



## **SPECIAL ISSUE:**

# **The WheatTech Watchglass**

*Wheat Management Tips from Chris Bowley - WheatTech Inc.*

## **Late Spring Disease and Insect Control**

Wheat in Kentucky, Illinois, Indiana, Ohio and Michigan has really jumped due to above average temperatures in recent weeks. As a result the wheat is ahead of schedule in southern areas and a little behind schedule in northern regions. The majority of the wheat ranges from early heading to GS 10 in southern sections to GS 6-8 in the more northern sections.

Now that the wheat has had a chance to develop, it is possible to assess tiller numbers, head size, crop color and ultimately evaluate yield potential. Problems associated with drainage and winter-kill have been lower than normal due above average fall growth and relatively mild winter temperatures. Poor internal drainage usually causes large losses due to drowned-out areas as well as heaving and winter kill problems across the region. This year these problems are light except in really wet natured fields.

Barley Yellow Dwarf Virus (BYDV) is causing major problems in KY and MO and is just starting to appear in extreme southern IL. Based on early indications, I would expect moderate to severe problems to show up in non sprayed fields south of the Ohio river, but overall levels should be relatively light as you go further north due to low aphid numbers.

Wheat is starting to head out in southern KY, so most fields will receive a fungicide application within the next 7-10 days. As you go further north, heading and flowering applications will occur end of April for southern IL/OH and IN and as late as 15<sup>th</sup>-25<sup>th</sup> of May for northern IN/IL/OH and MI.

It is always very important before making any fungicide decisions to evaluate the crop for yield potential especially in areas of water damage, where nitrogen applications were insufficient or delayed or if freeze damage was a major factor. At the current time, freeze injury seems to be confined to one or two counties around Hopkinsville, KY and overall should not be a major issue.

### **EVALUATING YIELD POTENTIAL**

There are two main things to look for when evaluating yield potential once the wheat reaches GS 8+: the tiller number per foot of row and the spikelet number per head. Our goal is to have 600 heads/yd<sup>2</sup> at harvest time with 35-40 grains per head. In order to do this, we need to have 35-45 large healthy tillers/ft (for 7.5" rows) and 17-20 spikelets per head. If the wheat was water-damaged, freeze-damaged, or suffered from insufficient nitrogen, then both tiller numbers and spikelet numbers will be affected which will result in decreased yield potential.

Use Table 1 as a guide to yield potential. These numbers assume that the wheat is relatively healthy and that the crop will be managed with a good fertility and insect and disease management programs where needed. Typical heads have 16-20 spikelets/head. This year the head size seems to range from 16 to 22 spikelets with the majority in the 19-22 range which is above average. The biggest factors affecting head size this season has been the relatively mild and dry winter.

Where BYDV (Figure 1) is present, assume that yield potential would be reduced by half of the percentage symptoms present (i.e. 70 bu yield potential with 30% symptoms estimate at 70 bu - 15% yield loss = 59.5 bu). In MO and KY, there are several fields with 50-75% BYDV symptoms appearing, in this situation 20-40 bu yield losses are likely, and the use of a fungicide is unlikely to give a good return on your investment.

Begin scouting for leaf diseases and insects to decide which fields warrant treatment and to evaluate which fields do not justify applications based on BYDV, fertility, or stand problems.

**Figure 1: Spring BYDV symptoms**



**Table 1**

TILLERS/FT ROW (7.5 IN ROWS)	SPIKELET NUMBER	HEADS/YD <sup>2</sup>	YIELD POTENTIAL (BU/A)
50+	18	720	100
50+	14	720	90
40	18	575	100
40	14	575	70
30	18	432	75
30	14	432	53
20	18	288	50
20	14	288	35



**DISEASES**

Now that we are at the early heading stage, we must decide if an insecticide and/or fungicide application is necessary on fields with good to excellent yield potential. Mildew levels are light-moderate in susceptible varieties. Leaf blotch (*Septoria tritici*) levels are generally light to moderate but increasing. Fields in KY already have moderate levels of septoria on the middle part of the canopy but will require several more rain events in the next 2-3 weeks to become a major factor. Leaf rust (*Puccinia recondita*) levels are very light but are starting to increase in MO and west KY. At the current time stripe rust does not appear to be an issue any where across our region which is good news.

