After harvest, the straw may be used for bedding or feed.	Apply a minimum of 5 gal/A by air or 15 gal/A ground (PropiMax), 5 gal/A by air or 10 gal/A ground (Bumper), 2 gal/A by air or 10 gal/A ground (Tilt). Do not apply more than 4 fl oz/A per season of Tilt if forage or hay will be harvested. Do not apply more than 4 fl oz (PropiMax, Bumper) or 8 fl oz (Tilt) of product/A per season.

FOLIAR FUNGICIDES FOR BARLEY

Disease	Fungicide	Dosage and Interval	Limitations	Special Notes
Leaf rust (<i>Puccinia hordei</i>) Septoria blotch (<i>S. passerinii</i> and <i>S. avenae</i> f.sp. <i>triticea</i>) Spot blotch (<i>Helminothosporium sativum</i>) Net blotch (<i>Pyrenophora teres</i>) Scald (<i>Rhynchosporium secalis</i>) (CONTINUED)	propiconazole + azoxystrobin	10.5–14 fl oz/A Apply up to full head emergence (Feekes growth stage 10.5).	Do not apply more than 2 applications in a single growing season. Allow at least 14 days between applications. 45 days PHI	Quilt may be applied by ground, air, or chemigation. Do not graze or feed livestock treated forage or cut green crop for hay or silage. Do not apply more than 20.5 fl oz/A of Quilt/year.
	propiconazole + trifloxystrobin	7 fl oz/A Apply until the ligule of the flag leaf emerges (Feekes growth stage 9).	Do not apply more than 2 applications (14 fl oz/A) in a single growing season. Allow at least 14 days between applications. If one application (7 fl oz/A) is applied, do not allow livestock to graze or feed for 30 days or harvest hay for 45 days after application.	Do not apply within 40 days of harvest. If 2 applications (14 fl oz/A) are applied, do not allow livestock to graze or harvest for forage or hay.
	prothioconazole	2.8-4.3 fl oz/A Start applications at disease onset and repeat at a 14 day interval if conditions remain favorable for disease development. Apply when up to 50% of the heads on the main stem are in flower (Feekes growth stage 10.52).	Apply up to 2 applications per year. Do not apply more than 9.37 fl oz/A/season. Do not apply within 32 days of harvest.	Apply a minimum of 5 gal/A by air or 10 gal/A ground.
	pyraclostrobin	6–9 fl oz/A	Maximum of two applications. Do not apply more than 18 fl oz/A per season. 14 day PHI for barley hay.	Do not apply after 50% head emergence (Feekes growth stage 10.3).
	Headline			
Powdery mildew (<i>Erysiphe graminis</i> f.sp. <i>hordei</i>)	azoxystrobin	12 fl oz/A Apply prior to disease development from jointing (Feekes growth stage 6) until late head emergence (Feekes growth stage 10.5).	Do not harvest treated barley for forage. Do not apply within 14 days of harvest for hay. Do not apply within 45 days of harvest for grain and straw.	Pathogen resistance management: Do not apply more than 24.5 fl oz of product/A per season. Do not make more than two applications of strobilurin fungicides in one year. A crop oil concentrate adjuvant may be added at 1.0% V/V to optimize efficacy.
	propiconazole	Tilt 2-4 fl oz/A PropiMax EC 4 fl oz/A Bumper 4 fl oz/A Apply Tilt up to 50% flowering. Apply PropiMax and Bumper until the ligule of the flag leaf has emerged (Feekes growth stage 9).	If using Tilt do not apply within 30 days of harvest for forage, 40 days before harvest for grain and straw and 45 days before harvest for hay. If using PropiMax or Bumper do not graze or feed livestock treated forage or cut the green crop for hay or silage. After harvest, the straw may be used for bedding or feed.	Apply a minimum of 5 gal/A by air or 15 gal/A ground (PropiMax), 5 gal/A by air or 10 gal/A ground (Bumper), 2 gal/A by air or 10 gal/A ground (Tilt). Do not apply more than 4 fl oz/A per season of Tilt if forage or hay will be harvested. Do not apply more than 4 fl oz (PropiMax, Bumper) or 8 fl oz (Tilt) of product/A per season. Low rates are intended for use at the tillering stage when the crop canopy volume is relatively small.

