### **HYBRID RYE** 2024 YIELD RESULTS



## **The Year of Big Yields**

**KWS SERAFINO** - 212 bu/ac in Idaho **KWS RECEPTOR** - 180 bu/ac in Minnesota



## The Year of Big Yields.

With better than average growing conditions, KWS Hybrid Rye was showing off its yield potential in the 2023-24 season. Yield performance trials in Iowa, Idaho, Michigan, Minnesota, North Dakota, Nebraska, New York, and South Dakota had KWS Hybrid Rye well over 100 Bu/Acre, peaking at over 200 bu. in Idaho, and 180 bu. in Minnesota. By using multiple universities across the US we are finding appropriate regions for KWS Hybrid Rye varieties. The variability in regions is ultimately crucial to determine the maximum value areas and bring economic benefit. We want you to be confident that our products have been evaluated from a non-bias research source.

Hybrid Rye is not just another crop with big yield, it has so many benefits:

- Hybrid Vigor simply more growth above and below the soil surface
- High Harvest Index bigger heads = very high grain yield potential and forage dry matter
- Improved Drought Tolerance 25% less water usage than wheat and barley
- **Great Competition to Weeds** allelopathic root exudates prevent weed development. Excellent crop competition from high biomass shading.
- Better Nutrient Efficiency better utilization of available nutrients in soil
- Very Strong Winterhardiness, Standability, and Disease & Insect Tolerance built-in ergot protection via PollenPlus<sup>™</sup> technology. Less risk of Fusarium, Leaf Rust, Leaf Blotch (Scald), Mildew, Take-all Karnal Bunt, highly resistant to Wheat Stem Sawfly and Wheat Streak Mosaic and can help break the corn rootworm cycle. CO<sup>2</sup> Efficient - significantly lower carbon footprint than other small grains and corn
- Produces 1/3 more straw than wheat and barley
- Fall Ground Cover to reduce erosion
- **Crop Rotation Benefits** increasing yields in subsequent crops like corn & soybeans and can be used in relay cropping systems.
- Very Early Forage Development in spring
- **Livestock Grain Feed Source** Hybrid Rye can easily replace some corn and wheat in the ration without a decrease in livestock productivity.

The pages of this yield results booklet are packed with 3-year data by state. We are sure you will find useful data to help you consider KWS Hybrid Rye in your operation. We have also included some agronomic insights – water use vs. triticale and wheat, and a nitrogen study with Hybrid Rye vs. open pollinated rye.

For more information on KWS Hybrid Rye varieties, growing practices, or to find your nearest dealer, please visit our website: www.kws-us.com.

Paul Gregor, Product Manager







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## **Grain Results**

When it comes to Hybrid Rye grain, our varieties KWS Receptor, KWS Serafino and KWS Tayo have your back in all situations.

#### Trial Highlights:

Colorado, Idaho, Illinois, Iowa, Kentucky, Michigan, Minnesota, Nebraska, New York, North Dakota, Pennsylvania, South Dakota, Washington, Wisconsin

\* a - denotes no data and that variety was not planted that year.

Planting recommendations: Trials were planted at KWS recommended rates of 800,000 seeds/acre. Use the seed rate calculator and seed tag to help with proper seeds per foot of row.

Nitrogen recommendation is 1.2 units of N/bushel. Apply a fall application of approximately 1/3 of your needs, then apply rest of nitrogen as soon as you can in early spring so that nitrogen is available before stem elongation.

# COLORADO

### Trial Highlights

Location: Great Plains Research Station at Akron, CO - Colorado State University.

This location is non-irrigated, dry land.

2024: Akron was planted on September 28, 2023 and harvested on July 15, 2024. This location saw excellent yields with adequate rainfall this season. \**Please note the wheat trial is in a different trial area, but gives a comparison to wheat yields.* 

2023: Akron was planted in two locations on September 29, 2022 and October 6, 2022. This location had excellent yields and good rainfall this year.

\*\*Due to extreme drought in Fall of 2021 with very little growth potential, the decision was made not to plant in Fall 2021 for 2022 harvest.

