DISEASE MANAGEMENT IN WHEAT

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The most effective and economical method to control diseases of wheat is to plant disease resistant varieties. Resistance is the primary means to manage foliar diseases, which cause the greatest yield reduction each year. However, few recommended varieties have "good" or high resistance to all the major foliar diseases. In addition, populations of fungi causing leaf rust and powdery mildew are constantly changing. There are numerous strains or races of these fungi. When a new variety is released, it is usually resistant to the most commonly occurring races of the fungi prevalent at that time. The race population can change rapidly. Certain individual races or new races may become more common. If a variety is not resistant to these races of the fungus, it can become severely diseased. This may happen as quickly as a year after the release of a new variety. Varietal recommendations are modified each year, often as a result of changes in disease susceptibility. Refer to the most recent information about the best varieties to grow in this guide and in the annual variety performance bulletin located at http://www.swvt.uga.edu/small.html.

Weather conditions during the winter and spring can have a major effect on the incidence and severity of disease (Table 22). If the winter and spring are cool and/or dry, leaf diseases will usually be of little or no significance regardless of a variety's resistance. A warm, wet winter and spring are favorable for infection by disease-causing fungi. This results in more severe disease. New fungal races also increase more rapidly under such conditions. The combination of low resistance and warmer than normal winters and springs are favorable for severe powdery mildew, leaf rust, and Stagonospora nodorum leaf and glume blotch, the three most important fungal diseases. *Stagonospora nodorum* was formerly named *Septoria nodorum*. These conditions lead to an increased use of foliar fungicides to control diseases on susceptible varieties.

Seedborne and soilborne diseases are controlled primarily by seed treatment and crop rotation. Resistance is generally not available for these diseases. Following planting and fertility management recommendations all contribute to successful disease management for these and other diseases.

Among the diseases of wheat, viruses are often the most difficult to control. Three virus diseases occur on wheat in Georgia: soilborne mosaic, wheat spindle streak mosaic, and barley yellow dwarf. Most varieties have good tolerance to soilborne mosaic and wheat spindle streak. Tolerance or resistance to barley yellow dwarf is fair to low for most varieties.

FHB also called scab, is a devastating and dangerous disease of wheat and barley with worldwide distribution. The disease causes yield loss, low-test weights, low seed germination, and contamination of grain with mycotoxins. A vomitoxin called deoxynivalenol (DON) is considered the primary mycotoxin associated with FHB. This mycotoxin is subject to regulatory limits by the U.S. Food and Drug Administration (FDA). While the incidence and severity of FHB (Fusarium Head Blight) was low in 2018. FHB incidence and severity has been high throughout the state from 2014 to 2017.

LEAF DISEASES

Powdery Mildew. This disease may occur on any above ground plant part, but it is usually most prevalent on the upper surface of the lower leaves. The conspicuous white to gray patches of fungus appear early in the season. When powdery mildew is severe, the entire leaf turns yellow and dies. Black spore-producing structures develop in older lesions. Dense stands, high nitrogen fertility, and rapid growth increase susceptibility. Under such conditions a variety listed as having "good" resistance may become heavily infected. As the stem elongates and temperatures increase, conditions become less favorable for powdery mildew. This disease has the least effect on yields of any of the three diseases discussed in this guide. On all but the most susceptible varieties, powdery mildew confined to the lower

leaves has little or no effect on yield. Fungicides should not be applied until flag leaf emergence unless a variety is very susceptible. If fungicide is applied too early, the plant will not be protected during the latter half of the grain-filling period. A complete description, diagnosis and management is now available http://extension.uga.edu/publications/detail.cfm?number=C1059 (circular 1059).

Leaf Rust. Reddish-brown pustules develop on leaves and sheaths. These pustules are filled with spores of the fungus. Rubbing an infected leaf will leave rusty colored areas on your fingers. Rust pustules may be very tiny, barely large enough to see with the naked eye, to 1/8 inch in length. Generally, varieties with higher levels of resistance will have smaller pustules than varieties with lower levels of resistance. Varieties with poor resistance will also have larger yellow halos around the pustules. Leaf rust has the greatest effect on yield of the diseases discussed here because it develops rapidly during favorable weather. A complete description, diagnosis and management is now available http://extension.uga.edu/publications/detail.cfm?number=C1060 (circular 1060).