FOLIAR FUNGICIDES FOR BARLEY

Disease	Fungicide	Dosage and Interval	Limitations	Special Notes
Powdery mildew (<i>Erysiphe graminis</i> f.sp. <i>hordei</i>) (CONTINUED)	propiconazole + azoxystrobin Quilt	10.5–14 fl oz/A Apply up to full head emergence (Feekes growth stage 10.5). Use the 7–14 fl oz/A rate for early season disease suppression.	Do not apply more than 2 applications in a single growing season. Allow at least 14 days between applications. 45 days PHI	Quilt may be applied by ground, air, or chemigation. Do not graze or feed livestock treated forage or cut green crop for hay or silage. Do not apply more than 20.5 fl oz/A of Quilt/year.
	propiconazole + trifloxystrobin Stratego	7 fl oz/A Apply until the ligule of the flag leaf emerges (Feekes growth stage 9).	Do not apply more than 2 applications (14 fl oz/A) in a single growing season. Allow at least 14 days between applications. If one application (7 fl oz/A) is applied, do not allow livestock to graze or feed for 30 days or harvest hay for 45 days after application.	Do not apply within 40 days of harvest. If 2 applications (14 fl oz/A) are applied, do not allow livestock to graze or harvest for forage or hay.
	pyraclostrobin Headline	6–9 fl oz/A	Maximum of two applications. Do not apply more than 18 fl oz/A per season. 14 day PHI for barley hay.	Do not apply after 50% head emergence (Feekes growth stage 10.3).
	sulfur *Various sulfur products are available.	See individual product labels.	No PHI listed.	Elemental sulfur is used primarily for powdery mildew control. Avoid application during periods of high temperature or plant injury may occur.
Head Blight/Scab (<i>Fusarium graminearum</i> and others)	prothioconazole Proline	4.3-5.7 fl oz/A Apply when 70-100% of the heads on the main stem are emerged (Feekes growth stages 10.3-10.5).	Do not apply more than 9.37 fl oz/A/season. Do not apply within 32 days of harvest.	Apply a minimum of 5 gal/A by air or 10 gal/A ground.
	propiconazole Tilt	4 fl oz/A Apply Tilt up to 50% flowering.	Do not apply within 30 days of harvest for forage, 40 days before harvest for grain and straw and 45 days before harvest for hay.	Apply a minimum of 2 gal/A by air or 10 gal/A ground. Do not apply more than 4 fl oz/A per season Tilt forage or hay will be harvested. Do not apply more than 8 fl oz of product/A per season.

*Copper and sulfur products are acceptable for organic production.

FOLIAR FUNGICIDES FOR OATS

Disease	Fungicide	Dosage and Interval	Limitations	Special Notes
Septoria leaf diseases (<i>S. avenae</i> f.sp. <i>avenae</i>) Crown (leaf) rust (<i>Puccinia coronata</i>) Stem rust (<i>Puccinia graminis</i> f.sp. <i>avenae</i>) Powdery mildew (<i>Erysiphe graminis</i> f.sp. <i>avenae</i>)	mancozeb			
	Dithane M-45	2 lbs/A	Do not make more than three applications during the season.	Use Latron CS-7 surfactant to improve product performance.
	Manzate Flowable	1.6 qts/A	Do not apply after Feekes growth stage 10.5 or heading, and not less than 26 days before harvest.	Mancozeb products are not specifically labeled for stem rust, only for leaf rust.
	Penncozeb 4FL	0.8–1.6 qts/A	Do not graze livestock in treated areas prior to harvest.	Low rates are intended for use at the tillering stage when the crop canopy volume is relatively small.
	Penncozeb 75 DF	1–2 lbs/A		
	Penncozeb 80 WP	1–2 lbs/A	Do not apply more than 4.8 qts (Manzate Flowable), 6 lbs (Penncozeb 80WP), or 6.4 lbs (Penncozeb 75DF) of product per acre per season.	
			Start applications at disease onset or when crop is in the tillering to jointing stage and repeat at 7–10 day intervals.	
	mancozeb + surfactant			
	Dithane DF Rainshield	2.1 lbs/A	Do not make more than three applications during the season.	Use Latron CS-7 surfactant to improve product performance.
	Dithane F-45 Rainshield	1.6 qts/A	Do not apply after Feekes growth stage 10.5 or heading, and not less than 26 days before harvest.	Mancozeb products are not specifically labeled for stem rust, only for leaf rust.
	Manzate Pro-Stick	2 lbs/A	Do not graze livestock in treated areas prior to harvest.	
			Start applications at disease onset or when crop is in the tillering to jointing stage and repeat at 7–10 day intervals.	
propiconazole	2–4 fl oz/A (Tilt for powdery mildew)			
Tilt	4 fl oz/A	If using Tilt do not apply within 30 days of harvest for forage, 40 days before harvest for grain and straw and 45 days before harvest for hay.	Apply a minimum of 5 gal/A by air or 15 gal/A ground (PropiMax), 5 gal/A by air or 10 gal/A ground (Bumper), 2 gal/A by air or 10 gal/A ground (Tilt).	
PropiMax EC	4 fl oz/A		Do not apply more than 4 fl oz/A per season of Tilt if forage or hay will be harvested.	
Bumper	Apply Tilt up to 50% flowering. Apply PropiMax and Bumper until the ligule of the flag leaf has emerged (Feekes growth stage 9).	If using PropiMax or Bumper do not graze or feed livestock treated forage or cut the green crop for hay or silage. After harvest, the straw may be used for bedding or feed.	Do not apply more than 4 fl oz (PropiMax, Bumper) or 8 fl oz (Tilt) of product/A per season.	
		Do not apply to oats within 40 days of harvest.	Low rates are intended for use at the tillering stage when the crop canopy volume is relatively small.	
propiconazole + trifloxystrobin				
Stratego	7 fl oz/A	Do not apply more than 2 applications (14 fl oz/A) in a single growing season. Allow at least 14 days between applications.	Do not apply within 40 days of harvest.	
	Apply until the ligule of the flag leaf emerges (Feekes growth stage 9).	If one application (7 fl oz/A) is applied, do not allow livestock to graze or feed for 30 days or harvest hay for 45 days after application.	If 2 applications (14 fl oz/A) are applied, do not allow livestock to graze or harvest for forage or hay.	