#### 2023 - 2024 Colorado Grain Trials (shown in bushel/acre)

Variety	Grain Type	2023	2024
KWS Serafino	Hybrid Rye	118.0	95.0
KWS Tayo	Hybrid Rye	127.0	92.0
KWS Receptor	Hybrid Rye	125.0	88.0
Byrd	Wheat	85.0	94.0
Hazlet	Rye	99.0	67.0
Avery	Wheat	87.0	-
Langin	Wheat	77.0	-

## IDAHO

#### 2022 - 2024 Idaho Grain Trials (shown in bushel/acre) 2024 2024 2024 Variety Grain Type 2022 2023 Aberdeen Kimberly Average 216.0 **KWS Receptor Hybrid Rye** 189.0 221.0 192.0 206.5 **KWS Serafino Hybrid Rye** 201.0 211.0 177.0 212.0 194.5 209.0 174.0 **KWS** Tayo **Hybrid Rye** 202.0 177.0 175.5 LCS Jet Winter Wheat 165.0 150.0 163.0 185.0 174.0 Keldin Winter Wheat 160.0 158.0 176.0 -167.0 155.0 SY Ovation Winter Wheat 159.0 139.0 188.0 163.5

### **Trial Highlights**

Location: Aberdeen & Kimberly, ID - University of Idaho

Irrigated

2024: These locations are planted next to the winter wheat variety trial. Hybrid Rye yields are tremendous and out yielded the standard checks in that trial.

2023: Aberdeen location only.

2022: Aberdeen location only. This location was planted adjacent to the winter wheat trials. Hybrid Rye had tremendous yield and out yielded the winter wheats.



# ILLINOIS

### Trial Highlights

Location: Champaign, IL - KWS Trial Plots 2024: These plots were in our KWS Breeder Trial. Planted on October 4, 2023 and harvested on June 21, 2024.

2023: These plots were at the KWS Station and were the showcase plots that were toured. Planted on October 6, 2022. Harvested on July 12, 2023.

2022: Planting date: October 19, 2021 Harvest date: July 1, 2022

## IOWA

		2022 - 2	2024 Iowa Gr	rain Trials (s	hown in bushel/acre	9)		
Variety	Grain Type	2022 Average	2023 Average	2024 Boone	2024 Greenfield	2024 Kanawha	2024 Nashua	2024 Average
KWS Serafino	Hybrid Rye	104.3	53.0	134.0	119.0	119.0	107.0	120.0
KWS Receptor	Hybrid Rye	102.0	53.0	106.0	133.0	123.0	99.0	110.0
KWS Tayo	Hybrid Rye	107.5	53.0	88.0	116.0	115.0	95.0	104.0
SU Performer	Hybrid Rye	-	-	99.0	99.0	123.0	97.0	105.0
SU Cossani	Hybrid Rye	-	-	96.0	109.0	112.0	99.0	104.0
Tulus	Triticale	85.0	47.0	101.0	91.0	92.0	91.0	94.0
Hazlet	Rye	65.0	34.0	77.0	71.0	80.0	70.0	75.0
Aroostook	Rye	71.3	39.0	81.0	64.0	80.0	69.0	74.0
Gardner	Rye	64.8	-	62.0	70.0	73.0	62.0	67.0
Dylan	Rye	60.0	35.0	64.0	52.0	65.0	69.0	63.0
Elbon	Rye	76.3	30.0	52.0	63.0	59.0	54.0	57.0
Danko	Rye	76.5	40.0	-	-	-	-	-
Spooner	Rye	63.5	35.0	-	-	-	-	-

#### 2022 - 2024 Illinois Grain Trials (shown in bushel/acre)

Variety	Grain Type	2022	2023	2024
KWS Serafino	Hybrid Rye	111.0	109.8	138.0
KWS Tayo	Hybrid Rye	91.0	116.8	133.0
KWS Receptor	Hybrid Rye	109.0	127.3	127.0
Hazlet	Rye	83.0	-	63.0

### **Trial Highlights**

#### Location: Iowa State University

Trials are located at Boone, Greenfield, Kanawha, and Nashua on the ISU Research Farms.

2024: Locations were planted between September 20, 2023 and October 9, 2023. Harvest occurred from July 16, 2024 through August 7, 2024. All locations had excellent, uniform growth and adequate rainfall leading to high yields. All locations followed a soybean crop.

2023: All 4 locations included. The previous crop was soybeans. Drought caused lower yields.

2022: All 4 locations included and had good weather and yields.

# KENTUCKY

Variety	Grain Type	2022 Average	2023 Average	2024 Lexington	2024 Waverly	2024 Average
KWS Receptor	Hybrid Rye	85.0	112.0	82.0	79.0	80.5
KWS Serafino	Hybrid Rye	76.0	108.7	79.0	81.0	80.0
KWS Tayo	Hybrid Rye	82.0	111.3	71.0	74.0	72.5
AgriMAXX 525	Wheat	-	-	69.0	63.0	66.0
Spooner	Rye	51.0	63.0	51.0	-	51.0
Hazlet	Rye	59.0	68.5	44.0	47.0	45.5

#### 2022 - 2024 Kentucky Grain Trials (shown in bushel/acre)

### Trial Highlights

Location: University of Kentucky

2024: The Lexington location was planted on October 12, 2023 and harvested on June 20, 2024. Waverly was planted on October 16, 2023 and harvested on June 11, 2024. Fusarium (FHB) pressure was heavy and caused lower yields throughout the trial.