Stripe Rust. Also known as yellow rust. Pustules coalesce to produce long yellow stripes between veins of the leaf and sheath. Small yellow, linear lesions occur on floral bracts. These pustules are filled with spores of the fungus. In Georgia, the disease appears in late February early March during cool, overcast and wet weather. Stripe rust occurs well before leaf rust. Stripe rust is an emerging disease in Georgia and has been seen for two of the last three years. Stripe rust can have a potentially devastating effect on yield. Chemical options are available to control stripe rust however selection of fungicide should be made judiciously. Genetic resistance to stripe rust should be the best way to manage the disease. According to state breeders, there are several varieties or breeding lines than have higher levels of resistance to the disease. Work is in progress to release newer varieties with resistance to stripe rust. A complete description, diagnosis and management is now available at http://extension.uga.edu/publications/detail.html?number=C960 (circular 960).

Leaf and Glume Blotch. Lesions (spots) are initially water-soaked and then become dry, yellow, and finally brown. Lesions are generally oblong, sometimes containing small black spore producing structures called pycnidia. The lesions are often surrounded by a yellow halo. Lower leaves are generally more heavily infected, with lesions joining together to cause entire leaves to turn brown and die. If pycnidia are present on lower leaves when the uppermost leaf and the head begin to emerge, infective spores will move to the top of the plant in splashing rain even after a brief shower. Symptoms may not appear for 10-15 days on the top leaves or glumes on the head. By the time lesions are seen on the head, it is too late for effective fungicide use. Therefore, it is important to examine the lower leaves for lesions when making decisions about fungicide application, not just the top leaves. Lesions are first tan or brown on the upper portion of the glume while the lower part remains green. As the head matures, it becomes purplish to black in appearance from glume blotch. Leaf and glume blotch can reduce yield as much as 20% and reduce test weight due to grain shriveling even when disease severity is low.

Barley Yellow Dwarf. Barley yellow dwarf virus (BYDV) is probably the most widely distributed virus in wheat. It is estimated to reduce yields by 5 to 25% each year. The symptoms are variable and resemble nutritional problems or frost damage. Usually the discoloration is characterized by various shades of yellow or reddening from the tips to the base and from the leaf margin to the midribs of the leaves. Some varieties have more yellow symptoms whereas others have red to purple discoloration. When infection begins early in the season, after heading, the uppermost leaf is often very upright. Severe infection usually causes some stunting and reduction in numbers of seeds per head. BYDV is transmitted by several aphid species. Aphids acquire the virus by feeding on infected plants for very short periods and then move to other uninfected plants. Infection can occur any time when viruliferous aphids multiply and migrate in fields. Crop rotation is less effective for barley yellow dwarf because aphids can transmit the virus between fields, and many grasses on which the aphids feed also harbor the virus. Barley yellow

dwarf can cause severe losses in many Georgia fields, most often following a mild fall and winter, which allows aphids to be active and transmit the virus early in plant development. BYDV is present in nearly all fields each year. Disease severity depends on aphid populations and the proportion of aphids that can transmit the virus. Control of volunteer wheat and grassy weeds during the summer and along the edges of fields may slow initial infection. Planting during the latter part of the recommended period can delay fall infection. Resistant varieties and insecticide application to control aphids can reduce damage from barley yellow dwarf (see Insect Management).

Table 22. Optimum temperature and moisture for the major diseases affecting wheat grown in Georgia

DISEASE	OPTIMUM MOISTURE	OPTIMUM TEMPERATURE
Powdery Mildew[1]	High Humidity	59-72°F [2]
Leaf Rust	Free Moisture	59-72°F
Stripe Rust	Free Moisture	50-59°F
Leaf and Glume Blotch	Free Moisture	68-75°F
Take-All	Moist Soils	50-68°F
Fusarium Head Blight	High humidity at time of flowering	77-86°F

[1] Powdery mildew fungus does not need free moisture to develop.
[2] Temperatures above 77°F are not favorable for Powdery mildew fungal development.