FOLIAR FUNGICIDES FOR RYE

Disease	Fungicide	Dosage and Interval	Limitations	Special Notes
Leaf rust (<i>Puccinia rubigo-vera</i> f.sp. <i>secalis</i>)	mancozeb			
	Dithane M-45	2 lbs/A	Do not make more than three applications during the season.	Use Latron CS-7 surfactant to improve product performance.
	Manzate Flowable	1.6 qts/A	Do not apply after Feekes growth stage 10.5 or heading, and not less than 26 days before harvest.	Mancozeb products are not specifically labeled for stripe rust or stem rust, only for leaf rust.
	Penncozeb 4FL	0.8–1.6 qts/A	Do not graze livestock in treated areas prior to harvest.	Low rates are intended for use at the tillering stage when the crop canopy volume is relatively small.
Septoria leaf diseases (<i>S. nodorum</i> and <i>S. tritici</i>)	Penncozeb 75 DF	1–2 lbs/A		
	Penncozeb 80 WP	1–2 lbs/A	Do not apply more than 4.8 qts (Manzate Flowable), 6 lbs (Penncozeb 80WP), or 6.4 lbs (Penncozeb 75DF) of product per acre per season.	
Glume blotch (<i>S. nodorum</i>)				
Powdery mildew (<i>Erysiphe graminis</i> f.sp. <i>secalis</i>)		Start applications at disease onset or when crop is in the tillering to jointing stage and repeat at 7–10 day intervals.		
Spot blotch (<i>Helminthosporium sativum</i>)	mancozeb + surfactant		Do not make more than three applications during the season.	Use Latron CS-7 surfactant to improve product performance.
Tan spot (<i>Pyrenophora tritici-repentis</i>)	Dithane DF Rainshield	2.1 lbs/A	Do not apply after Feekes growth stage 10.5 or heading, and not less than 26 days before harvest.	Mancozeb products are not specifically labeled for stripe rust or stem rust, only for leaf rust.
	Dithane F-45 Rainshield	1.6 qts/A	Do not graze livestock in treated areas prior to harvest.	
	Manzate Pro-Stick	2 lbs/A	Start applications at disease onset or when crop is in the tillering to jointing stage and repeat at 7–10 day intervals.	
	propiconazole			
	Tilt	2-4 fl oz/A (Septoria leaf diseases, tan spot and powdery mildew)	If using Tilt do not apply within 30 days of harvest for forage, 40 days before harvest for grain and straw and 45 days before harvest for hay.	Apply a minimum of 5 gal/A by air or 15 gal/A ground (PropiMax), 5 gal/A by air or 10 gal/A ground (Bumper), 2 gal/A by air or 10 gal/A ground (Tilt).
	PropiMax EC	4 fl oz/A	If using PropiMax or Bumper do not graze or feed livestock treated forage or cut the green crop for hay or silage. After harvest, the straw may be used for bedding or feed.	Do not apply more than 4 fl oz/A per season of Tilt if forage or hay will be harvested.
	Bumper	Apply PropiMax and Bumper until the ligule of the flag leaf has emerged (Feekes growth stage 9).		Do not apply more than 4 fl oz (PropiMax, Bumper) or 8 fl oz (Tilt) of product/A per season.
	pyraclostrobin			
	Headline	6–9 fl oz/A	Maximum of two applications. Do not apply more than 18 fl oz/A per season.	Apply no later than 50% head emergence (Feekes growth stage 10.3).