2023: Average includes Princeton and two Waverly locations. Princeton, KY - Plant date: October 9-10, 2022. Harvest date: June 23, 2023 and July 6, 2023. Conventional tillage. There was some early freeze damage that affected stem strength in certain varieties resulting in lodging. Extended seed filling period which boosted yields. Waverly, KY - After planting the germinating result was irregular because it was very dry. By November 1st, the ground had gotten good rain with warm temperatures to help the crop recover and varieties yield very good.

2022: Average includes two locations in Lexington. Plant date: October 24, 2021. Harvest Date: June 27, 2022 This location experienced a hard spring freeze that resulted in head damage, yield loss and lodging which lowered the overall yield.

## MICHIGAN

### 2022 - 2024 Michigan Grain Trials (shown in bushel/acre)

Variety	2022 Average	2023 Average	2024 Mason	2024 SVREC	2024 Average
KWS Receptor	112.5	104.5	92.0	111.0	101.5
KWS Serafino	117.0	105.0	95.0	106.0	100.5
KWS Tayo	118.5	98.0	94.0	107.0	100.5

### **Trial Highlights**

Location: Michigan State University 2024: Planted on October 2 & 4, 2023 and harvested on July 8 & 9, 2024.

2023: Average includes Mason and SVREC locations. Planted on September 30, 2022 through October 1, 2022. This trial was visited in May and the Hybrid Rye looked very promising and more lush than the winter wheat near it.

2022: Average includes Mason and SVREC locations. Planting date: September 19 & 20, 2021. Harvest date: July 10, 2022.

# MINNESOTA

	2022 - 2024 Minnesota Grain Trials (shown in bushel/acre)									
Variety	Grain Type	2022 Average	2023 Average	2024 Becker	2024 Crookston	2024 Grand Rapids	2024 Lamberton	2024 LeCenter	2024 Roseau	2024 Average
KWS Receptor	Hybrid Rye	113.2	107.0	118.0	168.0	114.0	103.0	153.0	180.0	140.0
KWS Serafino	Hybrid Rye	116.8	112.0	111.0	165.0	123.0	85.0	147.0	166.0	133.0
KWS Tayo	Hybrid Rye	114.8	110.0	99.0	150.0	110.0	92.0	157.0	171.0	130.0
Keldin*	Wheat	79.3	79.0	90.0	113.0	-	79.0	114.0	121.0	103.4
Danko	Rye	81.2	87.0	78.0	113.0	76.0	79.0	128.0	135.0	101.0
Hazlet	Rye	87.2	69.0	84.0	110.0	51.0	77.0	108.0	143.0	95.0
Rymin	Rye	68.6	86.6	74.0	106.0	53.0	68.0	101.0	122.0	87.0
Gardner	Rye	76.3	75.0	73.0	77.0	39.0	61.0	97.0	114.0	77.0
Dylan	Rye	77.4	84.0	-	-	-	-	-	-	-
Remington	Rye	73.6	80.0	-	-	-	-	-	-	-
Elbon	Rye	63.2	67.0	-	-	-	-	-	-	-

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### **Trial Highlights**

Location: University of Minnesota

2024: Locations were planted from September 14, 2023 through October 2, 2023 and harvested on July 19, 2024 through August 19, 2024. Becker has limited irrigation all other locations are dryland. A wet spring caused reduction in yield and probably loss of nitrogen at Lamberton location, as plants were in saturated soil for an extended period of time. \*Please note the wheat trial is in a different trial area, but gives a comparison to wheat yields.

2023: Average includes: Becker, Crookston, Lamberton, LeCenter, and Roseau. Planted on September 18, 21, 28 and 29, 2022. Location has limited irrigation, plots were uniform showing some signs of water stress. LeCenter location is non-irrigated and stands were a little thin from fall drought at planting.

2022 average includes: Becker, Crookston, LeCenter, and Roseau

### Trial Highlights

Location: Lamberton, MN

2024: Planted on September 27, 2023. Harvested on July 30, 2024. A wet spring caused reduction in yield and probably loss of nitrogen as plants were in saturated soil for an extended period of time.

2023: Planted on September 28, 2022. Harvested on July 27, 2023.

2022: Planted on September 28, 2021 and harvested on July 28, 2022.