SEEDBORNE AND SOILBORNE DISEASES

Seedling Blights. Several fungal pathogens infect the seed as it matures, particularly when rains are frequent during seed development. Seed quality is reduced significantly, and germination is often problematic. Soil temperatures, which are higher early in the fall, also favor infection of the ungerminated seed and tissues of the germinating seedling by several species of soilborne *Pythium*. The combination of infection by both seedborne and soilborne fungi can result in severe pre- and post-emergence damping off. The result may be a substantially reduced stand that grows slowly, or it may be necessary to replant. Seedling blights can be reduced by planting good-quality seed and by the use of fungicide-treated seed (Table 23).

Smut Diseases. There are two smut diseases that affect wheat in Georgia. They usually cause only minor problems, but they can increase rapidly and cause serious losses if not controlled. Loose smut causes the tissues in the head to be replaced by masses of powdery spores. The fungus spores invade the embryo of the developing seed and the fungus survives there until the seed germinates. Common bunt or stinking smut occurs rarely, but it can cause complete loss of a crop. The tissues of the head remain intact, but the seed is destroyed. The masses of smut spores are in 'bunt balls', which are held in the seed coat of the grain. Stinking smut gets its name from the foul odor it produces that is similar to rotting fish. The bunt balls are easily ruptured during harvest and millions of spores are deposited on the surface of healthy seeds. Spores germinate and invade the germinating seedling, and then the fungus grows systemically like loose smut. Smut spores are not toxic to animals or humans. These smut pathogens are only transmitted by seed. Planting certified seed is an effective method to control smut diseases because seed fields are carefully inspected. Seed treatment with systemic fungicides is an inexpensive way to achieve nearly complete control of loose smut and common bunt (Table 23).

Table 23. Seed Treatment Fungicides for Control of Seedborne and Soilborne Diseases of Wheat

FUNGICIDE	CROP	RATE/100 LB SEED	REMARKS AND PRECAUTIONS
azoxystrobin Dynasty	Wheat and Barley	0.153-0.882 fl oz	For protection against common bunt and partial control of dwarf bunt. Where appropriate use in combination with Dividend extreme
captan Captan 400	Wheat, Barley, Oats, Rye	See label	Controls seedling blights. Does not control smuts.
carboxin + captan Enhance	Wheat, Barley, Oats	4.0 oz.	Controls loose smut, common and kernel bunt, seed rots and seedling diseases.
carboxin + ipconazole Rancona V100	Wheat, Barley, Oats, Rye	0.9 -1.5 fl oz	For control of seedborne and soilborne fungi
carboxin + thiram Vitavax 200 RTU-Vitavax-Thiram	Wheat, Barley, Oats, Triticale Wheat, Oats, Barley	2.0 oz. 2.0-4.0 oz.	Controls loose smut and stinking smut. Controls seedling blights. See label for specific rate for grains.
carboxin + PCNB + metalaxyl Prevail	Wheat, Oats, Barley	2.5 – 5.0 oz. wheat 1.6- 3.3 oz. oats	Controls loose smut, common and kernel bunt, seed rots and seedling diseases from Pythium and Rhizoctonia.
difenoconazole Dividend	Wheat	0.5-1.0 oz.	Controls loose smut and stinking smut.
difenoconazole + mefenoxam Dividend XL RTA Dividend XL Dividend Extreme	 Wheat Wheat Wheat	 5-10 oz. 1.0-.2.0 oz. 0.5-1.0 oz.	Controls loose smut, stinking smut, and Pythium damping-off. Grower and commercially applied.
fludioxonil Maxim 4FS	Barley, Millet, Oats, Rye, Sorghum, Triticale, Wheat	0.08-0.16 fl oz.	Controls Fusarium, Rhizoctonia, Helminthosporium and weakly pathogenic fungi such Aspergillus and Penicillium.
ipconazole Rancona 3.8 FS Rancona Apex	Wheat, Barley, Oats, Rye	3.8 FS =0.051 – 0.085 fl. oz. Apex= 5.0 – 8.3 fl. oz.	Controls loose smut, common and kernel bunt, seed rots and seedling diseases.
ipconazole + metalaxyl Rancona Pinnacle	Wheat, Barley, Oats, Rye	5.0 – 8.33 fl oz	Controls seed rot, damping off seed and soil borne fungi, loose smut, common and kernel bunt,
mefenoxan Apron XL, Apron XL-LS	Wheat, Barley, Millet, Oats, Rye, Sorghum, Triticale	0.042-0.08	Controls Pythium damping-off. Does not control smuts.
metalaxyl Allegiance Sebring Dyna-shield Belmont	Wheat, Barley, Millet, Oats, Rye, Sorghum, Triticale	See label	Controls Pythium damping-off. Does not control smuts.
metalaxyl + metconazole + Clothianidin NipsIt SUITE	Wheat, Oats, Barley	5.0 – 7.5 fl oz	Controls common smut, flag smut loose smut, seed decay fungi, Fusarium seed scab, Pythium seed rot and seedling. Early season Fusarium seedling dieback, early season Rhizoctonia root rot and early season common rot
penflufen Evergol Prime	Wheat, Oats, Barley	0.32 fl. oz.	Controls loose smut, common and kernel bunt, seed rots and seedling diseases