SMALL GRAINS GROWTH STAGE CHART	
Feekes Scale	Description
1	First leaf through coleoptile
2	Main shoot and 1 tiller
3	Main shoot and 6 tillers
4-5	Pseudo stem erection
6	1st node detectable
7	2nd node detectable
8	Flag leaf just visible
9	Flag leaf collar just visible
10	Boots just swollen
10.1	First awns visible
10.2	1/4 of inflorescence emerged
10.3	1/2 of inflorescence emerged
10.4	3/4 of inflorescence emerged
10.5	Emergence of inflorescence completed
10.51	Beginning of anthesis
10.54	Kernel is watery ripe
11.1	Medium milk
11.2	Soft dough
11.3	Kernel is hard (difficult to divide by thumbnail)
11.4	Kernel is hard (can no longer be dented by thumbnail)

FOLIAR FUNGICIDES FOR GRASSES GROWN for SEED

Disease	Fungicide	Dosage and Interval	Limitations	Special Notes
Rust (<i>Puccinia graminis</i> <i>Puccinia triticina</i>)	pyraclostrobin	6–12 fl oz/A	Maximum of two applications.	27 day PHI for hay or grazing.
	Headline	Reapply in 14–21 days.	Do not apply more than 24 fl oz/A per season.	14 day PHI for harvest.
Powdery mildew (<i>Erysiphe graminis</i>)	tebuconazole	4–8 fl oz/A	4 day preharvest interval.	Use 20 gal/A for ground or 10 gal/A for air application.
	Folicur	Begin applications when powdery mildew first appears and repeat every 14–16 days.	Do not forage, cut green chop or use seed for feed purposes.	Do not apply more than 16 oz of product per acre per season.
	Embrace			
	Orius	Under heavy disease pressure use 6–8 fl oz/A and shorter intervals.		A spray surfactant at the lowest minimum rate may be added to optimize efficacy.
	TebuStar			
	Tebuzol			
	Toledo			
Leaf rust Stripe rust Stem rust Septoria leaf spot Glume blotch Bipolaris and Drechslera leaf spots (various fungal species)	chlorothalonil		Do not apply within 14 days of harvest.	Use sufficient water to obtain adequate coverage, 5–10 gal/A for concentrated ground and aerial application.
	Bravo Weather Stik	1–1.5 pints/A	Do not graze livestock in treated areas or feed treated plant parts to livestock.	
	Bravo Ultrex	0.9–1.4 lbs/A	Do not apply more than 6 pints (Bravo Weather Stik) or 5.4 lbs. (Bravo Ultrex) of product per acre per season.	
		Begin applications at stem elongation and reapply at flag leaf emergence and repeat every 14 days thereafter.		
	tebuconazole	4–8 fl oz/A	4 day preharvest interval.	Use 20 gal/A for ground or 10 gal/A for air application.
	Folicur	Begin applications when conditions are favorable for disease and repeat every 14–16 days.	Do not forage, cut green chop or use seed for feed purposes.	Do not apply more than 16 oz of product per acre per season.
	Embrace			
	Orius	Under heavy disease pressure use 6–8 fl oz/A and shorter intervals.		A spray surfactant at the lowest minimum rate may be added to optimize efficacy.
	TebuStar			
	Tebuzol			
Toledo				

FOLIAR FUNGICIDES FOR CORN

Disease	Fungicide	Dosage and Interval	Limitations	Special Notes
Gray leaf spot (<i>Cercospora maydis</i>)	azoxystrobin	6-15.5 fl oz/A	Do not apply within 7 days of harvest.	Use only in an integrated disease management approach with resistant hybrids, proper fertility, residue management and crop rotation.
	Quadris	Apply at the first sign of gray leaf spot symptoms. A second application may be required 14 days later.	Do not apply more than two sequential applications of Quadris without alternating with another fungicide chemistry. Do not apply more than 2 applications of Quadris or other strobilurin fungicides per year.	Quadris may be applied by ground, air or through chemigation. Do not apply more than 12 fl oz of product/A per season.

FOLIAR FUNGICIDES FOR CORN

Disease	Fungicide	Dosage and Interval	Limitations	Special Notes
Gray leaf spot (<i>Cercospora maydis</i>) (CONTINUED)	mancozeb Manzate Flowable Penncozeb 4FL Penncozeb 75 DF Penncozeb 80 WP	1.2 qts/A 0.8–1.2 qts/A 1–1.5 lbs/A (repeat as needed) 1–1.5 lbs/A (repeat as needed) Start applications at disease onset and repeat at 4–7 day intervals.	Do not apply more than 12 qts (Manzate Flowable and Penncozeb 4FL), 15 lbs (Penncozeb 80WP), or 16 lbs (Penncozeb 75 DF) of product per acre per season. Do not feed treated forage to livestock.	Do not apply within 40 days of harvest. Use Latron CS-7 surfactant to improve product performance.
	mancozeb + surfactant Manzate Pro-Stick	1.5 lbs/A Start applications at disease onset and repeat at 4–7 day intervals.	Do not apply more than 15 lbs of product per acre per season. Do not feed treated forage to livestock.	Do not apply within 40 days of harvest.
	propiconazole Tilt PropiMax EC Bumper	4 fl oz/A Apply when disease first appears. If conditions favorable for disease persist, reapply every 7-14 days if using Tilt or every 14 days if using PropiMax or Bumper.	If using Tilt, do not apply within 30 days of harvest for forage, grain and stover. If using PropiMax or Bumper, do not harvest field corn, field corn grown for seed for forage within 30 days of application. Do not apply more than 16 fl oz/A/season.	Apply a minimum of 5 gal/A by air or 15 gal/A ground (PropiMax), 5 gal/A by air or 10 gal/A ground (Bumper), 2 gal/A by air or 10 gal/A ground (Tilt). Do not apply more than 8 fl oz/A/season of Tilt on field corn harvested for forage. If using Propimax or Bumper do not apply to field corn or field corn grown for seed after silking.
	propiconazole + azoxystrobin Quilt	10.5–14 fl oz/A Apply when disease first appears. If conditions favorable for disease persists, reapply every 14 days.	Do not apply more than two applications of Quilt or other strobilurin fungicides per year. Do not apply more than 28 fl oz/A for field corn harvested for forage.	Quilt may be applied by ground, air or chemigation. Do not apply more than 56 fl oz/A per season. Do not apply within 30 days of harvest for forage, grain or stover.
	propiconazole + trifloxystrobin Stratego	10–12 fl oz/A Apply when disease first appears and at 7–14 day intervals, thereafter if conditions continue to favor disease. Applications may be made to corn from the 4-leaf (V4) stage to after silking.	Do not apply more than 24 fl oz/A of Stratego/year. Do not apply to field corn and field corn grown for seed after silking. Do not graze or harvest for forage within 30 days of application. Do not apply more than 2 sequential applications of Stratego. Do not apply more than 2 total applications of Stratego or other strobilurin fungicides.	Use higher rates and shorter intervals when disease pressure is high.
	pyraclostrobin Headline	6–9 fl oz/A Apply before diseases occur. If conditions favorable for disease persist, reapply every 7–14 days. Use the higher rate and shorter intervals when disease pressure is high.	Do not apply within 7 days of harvest. Do not apply more than two applications of Headline without alternating with a fungicide that has a different mode of action for at least one application	Adjuvants may be used with Headline. Do not apply more than 72 fl oz/A per season.

FOLIAR FUNGICIDES FOR CORN

Disease	Fungicide	Dosage and Interval	Limitations	Special Notes
Northern corn leaf blight Northern corn leaf spot Helminthosporium diseases Helminthosporium leaf blights <i>(Helminthosporium maydis, H. carbonum, and H. turcicum)</i>	azoxystrobin Quadris	6-15.5 fl oz/A Apply before diseases appear. Repeat applications may be required on a 7–14 days schedule.	Do not apply within 7 days of harvest. Do not apply more than two sequential applications of Quadris without alternating with another fungicide chemistry. Do not apply more than 2 applications of Quadris or other strobilurin fungicides per year.	Use only in an integrated disease management approach with resistant hybrids, proper fertility, residue management and crop rotation. Quadris may be applied by ground, air or chemigation. Do not apply more than 12 fl oz of product/A per season.
	chlorothalonil Bravo Ultrex	0.7–1.8 lbs/A Begin applications when conditions favor disease and repeat every 7 days. Under severe disease conditions, use 1.4–1.8 lbs/A.	Do not apply within 14 days of harvest. Do not apply to sweet corn to be processed. Do not allow livestock to graze treated fields. Do not ensile treated corn.	Bravo Ultrex may be applied by ground, air or chemigation. Use sufficient water to obtain adequate coverage, 5–10 gal/A for concentrated ground and aerial application. Do not apply more than 10.9 pounds of product per acre per season.
	chlorothalonil + surfactant Bravo Weather Stik	0.75–2 pints/A Begin applications when conditions favor disease and repeat every 7 days. Under severe disease conditions use 1.5–2 pints/A.	Do not apply within 14 days of harvest. Do not apply to sweet corn to be processed. Do not allow livestock to graze treated fields. Do not ensile treated corn.	Use sufficient water to obtain adequate coverage, 5–10 gal/A for concentrated ground and aerial application. Do not apply more than 12 pints of product/A per season.
	mancozeb Dithane M-45 Manzate Flowable Penncozeb 4FL Penncozeb 75 DF Penncozeb 80 WP	1.5 lbs/A (repeat at 4–14 days) 1.2 qts/A 0.8–1.2 qts/A 1–1.5 lbs/A (repeat as needed) 1–1.5 lbs/A (repeat as needed)	Do not apply more than 12 qts (Manzate Flowable and Penncozeb 4FL), 15 lbs (Penncozeb 80WP), or 16 lbs (Penncozeb 75 DF, Dithane M-45) of product per acre per season. Do not apply within 40 days of harvest. Do not feed treated forage to livestock.	Use Latron CS-7 surfactant to improve product performance.
	mancozeb + surfactant Dithane DF Rainshield Dithane F-45 Rainshield Manzate Pro-Stick	1.5 lbs/A 1.2 qts/A 1.5 lbs/A Start applications at disease onset and repeat at 4–14 day intervals for Dithane DF Rainshield and Dithane F-45 Rainshield or 4–7 day intervals for Manzate Pro-Stick.	Do not apply within 40 days of harvest. Do not feed treated forage to livestock.	Do not apply more than 16 lbs of Dithane DF Rainshield, 12 qts/A of Dithane F-45 Rainshield or 15 lbs of Manzate Pro-Stick during the season. Use Latron CS-7 surfactant to improve product performance.

FOLIAR FUNGICIDES FOR CORN

Disease	Fungicide	Dosage and Interval	Limitations	Special Notes
Northern corn leaf blight	propiconazole	2-4 fl oz/A	If using Tilt, do not apply within 30 days of harvest for forage, grain and stover.	Apply a minimum of 5 gal/A by air or 15 gal/A ground (PropiMax), 5 gal/A by air or 10 gal/A ground (Bumper), 2 gal/A by air or 10 gal/A ground (Tilt).
Northern corn leaf spot	Tilt	Apply when disease first appears.		
Helminthosporium diseases	PropiMax EC	If conditions favorable for disease persist, reapply every 7-14 days.	If using PropiMax or Bumper, do not harvest field corn, field corn grown for seed for forage within 30 days of application.	Do not apply more than 8 fl oz/A/season of Tilt on field corn harvested for forage.
Helminthosporium leaf blights	Bumper		Do not apply more than 16 fl oz/A/season.	If using Propimax or Bumper do not apply to field corn or field corn grown for seed after silking.
<i>(Helminthosporium maydis, H. carbonum, and H. turcicum)</i>	propiconazole + azoxystrobin	7-14 fl oz/A	Do not apply more than two applications of Quilt or other strobilurin fungicides per year.	Quilt may be applied by ground, air or chemigation.
(CONTINUED)	Quilt	Apply when disease first appears. If conditions favorable for disease persists, reapply every 7-14 days. Increase rate as disease pressure increases.	Do not apply more than 28 fl oz/A for field corn harvested for forage.	Do not apply more than 56 fl oz/A per season. Do not apply within 30 days of harvest for forage, grain or stover.
	propiconazole + trifloxystrobin	10-12 fl oz/A	Do not apply more than 24 fl oz/A of Stratego/year.	Use higher rates and shorter intervals when disease pressure is high.
	Stratego	Apply when disease first appears and at 7-14 day intervals, thereafter if conditions continue to favor disease Applications may be made to corn from the 4-leaf (V4) stage to after silking.	Do not apply to field corn and field corn grown for seed after silking. Do not graze or harvest for forage within 30 days of application. Do not apply more than 2 sequential applications of Stratego. Do not apply more than 2 total applications of Stratego or other strobilurin fungicides.	
	pyraclostrobin	9-12 fl oz/A	Do not apply more than 72 fl oz/A per season.	Adjuvants may be used with Headline.
	Headline	Apply prior to disease development and at 7-14 day intervals, thereafter if conditions continue to favor disease. Use higher rates and shorter intervals when disease pressure is high.	Do not apply more than two sequential applications of Headline.	Do not apply more than two applications of Headline without alternating with a fungicide that has a different mode of application for at least one application.
Rust <i>(Puccinia sorghi)</i>	azoxystrobin	6-15.5 fl oz/A	Do not apply within 7 days of harvest.	Use only in an integrated disease management approach with resistant hybrids, proper fertility, residue management and crop rotation.
	Quadris	Apply before diseases appear. Repeat applications may be required on a 7-14 days schedule.	Do not apply more than two sequential applications of Quadris without alternating with another fungicide chemistry. Do not apply more than 2 applications of Quadris or other strobilurin fungicides per year.	Quadris may be applied by ground, air or chemigation. Do not apply more than 12 fl oz of product/A per season.