2022-2024 Minnesota Grain Breeder Trial (shown in bushel/acre)

Variety	Grain Type	2022	2023	2024
KWS Serafino	Hybrid Rye	100.0	138.0	85.0
KWS Receptor	Hybrid Rye	100.0	128.0	77.0
KWS Tayo	Hybrid Rye	104.0	142.0	71.0
Hazlet	Rye	86.0	94.0	45.0

# NEBRASKA

Variety	Grain Type	2022 Average	2023 Average	2024 Sidney	2024 N. Platte	2024 Mead	2024 Average
KWS Receptor	Hybrid Rye	130.0	75.0	56.0	142.0	107.0	101.7
KWS Tayo	Hybrid Rye	110.0	66.0	55.0	159.0	56.0	90.0
KWS Serafino	Hybrid Rye	129.0	64.0	40.0	145.0	82.0	89.0
Wesley	Wheat	-	47.0	-	-	-	-
Ruth	Wheat	83.0	43.0	-	-	-	-
Hazlet	Rye	-	-	-	-	-	-

#### 2022 - 2024 Nebraska Grain Trials (shown in bushel/acre)

### Trial Highlights

Location: Lincoln, NE - University of Nebraska

2024: Sidney location had drought conditions that impacted yields. Planted on September 29, 2023 and harvested on July 22, 2024. North Platte location had adequate rain during pollination and grain fill. Planted on September 21, 2023 and harvested on July 16, 2024. Mead location had uneven stands from oat trash residue. It was planted on September 27, 2023 and harvested on July 10, 2024.

2023: Locations were planted on September 26 - 28, 2022. They were harvested on July 31, 2023. There was good soil moisture at planting. Decent fall stand and winter survival. Tillered well in spring and had rains during pollination and grain fill which helped increase yields. 2023 average includes Sidney and Mead locations.

2022: Planting Date: September 24, 2021. Harvest Date: July 5, 2022. Overall good yields. 2022 only includes Lincoln.

# NEW YORK

Variety	Grain Type	2022 Average	2023 Average	2024
KWS Serafino	Hybrid Rye	123.0	102.5	119.0
KWS Receptor	Hybrid Rye	132.0	116.5	118.0
KWS Tayo	Hybrid Rye	127.0	107.5	104.0
Danko	Rye	99.5	88.5	96.0
Hazlet	Rye	94.5	74.5	84.0
Erie	Wheat	60.5	90.0	-

2022 - 2024 New York Grain Trials (shown in bushel/acre)

### Trial Highlights

#### Location: Cornell University

2024: Only one location in Caldwell, NY. Planted on October 4, 2023 and harvested on July 11, 2024. This field looked chlorotic. Nitrogen was lost because of excess water which affected the nitrogen applied in the spring. Nitrogen not being available caused a loss in yields.

2023: Average includes Snyder and Caldwell locations and they were planted on October 5 and 12, 2022. These sites had poor emergence from later planting and weather.

2022: Average includes Snyder and Caldwell locations. Some water and winter injury on plots. Planted between October 1-8, 2021. Harvested on July 19 and 20, 2022.

# NORTH DAKOTA

Variety	Grain Type	2022 Average	2023 Average	2024 Carrington	2024 Langdon	2024 Minot	2024 Average
KWS Receptor	Hybrid Rye	122.0	78.5	112.0	143.0	109.0	121.3
KWS Serafino	Hybrid Rye	113.7	73.4	101.0	136.0	100.0	112.3
KWS Tayo	Hybrid Rye	121.0	74.3	95.0	130.0	101.0	108.7
Danko	Rye	88.7	53.9	74.0	116.0	87.0	92.3
Dylan	Rye	87.0	53.0	69.0	106.0	89.0	88.0
Hazlet	Rye	97.7	60.3	70.0	100.0	93.0	87.6
Rymin	Rye	79.7	52.1	67.0	94.0	77.0	79.3
Gardner	Rye	-	47.4	60.0	83.0	69.0	70.7
Spooner	Rye	72.7	49.5	59.0	86.0	66.0	70.3
Aroostook	Rye	65.7	44.4	69.0	47.0	88.0	68.0

#### 2022 - 2024 North Dakota Grain Trials (shown in bushel/acre)

### Trial Highlights

#### Location: North Dakota University

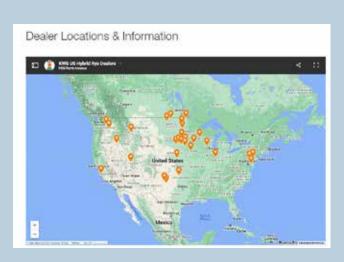
2024: Carrington location was planted on September 20, 2023 and harvested on August 2, 2024. The previous crop was forage barley. Langdon was planted on September 28, 2023 and harvested on August 19, 2024. The previous crop was soybeans. Minot was planted on October 12, 2023 and harvested on August 6, 2024. Previous crop was soybeans. Very uniform plots which resulted in exceptional yields.

2023: Average includes: Carrington, Hettinger, Langdon and Minot locations. They were planted between September 20 and 26, 2022 and harvested July 28 through August 9, 2023. Yields were lower than expected due to hot, dry weather in mid-June through end of July with little to no precipitation.

2022: Average includes: Minot, