



UNIVERSITY OF WISCONSIN AGRONOMY, SOYBEAN RESEARCH, UNIVERSITY OF WISCONSIN-EXTENSION

### **Top 8 Recommendations for Winter Wheat Establishment in 2021**

Shawn Conley, State Soybean and Small Grains Specialist

John Gaska, Outreach Specialist

Damon Smith, State Field Crops Pathology Specialist

#### **Top 8 winter wheat establishment recommendations:**

1. Variety selection: please see the [2021 WI Winter Wheat Performance Test](#)
2. Plant new seed (**DO NOT** plant saved seed).
3. A fungicide seed treatment is recommended for winter wheat in WI, especially for seed damaged by Fusarium head blight (FHB).
4. Wheat should be planted 1 to 1.5 inches deep regardless of planting date.
5. Plant between September 20 and October 10.
6. The target seeding rate for wheat planted from September 20<sup>th</sup> to October 1<sup>st</sup> is 1,750,000 seeds per acre.
7. The optimal seeding rate for wheat planted after October 1<sup>st</sup> should be incrementally increased as planting date is delayed to compensate for reduced fall tillering.
8. Crop rotation matters.

#### **Variety Selection**

As with any crop, variety selection is the most important factor to consider in maximizing winter wheat yield and profitability. When choosing a winter wheat variety, several factors must be considered. These include winter survival, insect and disease resistance, lodging, test weight, and most importantly, yield. Since no variety is ideal for every location, it is important to understand the crop environment and pest complex that affects your specific region to maximize yield.

**Yield** is based on the genetic potential and environmental conditions in which the crop is grown. Therefore, by diversifying the genetic pool that is planted, a grower can hedge against crop failure. Select those varieties that perform well not only in your area, but across experimental sites and years. This will increase the likelihood that, given next year's environment (which you cannot control), the variety you selected will perform well.

**Test weight** is also an important factor to consider when selecting a variety. The minimum test weight to be considered a U.S. #2 soft red winter wheat is 58 lb/bu. Wheat at lower test weights will be discounted. Environment, pests and diseases may greatly affect test weight; therefore, selecting a

[www.coolbean.info](http://www.coolbean.info)

variety that has a high test weight potential in your region is critical to maximizing economic gain. Test weight discounts at the elevator can range from 8 to 12 cents per ½ lb/bu below 58 lbs/bu.

Select a variety that has the specific **insect and disease resistance** characteristics that fits your needs. By selecting varieties with the appropriate level of resistance, crop yield loss may be either reduced or avoided without the need of pesticides. Careful management of resistant cultivars through crop and variety rotation, are required to ensure that these characteristics are not lost.

Statewide, winter wheat disease pressure was very low. The major disease of winter wheat in Wisconsin in 2021 was powdery mildew caused by the pathogen *Blumeria graminis* f. sp. *tritici*. Powdery mildew could be found in many fields throughout the state, with incidence and severity depending on variety and location. Severity was lower than in the previous two seasons, but FHB could be found at all locations examined.

Other diseases such as Fusarium head blight (FHB) Septoria leaf blotch, stripe rust, and leaf rust were reasonably low across the state, compared to previous years, due to above average temperatures and below average rainfall. Finally, *Barley yellow dwarf virus* (BYDV) was identified at varying levels across the state. In most cases incidence did not reach levels that limited yield, but the disease could be easily found in many fields.

When making your wheat variety decision for the 2021-2022 season, take time to review several previous years of Wheat Performance Test results. While not all wheat varieties perform the same across a location, they do tend to yield better when they have less disease. Sorting the tables first by lowest FHB incidence and FHB severity scores then looking for yields comparable to the best yielding variety (stared yield score) can facilitate finding a variety with excellent yield and a good disease performance package. Double check the scores from 2019 with those of 2020 (the last several years with measurable disease) to find balanced top performing varieties in your location. Table 1. illustrates high-yielding varieties (yield was not different from the highest yielding variety in the trial) that had low FHB scores in 2019 AND 2020 for the Sharon and Fond du Lac variety testing locations.