prothioconazole + penflufen + metalaxyl Evergol Energy	Wheat, Oats, Barley	1.0 fl. oz.	Controls loose smut, common and kernel bunt, seed rots and seedling diseases along with early suppression of powdery mildew, rust and glume/leaf blotch
sedaxane Vibrance	Wheat, Barley, Oats, Rye, Triticale	0.08-0.16 fl oz	Controls Loose smut, Seed decay seedling blight and damping-off caused by *Rhizoctonia solani*
sedaxane + difenconazole + mefenoxam Vibrance Extreme	Wheat, Barley, Oats, Rye, Triticale	2.8-5.6 fl oz	Controls smuts and bunts, general seed rot, seedling blight, root rot and damping-off caused by seed or soilborne *Fusarium* spp or *Rhizoctonia* spp, Seedling blight and root rot and damping-off caused by *Pythium* spp, seed borne *Septoria*, Septoria leaf blotch, Fusarium seed scab
sedaxane + difenconazole + fludioxonil + mefenoxam Vibrance Quattro	Wheat, Barley, Oats, Rye, Triticale	5.0 fl oz	Controls smuts and bunts, general seed rot, seedling blight, root rot and damping-off caused by seed or soilborne *Fusarium* spp or *Rhizoctonia* spp, Seedling blight and root rot and damping-off caused by *Pythium* spp, seed borne *Septoria*, Septoria leaf blotch, Fusarium seed scab
tebuconazole Raxil (tebuconazole can be found in various combinations with other fungicides, look for Sativa, Foothold, Raxil)	Wheat, Oats, Barley	3.5 to 4.6 fl. oz.	Controls loose smut and stinking smut. Controls seedling blights. Commercially-applied and drill-box formulations available.
thiram	Wheat, Barley, Rye	See label	Controls seedling blights. Does not control smuts. Can be used for drill-box treatment.
triadimenol Baytan 30 RTU Baytan-Thiram	Wheat, Barley, Oats, Rye All	0.75-1.5 oz. 4.5-9.0 oz.	Controls loose smut and stinking smut. Controls smuts and seedling blights.
triticonazole + metconazole Charter F	Wheat, Barley, Oats, Rye	5.4 fl. oz.	Controls loose smut, common and kernel bunt, seed rots and seedling diseases.

For information on CruiserMaxx Cereals (thiamethoxam + mefenoxam + difenconazole), CruiserMaxx Vibrance Cereals (sedaxane + thiamethoxam + mefenoxam + difenconazole), Cruiser Vibrance Quattro (thiamethoxam + mefenoxam + difenconazole + sedaxane + fludioxonil), and Gaucho XT (Imidaclorpid + metalaxyl + tebuconazole), Rancona Crest (ipconazole + metalaxyl + imidacloprid). See the Insect Management Section of this Guide. Commercial treatment of small grain seed is preferred, but a drill box treatment can be used with many formulations. Drill-box treatment may not give control to commercial treatment

Take-all Root and Crown Rot. The fungus responsible for this disease builds up in the soil when wheat is planted in the same field two or more years. Roots are damaged progressively during the winter and early spring. Shortly after heading infected plants wilt and die due to poor water movement from the rotted roots to the stems. The crown and lower stem turn black and plants are easily pulled from the soil. Areas of dead plants are circular or follow tillage patterns indicating movement of infested crop debris. Take-all is reduced by rotation with oats, fallow, or other non-cereal winter crops such as canola. Rotation with barley, rye, or triticale maintains the fungus in roots of these crops although they may not exhibit symptoms as severe as on wheat. Sorghum as a summer crop will reduce the disease in a

subsequent wheat crop, whereas soybeans favor take-all. Other control measures include planting near the end of the recommended period to reduce fall infection and avoiding soil pH above 6.5.

Soilborne Mosaic and Spindle Streak Mosaic. The symptoms of soilborne mosaic range from mild green to a prominent yellow leaf mosaic. Plants may be stunted or rosette in shape. Symptoms are usually seen in late winter and early spring. New leaves may be mottled or exhibit streaks or flecking. Wheat spindle streak mosaic virus causes stunting and poor growth with yellow mottling and numerous elongated streaks on leaves. Leaf streaks are usually a light green to yellow. The discontinuous streaks run parallel to the leaf veins and taper to form a spindle shape. Both viruses are transmitted by a fungus, which survives in the soil and transmits the virus into the wheat roots. These diseases are typically a problem when soils remain wet during the late fall and winter. Spindle streak mosaic and soilborne mosaic are most common in fields planted to wheat for two or more years. Both viruses may occur together, and symptoms may intermingle. Crop rotation is an effective control method.

OTHER DISEASES

Fusarium Head Blight (FHB) or Head Scab. Fusarium Head Blight is caused by the pathogen *Fusarium* spp /teleomorphs *Gibberella* spp and *Microdochium nivale*. FHB is a devastating and dangerous disease of wheat and barley with worldwide distribution. The disease causes yield loss, low-test weights, low seed germination, and contamination of grain with mycotoxins. A vomitoxin called deoxynivalenol (DON) is considered the primary mycotoxin associated with FHB. This mycotoxin is subject to regulatory limits by the U.S. Food and Drug Administration (FDA). While the incidence and severity of the infections of Fusarium head blight in 2018 were low due to weather patterns, high incidence and severity causing severe losses were registered in in previous years in Georgia. The fungus requires warm (78-86 F consistently), humid/wet weather coinciding with wheat at flowering stages for infection to occur. *Fusarium* conidia and/or ascospores infection are most common at wheat anthesis. Fusarium Head Blight is best recognized on emerged immature heads where one or more or the entire head appears prematurely bleached (see image to right). Usually a pinkish/orange mycelium is present, which will develop dark fruiting bodies (perithecia). Diseased, bleached spikelets are sterile or contain shriveled/discolored seed (usually with a tint of pink or orange). For control, avoid rotation with other cereal crops, specifically corn (*Fusarium graminearum* also causes ear and stalk on corn) or sorghum. For more information on FHB visit http://www.scabusa.org. For FHB risk and /or prediction information visit http://www.wheatscab.psu.edu. A complete description, diagnosis and management is now available at http://extension.uga.edu/publications/detail.cfm?number=C1066 (circular 1066).

FUNGICIDE USE

The decision about whether or not to use a fungicide needs to be made carefully. Fungicides do not increase yield. They only help preserve yield and test weight. If yield potential is low or there is no disease present at the critical time for fungicide application or conditions are not favorable for disease, there will be little benefit from fungicide application. If the price of wheat is low, there will be less profit from the use of fungicides. For these reasons, a decision guide has been developed to help you determine if fungicides will be beneficial. This guide makes no guarantee for an economic return on the fungicide investment. It will simply allow you to determine if fungicide treatment might help maintain yields.

To use this guide effectively, you must scout your wheat fields and be able to recognize the three major foliage diseases likely to reduce yields. Consult the UGA Extension publications Plant Pathology section at http://extension.uga.edu/publications.html Or the field crops section of the UGA Plant Pathology Extension site http://www.caes.uga.edu/departments/plant-pathology/extension/educational-materials/plant-disease-library.html for information on these and other wheat diseases. Some fungicide manufacturers have a color booklet on small grain diseases, which is helpful in disease identification. Begin scouting soon after the plants tiller and the stem begins to elongate. The leaves of plants should be observed at least once per week when jointing begins. Inspect plants twice each week from the time the flag (uppermost) leaf begins to emerge until flowering is complete. This is the most critical time to

consider fungicide application. Inspect all the leaves, especially the lower leaves. Early in the season the lowest leaves may have symptoms while the younger upper leaves do not. Symptoms on the lower leaves are a good indication that the upper leaves will become infected, especially if rain or heavy dews occur during the next several weeks. Because disease symptoms may not appear until 7-12 days after infection begins, upper leaves that appear healthy may already be infected.

Fungicides can only be effective when you carefully select the fungicide with good activity against the disease(s) present (Table 24). They should be applied at the correct rate and time according to the label. Fungicides should be applied with enough water to get good coverage: 5-7 gal/acre for aerial and 20-30 gal/acre for ground application. Use of a spreader-sticker will help improve leaf retention and fungicide performance. When applying fungicides always read the label and comply with the instructions and restrictions listed.

Generally, the most effective time to apply fungicides is from flag leaf emergence to completion of heading but be certain to follow any label restrictions concerning time of application, the number of applications, and total amount of fungicide that can be applied per season.
Infectious fungi sometimes develop resistance to particular fungicides, especially when a product is used repeatedly without alternating with chemically unrelated fungicides. When fungicide resistance develops, there is no value in increasing rates, shortening intervals between sprays, or using other fungicides with similar modes of action. Several general strategies are recommended to minimize the risk of fungicide resistance. First, don't rely on fungicides alone for disease control. Avoid using wheat varieties that are highly susceptible to common diseases. Follow good disease management practices to reduce the possibility of fungicide resistance. Limit the number of times at-risk fungicides are used during a growing season. Alternate at-risk fungicides with different fungicide groups. These are general principles that can help to reduce but not eliminate risk. A fungicide-resistant pathogen population can still develop when these principles are practiced.

Table 24. Fungicides for Wheat Foliar Diseases

DISEASE	CHEMICAL AND FORMULATION	RATE PRODUCT PER ACRE	REMARKS AND PRECAUTIONS	FRAC	REI
Stagonospora Leaf and Glume Blotch, Leaf Rust, Stripe Rust, Powdery Mildew, Tan Spot	azoxystrobin** Quadris Equation Satori	6.2-10.8 oz. 4.0-12.0 fl oz	Apply after Feekes 6 but not later than Feekes 10.5. Do not harvest treated wheat for forage. A crop oil concentrate adjuvant may be added at 1.0% v/v to optimize efficacy	11	4 hrs
	azoxystrobin + cyproconazole Azure Xtra	3.5 -6.8 fl oz	Apply product at 3.5 oz /A in the spring at @ Feekes 5. Apply at 5-6.8 fl oz/A between Feekes 8-10.51.	11+3	12 hrs
	azoxystrobin + propiconazole Quilt, QuiltXcel, Avaris, Trivapro B	7-14 oz	Applications may be made no closer than a 14-day interval. Quilt and QuiltxXcel can be applied up to Feekes growth stage 10.5. QuiltXcel has a higher rate of azoxystrobin. Low rates of Quilt and QuiltXcel are used for spring suppression of early season diseases. 10.5 fl oz and above are used for flag leaf protection and maximizing yield potential. Trivapro A + Trivapro B= Trivapro co-pack. Do not apply more than 28 fl oa /A of Trivapro B per year	11+3	12 hrs
	azoxystrobin + tebuconazole Custodia	6.4-8.6 fl oz	Should be applied prior to disease development up to late head emergence (Feekes 10.5). Do not apply after this stage	11+3	12 hrs
	benzovindiflupyr Trivapro A	4.0 fl oz	Combining Trivapro A and Trivapro B co-pack. Apply in spring for early disease control or Feekes 8 through Feekes 10.5.4 for disease control on flag leaf. Make applications no closer than 14 days apart. Do not apply more than 14 fl oz/A of	7	12 hrs