Disease control decisions made in the next 10-40 days will be based on yield potential, variety disease susceptibility and on scouting evaluations of disease levels present. As a rule we can assume a 5-8 bushel yield increase from a fungicide application on a moderately susceptible variety with 60-80 bu potential (Table 2). As yield potential increases, so does the percentage of response. Fungicide response is reduced in fields with lower yield potential due to less favorable microclimatic conditions. It currently appears that disease levels will be average to above average and this will continue to change rapidly given continued warm wet conditions. Mildew currently seems to be the biggest problem with septoria and rust still developing. Head scab potential also is likely to be quite high due to recent rain events, heavy morning dews and above average temperatures.

**Table 2**

YIELD (BU/A)	% YIELD* INCREASE	INCREASE (BU/A)	\$/A INCREASE	NET PROFIT (\$/A)**
90	15	13.5	\$49.28	\$36.78
90	10	9.0	\$32.85	\$20.35
70	10	7.0	\$25.55	\$13.05
70	7.5	5.25	\$19.16	\$6.66
50	7.5	3.75	\$13.68	\$1.18
50	5	2.5	\$9.13	\$-3.38

\* Assuming normal response to leaf diseases, head scab can cause 50-75% yield loss under severe conditions, and severity is usually not affected by yield potential.

\*\* Based on wheat price of \$3.65 and estimated fungicide + application costs of \$12.50

The market price of wheat also affects the decision making process. Fortunately we are currently seeing very good wheat prices; fungicide prices have also dropped due to the arrival of soybean rust. With a wheat price of \$3.65/bu, a 3-4 bu/acre increase is needed to offset the cost of a typical fungicide application. This does not factor in the increase in test weight often induced by fungicides.

Powdery mildew can usually be found in early planted fields in dense lush stands where high nitrogen rates have been applied. Mildew is recognized by small white colonies of cottony mycelia on the upper and lower surface of the leaf. The disease favors moderate temperatures (59-72° F) and high humidity; consequently, it appears early, but develops slowly when temperatures reach 80-90°F. For varieties susceptible to powdery mildew an early application (GS 7-9) of Tilt, Quilt, or Stratego is the most effective program to minimize the mildew progression.

Leaf blotch usually shows up later in the season after the wheat canopies over. Early symptoms develop between GS 7-8 and usually start to cause yield damage 5-10 days after heading. Symptoms appear as circular to oval speckled spots. These lesions tend to be elongated, reddish brown in the center, and surrounded by a yellow chlorotic halo. As it ages, the center turns light brown, and black specks (pycnidia) develop.

Glume blotch has limited leaf symptoms that are similar in appearance to leaf blotch. Damaging infection occurs on the heads and appears as small, irregular, gray/brown spots on the outside of the glume. Later symptoms consist of lesions enlarging and turning a dark brown to black color. This disease favors 70-82° F, high humidity and heavy rain events. There are no totally resistant varieties to glume blotch and, in prolonged wet periods, can be the most yield-limiting disease especially in KY and southern parts of IN, IL, and OH. Tilt, Stratego, Quilt, Headline, and Folicur are very effective against both leaf and glume blotch if applied before disease development.

Leaf rust is the last foliar disease to attack wheat. Symptoms usually appear in fields near flowering (GS 10.5) and consist of characteristic red/orange, pin head sized pustules on the upper leaf surface. Infection is spread by wind borne spores and develops very rapidly at 60-80° F. While there are many resistant varieties, rust affects many widely grown varieties including Pioneer 25R37, Hopewell and Clark. This disease can cause major yield reductions, but is not bad every year.

Stripe rust has similar sized pustules to leaf rust; the difference is that they are yellow in color and form straight lines down the veins compared to leaf rust, which is randomly scattered on the leaf surface. In contrast, this disease thrives at 50-60° F. It is also important to remember that resistance to leaf rust does not mean resistance to stripe rust.

Another factor to consider is each variety's disease rating. It is important to obtain up to date ratings from the area that the wheat is to be grown (Appendix 1). This will help with many key questions such as when to scout, which products to use, and the necessary timing of application.

Often field scouting is not effective in detecting diseases in time for proper control. Using disease thresholds to trigger fungicide applications can control mildew and leaf rust very effectively. However, throughout the main soft red wheat growing area the major disease problems are Head scab and leaf blotch/glume blotch (*Stagonospora nodorum*) which are controlled more effectively by preventative treatments. Table 3 lists thresholds recommended for use with a moderately susceptible to susceptible variety.



**TABLE 3**

DISEASE	AREA OF FLAG OR F-1 LEAF COVERED	GS TO SCOUT	COMMENTS
powdery mildew	5-10%	7-10.5	rarely a major yield reducer in KY, usually more severe in OH, IN
leaf blotch	1-3%	8-11.1	control prior to flag leaf infection
glume blotch	1-3% or any head symptoms	8-11.1	control before infection occurs on head
leaf rust	1-3%	8-11.1	even very late infestations can cause yield loss, more severe from KY south

Table 4 shows average variety response for some of the more popular varieties to a fungicide application prior to heading for Salem IL.

**TABLE 4**

VARIETY	POWDERY MILDEW	LEAF BLOTCH	LEAF RUST (STRIPE RUST)	HEAD SCAB	FUNG RESPONSE
					2 YR AVE*
Pioneer 25R37	MR	MR	MS	MS-MR	1.1
Becks 117	MR	MR	MS	MS	3.7
AP Cooper	MR	MS	R	S	3.9
Arise 766	MR	MS	MR	MS	6.1
Excel 400-1	MS	MS	MS	MR-R	5.5
Pioneer 25R35	MS	MR	MR (S)	MR-R	3.8

\* data from Wheat Tech, Inc. plots Salem, IL

The susceptibility ratings suggest we should scout Pioneer 25R35 (GS 6-8) for powdery mildew. On varieties susceptible to leaf blotch, scouting should take place between GS 8 and heading. Leaf rust is usually not a problem until heading and should be scouted for when the flag leaf is fully extended (GS 9).

When looking at the variety response to fungicide data there are two important things to remember. First, disease susceptibility increases over time so varieties like Pioneer 25R37 might not be as good as they appear. Second, averages are misleading as they are made up of years with little response and years with 10 bu responses depending on the diseases present. Roane, 25R54, 25R37, AP Benton and Becks 117 appear to have good disease packages.



The flag leaf and the leaf below the flag leaf (F-1) contribute 80-85% of the final yield and any disease or insect damage to these leaves can be devastating. It is vital to monitor the wheat carefully from flag leaf emergence through the flowering period and make fungicide applications as needed. Usually the best single application timing for wheat is from early head emergence to early flowering. Many chemical companies will suggest applying products at GS8 to protect the flag leaf but with few exceptions most varieties will have higher yields if you delay applications to at least very early heading.

There are 5 main options for fungicides for 2006: Tilt, Quilt, Folicur, Stratego, and Headline plus generic versions of Tilt and Folicur. Section 24c head emergence label expansions remain in effect for Tilt in Indiana, Ohio, Kentucky and Michigan. The 24c label allows use of Tilt up to Feekes 10.5 (full head emergence). You need to have a copy of the state label in your possession when spraying for this timing of the product to be legal. Unfortunately, Illinois does not have a label for late applications, so Tilt may only be applied legally up to very early GS 9. In most cases the labels for timing on Stratego and Quilt (both contain Tilt plus a strobiluron) follow the Tilt labels so can only be applied up to GS 9 in IL and up to GS 10.5 in most other states (check for local state labels). Headline has a full federal label for applications up to GS 10.5. Folicur currently has a section 18 label for early flowering applications to control head scab in KY and IL. Labels have also been applied for in MI and IN and both are still pending. Ohio has not applied for a section 18 for Folicur.

Table 5 reveals the strengths and weaknesses of the five fungicides available for disease control. Following the loss of Bayleton, Tilt probably has the best activity on powdery mildew. All of the products are very effective for septoria control. For leaf rust both Stratego, Quilt, and Headline provide longer residual control than Tilt or Folicur. Based on limited data Tilt, Quilt, and Stratego may be better on stripe rust than Headline.