**Table 1. High-yielding varieties<sup>1</sup> with low FHB scores in 2019 AND 2020 at the Sharon and Fond du Lac locations.**

	Sharon <sup>2</sup>	Fond du Lac
<b>1</b>	Pioneer 25R74	PIP 715
<b>2</b>	Diener D491W	Pioneer 25R25
<sup>1</sup> Variety yield had to be statistically similar to the best-performing variety in both 2019 and 2020.		
<sup>2</sup> Variety had to have been planted in our trials in both 2019 and 2020 to be considered for this list		

**Plant height** and **lodging potential** are also important varietal characteristics that may be affected by your cropping system. If the wheat crop is intended for grain only, it may be important to select a variety that is short in stature and has a low potential for lodging. This may decrease yield loss due to crop spoilage and harvest loss as well as increase harvesting rate. However, if the wheat crop is to be used as silage or is to be harvested as both grain and straw, then selecting a taller variety may be warranted.

For detailed information regarding winter wheat variety performance please visit [www.coolbean.info](http://www.coolbean.info) for results of the [2020 WI Winter Wheat Performance Test](#).

### Plant New Seed in 2021

- To maximize wheat yields in 2021, it is imperative that growers [plant certified](#) or private (professionally prepared) seed that is true to variety, clean, and has a high germination percentage (>85%).
- Do **NOT** save seed from fields that received a glyphosate harvest aid application as germination rate can be adversely affected.
- Some WI wheat fields experienced Fusarium Head Blight (FHB), also known as scab in 2021. Kernels from heads infected with scab may be shriveled or shrunken and lightweight. Some kernels may have a pink to red discoloration (Image 1). Others may be bleached or white in color.



Image 1. Scabby and Tombstone Kernels

If growers absolutely need to plant saved seed due to availability or other economic considerations, the following steps should be taken to increase the likelihood of establishing a legal and good wheat crop:

**Step One:** Determine if you can legally plant the wheat seed you saved. Today, many private wheat varieties now come with statements which buyers sign at the time of purchase, stating that they understand they are not authorized to use the harvested grain for seed. Most current public winter wheat varieties are Plant Variety Protected (PVP) and though you may replant them on your own land, you do not have the right to trade/sell seed of those varieties to others for planting.

**Step Two:** Once you have determined if you can legally plant the seed you saved, the next step is to clean the wheat seed. It is important that wheat seed be cleaned to remove small and damaged seeds and to eliminate weed seeds. Removing small and damaged seeds will not only aid in crop establishment, but will also provide a more uniform wheat seedling stand. Removing small and damaged seeds will also increase the thousand-kernel weight (TKW), which serves as a measure of seed quality. Wheat seed with TKW values greater than 30 grams tend to have increased fall tiller number and seedling vigor.

**Step Three:** Perform a germination test. Germination tests can either be completed at home or by sending a sample to the [Wisconsin Crop Improvement Association](#). A home test can be performed by counting out 4 sets of 100 seeds and placing each of them in a damp paper towel. Place the paper towel into a plastic bag to conserve moisture and store in a warm location out of direct sunlight. After five days, count the number of germinated seeds that have both an intact root and shoot. This will give the grower an estimate of % germination. It is important to choose random seeds throughout the entire seed lot and conduct at least 4 - 100 seed counts. If germination is below 85%, consider increasing the seeding rate to compensate; however, we would caution growers from seeding any wheat with a germination test below 80%.

**Step Four:** Assess the need for a seed treatment. A number of fungicides and insecticides are labeled for use as seed treatments on winter wheat and are listed in [Pest Management in Wisconsin Field](#)

[Crops 2021](#) (UW-Extension A3646). Seed treatment fungicides protect germinating seed and young seedlings from seedborne and soilborne pathogens. Seed treatment fungicides will not improve germination of seed that has been injured by environmental factors and will not resurrect dead seed. If seed with scab must be used for planting, a seed treatment fungicide is a must to improve germination and protect stand. Note that planting scabby seed won't increase the risk of FHB next spring. Also remember that seed treatment fungicides applied this fall will not protect against potential FHB infection next summer. You may still need to apply a foliar fungicide during anthesis to control FHB.

### **Seeding Depth**

Wheat should be planted at least 1.0 inch deep depending upon soil moisture conditions. Wheat planted less than 0.5 inches deep may result in uneven germination due to seed exposure or dry soil conditions. Shallow planted wheat is also more susceptible to winterkill. Wheat planted more than 1.5 inches deep may result in death due to pre-mature leaf opening or poor tiller development and winter survival. Uniform seed placement and seeding depth are important in promoting crop health in the fall.

### **Seeding rate**

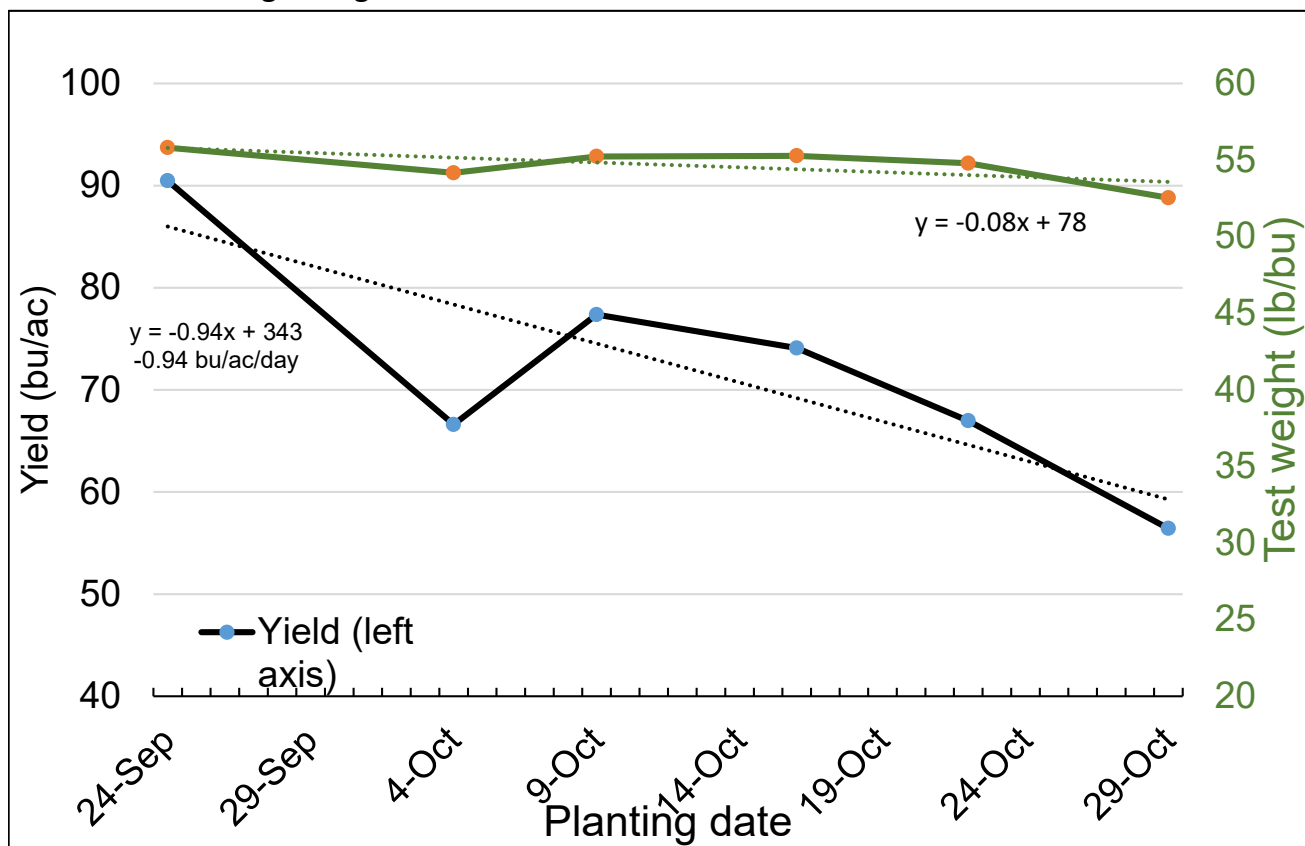
The targeted fall stand for wheat planted from September 15<sup>th</sup> to October 1<sup>st</sup> is between 30 and 40 plants per square foot. This is about 25 seeds per foot of row in 7.5" rows. To achieve this goal, the seeding rate for soft red winter wheat is between 1,300,000 and 1,750,000 viable seeds per acre (Table 2, 3). Depending upon varietal seed size, this equates to 74 to 175 pounds of seed per acre (Table 4). Our data from the 2012/13 and 2013/14 growing seasons indicate a significant yield increase when increasing your seeding rate from 1.5 and 1.75 million seeds per acre; however, that marginal yield increase is likely offset by the increased seed cost. The optimal seeding rate for wheat planted after October 1<sup>st</sup> should be incrementally increased as planting date is delayed to compensate for reduced fall tillering (Table 2).