			Trivapro A per year.		
	benzovindiflupyr + azoxystrobin + propiconazole Trivapro SE	9.4 -13.7 fl oz	For disease control on the flag leaf, apply from Feekes 8 (Zadoks 37) through Feekes 10 (Zadoks 45). Protecting the flag leaf is important for maximizing the potential yield. Highest yields are normally obtained Trivapro Fungicide is applied when the flag leaf is 50% to fully emerged. Trivapro Fungicide can be applied through full head emergence (Feekes growth stage 10.5.4). Do not apply after this stage to avoid possibly illegal residues.	7+11+3	12 hrs
	fluoxapyroxad + pyraclostrobin Priaxor	4-8 fl oz.	Apply no later than the beginning of flowering (Feekes 10.5, Zadok's 59). Maximum number of applications per season=2	7+11	12 hrs
	fluoxapyroxad + pyraclostrobin + propiconazole Nexicor	7-13 fl oz	For optimal disease control, begin applications of Nexicor prior to disease development. To maximize yield potential it is important to protect the flag leaf. Apply Nexicor immediately after flag leaf emergence, no later than the beginning of flowering (Feekes 10.5, Zadok's 59).	7+11+3	12 hrs
	fluoxastrobin Evito	2-4 fl oz.	For optimum results, begin applications preventatively and continue on a 14 to 21 day interval. Do make more than two sequential applications. Apply prior to disease development from Feekes 5 (Zadok's 31) up to late head emergence at Feekes 10.5 (Zadok's 59)	11	12 hrs
	fluoxastrobin + tebuconazole Evito T	4-6 fl oz	Apply a maximum of two applications per season Apply no later than Feekes growth stage 10 5. For optimum results, apply the rst application at approximately Feekes growth stage 5 (Zadoks 31) (shooting-pseudostem erected) and a second application no later than Feekes growth stage 10 5 (Zadoks 54) (heading completed)	11 + 3	12 hrs
	fluoxastrobin + flutriafol Fortix Preemtor SC	2-3 fl oz. 4-6 fl oz	For early season control Apply Fortix when flag leaf is 50% to fully emerged. Apply preventative when conditions for disease are favorable for development. *Supplemental labeling	11 + 3	12 hrs
	metconazole Caramba	10-14 oz.	Maximum number of applications per season=2; Minimum time from application to harvest=30 days	3	12 hrs
	picoxystrobin Aproach	3-4 fl oz 6-12 fl oz	For early season preventive disease control. Begin applications of Aproach prior to disease development and continue on a 7- to 14-day interval, depending on the targeted disease. Use higher rate and shorter interval when disease pressure is high.	11	12 hrs
	picoxystrobin + cyproconazole Aproach Prima	3.4 fl oz 3.4 -6.8 fl oz	For early season preventive disease control. Begin applications of Aproach-Prima prior to disease development and continue on a 7- to 14-day interval, depending on the targeted disease. Use higher rate and shorter interval when disease pressure is high	11+3	12 hrs
	propiconazole Tilt Propimax	4 oz.	Tilt can be applied until heading stage (Feekes 10.5). Do not apply Tilt after this growth stage to avoid possible illegal residues.	3	12 hrs
	propiconazole + trifloxystrobin Stratego	10 oz	Do not apply more than 2 applications of Stratego per season. Do not apply after Feekes 10.5	3+11	12 hrs