**TABLE 5**

DISEASE	HEADLINE 6OZ	TILT 4 OZ	STRATEGO 10 OZ	QUILT* 12 oz	FOLICUR* 4 oz
powdery mildew	F	G	F-G	F-G	G
leaf blotch	E	E	G	G	E
glume blotch	E	E	G	G	E
leaf rust	E	G	VG	E	G

\*use 1 pint/100 galls water of non ionic surfactant

Our data suggests that in the absence of a significant amount of head scab Headline, Quilt, and Stratego will out-yield Tilt or Folicur by 1.0-3.0 bushels. When we have head scab problems Tilt and Folicur perform significantly better. The difference seems to be greater in bad rust years, but the last two have been lighter than normal.

It is important to remember to select the product and application timing according to the disease spectrum of the variety being sprayed. When growing a variety susceptible to mildew and septoria, but resistant to rust, an early GS 8-9 treatment is best. If the variety is resistant to mildew and septoria, but susceptible to rust then delaying until GS 10.5 usually works better. If you are going after head scab you have to target early flowering.

**Table 6 illustrates typical fungicide programs for seven popular wheat varieties.**

VARIETY	GS 9-10	GS 10.5	MAIN TARGET
Pioneer 25R35	Quilt 12oz / Stratego 10oz	-	mildew/leaf & glume blotch
Becks 117	-	Folicur 4oz or Tilt* 4oz	Head scab/ rust
Roane	Headline 6oz		leaf & glume blotch
Pioneer 25R78	-	Folicur or Tilt* 4 oz	Head scab/ rust
Pioneer 25R37	-	Folicur or Tilt* 4 oz	Head scab/ rust
Croplan 8309	Quilt 12oz / Stratego 10oz	-	rust/leaf & glume blotch
Excel 400-1	Quilt 12oz / Stratego 10oz	-	rust/leaf & glume blotch

\* use Tilt or Tilt mixtures for Head scab if Folicur does not have a label.

Pioneer 25R35 is an example of a variety with a moderate response to fungicides that is susceptible to mildew and Septoria, but resistant to head scab and rust. This would lead us to use Quilt or Stratego because it is more effective on mildew and also to apply prior to heading to control the early disease. Roane is an example of a variety that does not get mildew and is good on scab but a little weak on septoria. This requires a preheading treatment with either Headline or Quilt/Stratego

In our program, we target varieties that currently have 75 bu or better yield potential to be sprayed when we first start to see a build up of disease in the field and the weather appears suitable for continued disease development. Varieties that exhibit at least a 3-4 bu average yield response or have shown a specific disease susceptibility are considered to be responsive to fungicide application.

Folicur is the most effective treatment we have for head scab control and should be considered your main fungicide choice on head scab susceptible varieties (see scab index on Appendix 1). If your state has a Folicur label, your variety is susceptible to scab and conditions are suitable for head scab development, then Folicur should be applied just prior to flowering at 4 oz/A using 15-20 gallons of water and twin jet nozzles (twin 30 degree angled nozzles from TeeJet). Coverage is vital and straight flat fan tips will not work especially at the lower water volumes. Mixtures of low rates of Quilt or Stratego or Headline with Folicur will also work very well in high yield situations to control head scab and also get a yield bump from the additional strobiluron. If your variety is resistant to scab, or if weather conditions are poor for scab development, then a program of Quilt, Stratego, or Headline might be more appropriate. In the absence of Folicur in high risk scab environments, I would use either Tilt alone or Tilt mixed with either Stratego or Quilt.

One final consideration in determining the need to apply fungicides is the weather. All too often we get to head emergence with good potential and low to moderate disease pressure every year and the determining factor in yield response is rainfall following heading which is impossible to predict. Fungicide applications at least pay for themselves three out of every five years. If it were possible to predict which years would produce the positive yield responses we could avoid spraying unnecessarily. This is not the case so we lean towards using fungicides as an insurance policy.

Variety disease ratings can change between states due to race differences (particularly true with leaf rust and powdery mildew), and it is important to get local disease ratings for your state.