### **Planting Date**

Winter wheat in WI should be seeded between September 20<sup>th</sup> and October 10<sup>th</sup>. Figure 1 shows yield and test weight response to planting date at Arlington, WI. Yield losses of 0.94 bu/a/day are possible with delayed planting after Sept. 25. Test weight response was significant but minimal.

Planting wheat too early can lead to increased incidence of barley yellow dwarf virus (BYDV) due to feeding and disease transmission by aphids. Aphids such as the bird cherry oat aphid can transmit BYDV to wheat in the fall. Considering that there were higher levels of BYDV observed in 2020, it is imperative to try to wait until after September 20<sup>th</sup> to be sure aphid activity is minimal. Their ability to feed on wheat and transmit BYDV is limited when temperatures are cooler. Waiting to plant wheat until later September shortens the potential aphid feeding time. Planting too early can also lead to excessive fall growth and potential smothering (increased winter respiration and winterkill) of the crop. There are also increased risks of planting too late. If air and soil temperatures get too cold, wheat will not germinate and emerge timely.

**Figure 1. Winter wheat grain yield and test weight response to planting date at Arlington WI in the 2019 and 2020 growing seasons.**



**Winter wheat and crop insurance** (Information courtesy of Michele Austin, Director of Insurance Operations; and Mindy Tracy, Insurance Officer; Compeer Financial)

The Wisconsin winter wheat final planting date varies by county, ranging from September 30th to October 10th. If the wheat is seeded after the county's final plant date (late planting period) the crop insurance guarantee is reduced by 1% per day for the first 10 days. If wheat is seeded after the late planting period, the crop insurance guarantee is reduced to 60% of the original guarantee or made uninsurable.

**Special notes regarding the 2022 crop**

The 2014 Farm Bill offers additional coverage on your winter wheat. You must sign up for the optional SCO (Supplemental Coverage Option) and ECO (Enhanced Coverage Option) insurance with your crop insurance agent by September 30th for your winter wheat crop. Please note that the producer needs to have elected PLC at FSA in order for SCO to apply to their insurance coverage. Producers can have either PLC or ARC elected though for the ECO insurance coverage This does not/cannot take the place of your traditional crop insurance policy. Contact your crop insurance agent for details. The Trend Adjustment and Yield Exclusions options are available for some Wisconsin counties on wheat. Talk to your crop insurance agent for more details.

- Winter wheat coverage is not available in all Wisconsin counties.
- Air seeded (flown on by airplane) wheat is not insurable and no premium is charged.



- The final day to turn in a 2021 winter wheat claim is October 31st.
- The 2022 wheat price discovery on CBOT (using September '22 contract) will be determined as follows (this price will be used for both yield protection and revenue protection plans of insurance):
  - The Projected Price tracks from August 15, 2021 - September 14, 2021
  - The Harvest Price tracks from August 1, 2022 - August 31, 2022
  - There is a 200% maximum difference between the Base and Harvest Prices with no downside limit.
  - Coverage levels range from 50%-85%.