FOLIAR FUNGICIDES FOR CORN

Disease	Fungicide	Dosage and Interval	Limitations	Special Notes	
Rust (<i>Puccinia sorghi</i>) (CONTINUED)	chlorothalonil + surfactant Bravo Weather Stik	0.75–2 pints/A Begin applications when conditions favor disease and repeat every 7 days. Under severe disease conditions use 1.5–2 pints/A.	Do not apply within 14 days of harvest. Do not apply to sweet corn to be processed. Do not allow livestock to graze treated fields. Do not ensile treated corn. Do not apply more than 12 pints/A per season.	Use sufficient water to obtain adequate coverage, 5–10 gal/A for concentrated ground and aerial application.	
	chlorothalonil Bravo Ultrex	0.7–1.8 lbs/A Begin applications when conditions favor disease and repeat every 7 days. Under severe conditions, use 1.4–1.8 lbs/A.	Do not apply within 14 days of harvest. Do not apply to sweet corn for processing. Do not allow livestock to graze treated fields. Do not ensile treated corn.	Bravo Ultrex may be applied by ground, air or chemigation. Use sufficient water to obtain adequate coverage, 5–10 gal/A for concentrated ground and aerial application. Do not apply more than 10.9 pounds product per acre per season.	
	mancozeb Dithane M-45 Manzate Flowable Penncozeb 4FL Penncozeb 75 DF Penncozeb 80 WP	1.5 lbs/A (repeat at 4–14 days) 1.2 qts/A 0.8–1.2 qts/A 1–1.5 lbs/A (repeat as needed) 1–1.5 lbs/A (repeat as needed)	1.5 lbs/A (repeat at 4–14 days) 1.2 qts/A 0.8–1.2 qts/A 1–1.5 lbs/A (repeat as needed) 1–1.5 lbs/A (repeat as needed)	Do not apply more than 12 qts (Manzate Flowable and Penncozeb 4FL), 15 lbs (Penncozeb 80WP), or 16 lbs (Penncozeb 75 DF, Dithane M-45) of product per acre per season. Do not apply within 40 days of harvest. Do not feed treated forage to livestock.	Use Latron CS-7 surfactant to improve product performance.
	mancozeb + surfactant Dithane DF Rainshield Dithane F-45 Rainshield Manzate Pro-Stick	1.5 lbs/A 1.2 qts/A 1.5 lbs/A	1.5 lbs/A 1.2 qts/A 1.5 lbs/A	Do not apply within 40 days of harvest. Do not feed treated forage to livestock.	Do not apply more than 16 pounds of Dithane Rainshield, 12 qts/A of Dithane F-45 Rainshield or 15 lbs of Manzate Pro-Stick during the season. Use Latron CS-7 surfactant to improve product performance.
	propiconazole Tilt PropiMax EC Bumper	4 fl oz/A Apply when disease first appears. If conditions favorable for disease persist, reapply every 7-14 days.	4 fl oz/A Apply when disease first appears. If conditions favorable for disease persist, reapply every 7-14 days.	If using Tilt, do not apply within 30 days of harvest for forage, grain and stover. If using PropiMax or Bumper, do not harvest field corn, field corn grown for seed for forage within 30 days of application. Do not apply more than 16 fl oz/A/season.	Apply a minimum of 5 gal/A by air or 15 gal/A ground (PropiMax), 5 gal/A by air or 10 gal/A ground (Bumper), 2 gal/A by air or 10 gal/A ground (Tilt). Do not apply more than 8 fl oz/A/season of Tilt on field corn harvested for forage. If using Propimax or Bumper do not apply to field corn or field corn grown for seed after silking.