## **INSECTS**

Aphid levels have been very slow to build with very low numbers until the middle of April. In most cases it is too late to expect any additional barley yellow dwarf virus problems south of central OH/IL/IN, but I would still control aphids populations of 5-10/ft in northern IN/IL/OH and especially MI where wheat is still at GS 5-7.

Aphids will be present in all wheat fields, but after GS 8-9 yield loss due to aphids declines rapidly and requires high numbers feeding on the heads to do much damage. Most growers will have an opportunity to control aphids while making a fungicide application over the next 10-40 days and an application of a good insecticide for aphid and other insect control may be very cost effective. The best choice for control of aphids and potential armyworm problems is to use one of the many effective pyrethroid insecticides. Options include Warrior, Baythroid, Mustang Max, and several generic Lambda Cylohathrin products (generic Warrior). There are also several Gamma cylohathrin products being sold but I have not tested these products and would currently not recommend them. All of these products work well at the lowest labeled rates for both aphids and armyworms. All pyrethroids are non-systemic so they rely on canopy penetration and good coverage for increased control. The main objective at this point is to prevent aphids getting up onto the wheat heads and to prevent the arrival of armyworms 10-14 days after heading.

Cereal leaf beetle adults and eggs have been found in a few fields at very low levels. It is too early to be sure what levels to expect, but they do not favor thick stands that would tend to suggest few problems this season. Cereal leaf beetle adults are ½ inch long shiny black with a red head. The larvae are pale yellow and soft bodied; however, they will appear brown to black in the field due to their habit of gluing pieces of trash and debris to their bodies as camouflage.

**Figure 2**

**Armyworm Clipping**



**Armyworms on the Ground**



Armyworms (Figure 2) should not appear until late April to mid May and tend to favor the thicker, more lush stands that are present in the better looking fields. It is important to monitor untreated fields throughout this period to ensure armyworm populations are not reaching threshold levels. Armyworm larvae are greenish brown with a narrow, mid-dorsal stripe, and two orange stripes along each side. The head is honeycombed with dark lines. Full size is about 1.5 inches long.

Traps in KY and IL are again catching mod-high numbers of armyworm moths indicating the potential for at least an average armyworm year. We suggest at least adding insecticide to any really thick fields with significant aphid problems especially if the field has a risk for lodging.

When deciding to spray for insects we use the following threshold levels:

**TABLE 7**

INSECT	THRESHOLD	GS TO SCOUT
aphids (pre GS 9)	10/ft row	6-9
aphids (post GS 9)	50-100/plant or 25/head	6-10
cereal leaf beetle	1 adult or larvae/5 stems	8-10
armyworm	3-4/sq ft (0.5-0.7" long)	9-11.1

Test plots have shown that pyrethroid insecticides applied timely in a tank mix with a fungicide offer good disease, aphid, cereal leaf beetle, and armyworm control in one application.

There are many other products that can be used to control insects. Our experience has shown pyrethroids to offer the widest spectrum, safer to the environment, and safer to the operators applying it than most other compounds available for wheat. Tracer is a new Dow product that proved very effective on armyworms and very safe to the operator. However, Tracer does not control aphids and, following the recent price drop of most pyrethroids, is currently at a price disadvantage.

Making the decision whether to spray or not to spray for insects will probably go back to yield potential. As a rule, if we are making a fungicide application on a field with good yield potential, we will usually add an insecticide as a preventative measure to control aphids, cereal leaf beetles, and armyworms. Fields where a fungicide is not justified should still be closely monitored to determine if any insect populations are reaching threshold levels. There is a risk of having to make rescue treatments if insect or disease levels increase rapidly. In either case, an ounce of prevention is worth a pound of cure.

### **LATE NITROGEN APPLICATIONS**

At present time we have very few fields which appear to have insufficient nitrogen. Where nitrogen is deficient, there are three viable options to apply extra nitrogen: either use 15-20 lbs ammonium nitrate (by plane), add 3 gallons 28% N (UAN) in with the fungicide application or use 1-2 gallons Coron/acre. In any case, be sure the cause of the yellowing is nitrogen deficiency rather than BYDV, wheat streak mosaic virus or any other problem before applying additional nitrogen.