	prothioconazole Proline	4.3-5 fl oz.	For optimum disease control, the lowest labeled rate of a spray surfactant should be tank mixed with Proline. Up to two applications of Proline can made per year.	3	12 hrs
	prothiconazole + tebuconazole Prosaro	6.5 - 8.2 fl. oz.	Begin applications of Prosaro preventively when conditions are favorable for disease development. For optimum disease control, the lowest labeled rate of a spray surfactant should be tank mixed with Prosaro	3+3	12 hrs
	prothioconazole + trifloxystrobin Stratego YLD Delaro 325 SC	4 fl oz 8.0 fl oz	Begin applications preventively when conditions are favorable for disease development. Do not apply more than 2 applications per season. Do not apply after Feekes growth stage 10.5. Do not apply within 35 days of harvest	3+11	12 hrs
	pydiflumetofen propiconazole Miravis Ace	13.7 fl oz	Protecting flag leaf is important for maximizing the potential yield	7 + 3	12 hrs
	pyraclostrobin Headline	6-9 oz	Apply no later than Feekes 10.5	11	12 hrs
	pyraclostrobin + metconazole Twinline	7-9 fl oz.	Do not apply more than 2 applications per season. Do not apply after Feekes 10.5	11+3	12 hrs
	tebuconazole Folicur, several other with tebuconazole as active ingredient. Check label of specific products	4 fl oz.	Folicur is not longer manufactured (2009). No end-user restrictions for disease control. Use until supply lasts. Not labeled for Powdery mildew control. For all tebuconazole products, a maximum of 4 fl oz may be applied per acre per season	3	12 hrs
	tebuconazole + trifloxystrobin, Absolute Absolute Maxx	3-5 fl oz.	Begin applications preventively when conditions are favorable for disease development. For optimum disease control apply 5 fl oz at flag leaf stage (Feekes 8-9). For early season suppression of Tan Spot, Leaf Blight and Powdery Mildew, apply at 3-4 oz. Do not apply more than 5 fl oz per season. Do not apply after Feekes growth stage 10.5.2. Do not apply within 35 days of harvest. Do not use with adjuvants.	3+11	12 hrs

Economic yield response to control wheat diseases is most likely to occur in fields with yield potentials of more than 50 bu/A and varieties with fair to poor resistance. ***Always follow label instructions, recommendations and restrictions***.

Table 25: Fungicides for Fusarium Head Blight

Active ingredient	Product	Rate/A (fl. oz)	Head scab	Harvest Restriction
Metconazole 8.6%	Caramba 0.75 SL	13.5 - 17.0	G	30 days
Propiconazole 41.8%	Tilt 3.6 EC	4.0	P	Feekes 10.5
Prothioconazole 41%	Proline 480 SC	5.0 - 5.7	G	30 days
*Tebuconazole 38.7%	Folicur 3.6 F	4.0	F	30 days
Prothioconazole 19% Tebuconazole 19%	Prosaro 421 SC	6.5 - 8.2	G	30 days
Pydiflumetofen 13.7% Propiconazole 11.4%	Miravis Ace SE	13.7	G	Feekes 10.5.4

Efficacy categories; P=Poor; F=Fair; G=Good; VG=Very Good; E=Excellent. Timing of fungicide application is crucial for the control of FHB. Research indicates that products within the triazole class of fungicides are most effective if applied at early flowering (Feekes 10.5.1). **Strobilurin fungicides are not recommended for management of FHB**. **Strobilurin fungicides can increase the DON content of FHB-infected grain.**

*A maximum of 4 fl. oz. of tebuconazole-containing products may be applied per acre per crop season.

Table modified from 2018 fungicide table produced by "The North Central Regional Committee on Management of Small Grain Diseases (NCERA-184)". **This information is provided only as a guide. By law, it is the responsibility of the pesticide applicator to read and follow all current label directions. No endorsement is intended for any products listed, nor is criticism meant for products not listed. The University of Georgia and members or participants in the NCERA-184 committee assume no liability resulting from the use of these products. Always check the label before application for the most current rates and application restrictions**.