**Table 2. Recommended winter wheat seeding rate by planting date.**

<b>Wisconsin Winter Wheat Seeding Rate Recommendations</b>				
Seeds/acre Million	Seeds/sq ft	Row Width		
		6	7	7.5
Seeds per foot row				
1.50	34	17.2	20.1	21.5
1.55	36	17.8	20.8	22.2
1.60	37	18.4	21.4	23.0
1.65	38	18.9	22.1	23.7
1.70	39	19.5	22.8	24.4
<b>1.75</b>	<b>40</b>	<b>20.1</b>	<b>23.4</b>	<b>25.1</b>
<b>Recommended seeding rate prior to Oct. 1</b>				
1.80	41	20.7	24.1	25.8
1.85	42	21.2	24.8	26.5
1.90	44	21.8	25.4	27.3
1.95	45	22.4	26.1	28.0
<b>2.00</b>	<b>46</b>	<b>23.0</b>	<b>26.8</b>	<b>28.7</b>
<b>Recommended seeding rate Oct. 1 to Oct. 10</b>				
2.05	47	23.5	27.5	29.4
2.10	48	24.1	28.1	30.1
2.15	49	24.7	28.8	30.8
2.20	51	25.3	29.5	31.6
<b>2.25</b>	<b>52</b>	<b>25.8</b>	<b>30.1</b>	<b>32.3</b>
<b>Recommended seeding rate after Oct. 10</b>				
2.30	53	26.4	30.8	33.0
2.35	54	27.0	31.5	33.7
2.40	55	27.5	32.1	34.4
2.45	56	28.1	32.8	35.2
2.50	57	28.7	33.5	35.9

**Table 3. Seeding rate impact on wheat yield. 2013-14 growing seasons.**

Seeding rate (million seeds a <sup>-1</sup> )	Grain yield (bu a <sup>-1</sup> )
1.25	88.8
1.50	88.5
1.75	90.8
2.00	90.5
2.25	91.4
2.50	90.8
	LSD (0.10) 1.8

\*Data pooled over environment (Janesville, Lancaster, Arlington, and Chilton, 2013; Arlington, Fond du Lac, and Chilton, 2014). \*No variety by seeding rate interaction (Public Sunburst, Pro Seed Genetics Pro260, DuPont Pioneer P25R40)

**Table 4. Seed size and seeding rate conversion table.**

Seeds/lb	Seeds per acre (x 1 million)						
	1.0	1.2	1.4	1.6	1.8	2.0	2.2
Pounds of seed/acre							
10000	100	120	140	160	180	200	220
11000	91	109	127	145	164	182	200
12000	83	100	117	133	150	167	183
13000	77	92	108	123	138	154	169
14000	71	86	100	114	129	143	157
15000	67	80	93	107	120	133	147
16000	63	75	88	100	113	125	138
17000	59	71	82	94	106	118	129

\*This table is based on 100% germination. Adjust your seeding rate by the % germ printed on your bag tag.

### Crop Rotation

Yield data from our long term rotation experiment located at Arlington, WI indicated that wheat grain yield was greatest when following soybean (Table 5) (Marburger, D., S.P. Conley, P.D. Esker, J.G. Lauer, and J.M. Ané. 2015. Yield Response to Crop/Genotype Rotations and Fungicide Use to Manage *Fusarium*-Related Diseases. Crop Sci. 55:1-10. doi: 10.2135/cropsci2014.03.0201). Our data suggests that growers should plant wheat after soybean first, then corn silage, corn for grain, and lastly wheat.

**Table 5. Winter wheat grain yield following winter wheat, soybean, corn for grain, and corn silage.**

Rotation	2010	2011	2012	Average
Continuous Wheat	<sup>1</sup>	<sup>1</sup>	38.5	38.5
Corn-Soybean-Wheat	66.9	89.9	94.4	83.7
Soybean-Corn(grain)-Wheat	57.8	59.0	81.6	66.1
Soybean-Corn(silage)-Wheat	72.9	80.5	81.5	78.3

<sup>1</sup>Not able to collect data due to extremely low yields

If growers choose to plant second year wheat, several management factors should be considered to reduce risk. First plant a different wheat variety in the second year that possesses excellent resistance to residue-borne diseases. Under no circumstances should growers consider planting bin-run seed in second year wheat. By planting a different variety with strong disease resistance characteristics you can reduce the likelihood of early disease pressure and significant yield loss. Growers should use a seed treatment in wheat following wheat. Be aware that seed treatments are not a cure all for all common diseases in continuous wheat systems (e.g. take-all, Cephalosporium stripe). Growers should also consider increasing their seeding rate to 1.8 to 2.0 million seeds per acre in wheat following wheat systems. This will aid in stand establishment and increase the likelihood of a uniform stand going into the winter. Lastly, if using a no-till system, planting into a seedbed that is free of living volunteer wheat is important in reducing the incidence of BYDV. Growers should consider an herbicide application to destroy any living volunteer wheat at least 2 weeks prior to planting to prevent a “green bridge” for the aphids that transmit BYDV.