Once you get to heading the need for additional nitrogen diminishes quickly so if you are short on N try to make additional applications prior to heading if possible. Applications later than this will green up the wheat but will have less affect on yield. With the current options available, I think CoRoN is probably the best late season option, the price has declined compared to 28%UAN over the last 3-4 years, and you do not have to worry about any leaf burn - this makes for a very easy to use tank mix partner for fungicides. I would use 1 gallon/acre if you think you a just a few pounds light and up the rate to 2 gallons if you think you are 20-30 lbs light.



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**APPENDIX 1****2005 DISEASE RATINGS OF WHEAT VARIETIES TESTED IN KENTUCKY.**

<u>Variety</u>	<u>Stripe Rust</u>	<u>Powdery</u>		<u>Incidence (%)</u>	<u>Head Scab*</u>	
		<u>Mildew</u>	<u>Leaf Rust</u>		<u>Severity (%)</u>	<u>Index (%)</u>
Agripro Benton	3.1	3.3	3.5	70.9	36.1	28.5
Agripro Cooper	6.0	3.5	3.3	87.1	42.7	37.8
Beck 117	3.1	2.3	4.0	*	*	*
Clark	7.5	3.3	4.5	83.6	37.3	30.7
EXCEL 211	2.5	5.8	3.0	*	*	*
EXCEL 307	2.3	5.8	2.5	83.1	41.3	35.8
EXCEL 333	2.4	3.0	2.8	*	*	*
EXCEL 352tw	4.5	2.3	2.5	*	*	*
KAS Adams	5.9	2.3	3.8	*	*	*
KAS Allen	5.6	2.5	2.0	*	*	*
KAS Declaration	2.5	3.0	5.8	89.7	53.7	48.1
KAS Independence	4.1	2.3	1.3	70.8	31.4	25.8
McCormick	3.1	2.0	4.8	89.1	26.2	23.5
Pioneer Brand 25R35	7.5	5.0	1.7	*	*	*
Pioneer Brand 25R37	2.5	3.3	4.0	82.2	41.2	33.0
Pioneer Brand 25R47	2.5	4.0	1.8	84.9	37.1	32.8
Pioneer Brand 25R54	3.1	2.8	3.5	78.2	27.6	24.1
Pioneer Brand 25R78	7.1	4.8	2.0	82.1	45.3	37.1
Pioneer Brand 26R15	3.8	3.5	1.3	75.5	35.3	26.8
Pioneer Brand 26R58	6.8	5.3	3.3	83.0	53.9	43.6
Roane	3.0	4.3	1.8	78.1	34.1	29.7
Sisson	8.2	2.0	4.0	89.6	54.7	50.2
SS 560	4.6	2.8	3.8	93.3	75.1	70.4
SS 8302	2.2	3.8	4.0	76.3	50.4	38.3
SS 8309	4.1	2.8	3.0	77.9	31.7	23.9
Steyer Alma	5.6	4.3	3.0	*	*	*
Steyer Besecker	2.2	3.0	2.5	*	*	*
Steyer Coffman	5.0	3.0	1.3	*	*	*
Steyer Merrell	2.5	3.3	3.0	*	*	*
Steyer Wiley	2.9	2.0	2.8	85.1	45.0	39.1
Truman	1.5	1.5	5.5	69.1	26.3	18.7
Vigoro Tribute	5.1	2.5	2.0	69.6	30.4	20.7
Vigoro V9410	3.0	6.0	2.3	81.5	45.9	35.6
Vigoro V9412	3.4	1.8	2.8	69.1	31.0	24.7
Vigoro V9513	2.3	2.8	3.8	*	*	*
<b>Average</b>	<b>4.4</b>	<b>3.2</b>	<b>3.0</b>			

Rust and Mildew Ratings: 1 = Excellent; 9 = Poor.

Stripe Rust data collected at Logan Co. and Caldwell Co. conventional tests.

Powdery Mildew data collected at Fayette Co. test.

Leaf Rust data collected at Caldwell Co. test.

\* Head Scab rated at one location in 2005. Head scab data based on one observation is not considered reliable.

Other varieties rated at Lexington 2004-05, Princeton 2004 Scab Nurseries.