FOLIAR FUNGICIDES FOR CORN

Disease	Fungicide	Dosage and Interval	Limitations	Special Notes
Rust (<i>Puccinia sorghi</i>) (CONTINUED)	propiconazole + azoxystrobin Quilt	10.5–14 fl oz/A Apply when disease first appears. If conditions favorable for disease persists, reapply every 14 days.	Do not apply more than two applications of Quilt or other strobilurin fungicides per year. Do not apply more than 28 fl oz/A for field corn harvested for forage.	Quilt may be applied by ground, air or chemigation. Do not apply more than 56 fl oz/A per season. Do not apply within 30 days of harvest for forage, grain or stover.
	propiconazole + trifloxystrobin Stratego	7–10 fl oz/A Apply when disease first appears and at 7–14 day intervals, thereafter if conditions continue to favor disease. Applications may be made to corn from the 4-leaf (V4) stage to after silking.	Do not apply more than 24 fl oz/A of Stratego/year. Do not apply to field corn and field corn grown for seed after silking. Do not graze or harvest for forage within 30 days of application. Do not apply more than 2 sequential applications of Stratego. Do not apply more than 2 total applications of Stratego or other strobilurin fungicides.	Use higher rates and shorter intervals when disease pressure is high.
	pyraclostrobin Headline	6–9 fl oz/A Apply before disease occur. If conditions favorable for disease persist, reapply every 7–14 days. Use the higher rate and shorter intervals when disease pressure is high.	Do not apply within 7 days of harvest. Do not apply more than two applications of Headline without alternating with a fungicide that has a different mode of action for at least one application.	Adjuvants may be used with Headline. Do not apply more than 72 fl oz/A per season.
Eyespot (<i>Aureobasidium zeae</i>)	azoxystrobin Quadris	6-15.5 fl oz/A Apply prior to disease development and at 7–14 day intervals, thereafter if conditions continue to favor disease.	Do not apply within 7 days of harvest. Do not apply more than two applications of Quadris or other strobilurin fungicides per year without alternating with a fungicide that has a different mode of action.	Quadris may be applied by ground, air or chemigation. Do not apply more than 12 fl oz of product/A per season. Do not apply more than 2 total applications of Quadris or other strobilurin fungicides.
	propiconazole Tilt PropiMax EC Bumper	4 fl oz/A Apply when disease first appears. If conditions favorable for disease persist, reapply every 7-14 days if using Tilt or every 14 days if using PropiMax or Bumper.	If using Tilt, do not apply within 30 days of harvest for forage, grain and stover. If using PropiMax or Bumper, do not harvest field corn, field corn grown for seed for forage within 30 days of application. Do not apply more than 16 fl oz/A/season.	Apply a minimum of 5 gal/A by air or 15 gal/A ground (PropiMax), 5 gal/A by air or 10 gal/A ground (Bumper), 2 gal/A by air or 10 gal/A ground (Tilt). Do not apply more than 8 fl oz/A/season of Tilt on field corn harvested for forage. If using Propimax or Bumper do not apply to field corn or field corn grown for seed after silking.

FOLIAR FUNGICIDES FOR CORN

Disease	Fungicide	Dosage and Interval	Limitations	Special Notes
Eyespot (<i>Aureobasidium zeae</i>) (CONTINUED)	propiconazole + azoxystrobin Quilt	10.5–14 fl oz/A Apply when disease first appears. If conditions favorable for disease persists, reapply every 14 days.	Do not apply more than two applications of Quilt or other strobilurin fungicides per year. Do not apply more than 28 fl oz/A for field corn harvested for forage.	Quilt may be applied by ground, air or chemigation. Do not apply more than 56 fl oz/A per season. Do not apply within 30 days of harvest for forage, grain or stover.
	propiconazole + trifloxystrobin Stratego	10–12 fl oz/A Apply when disease first appears and at 7–14 day intervals, thereafter if conditions continue to favor disease. Applications may be made to corn from the 4-leaf (V4) stage to after silking.	Do not apply more than 24 fl oz/A of Stratego/year. Do not apply to field corn and field corn grown for seed after silking. Do not graze or harvest for forage within 30 days of application. Do not apply more than 2 sequential applications of Stratego. Do not apply more than 2 total applications of Stratego or other strobilurin fungicides.	Use higher rates and shorter intervals when disease pressure is high.

CORN GROWTH STAGE CHART

Growth Stage	Description
VE	Emergence
V1	One leaf with collar visible
V2	Two leaves with collar visible
V(n)	(n) leaves with collar visible
VT	Tasseling
R1	Silking
R2	Blister
R3	Milk
R4	Dough
R5	Dent
R6	Maturity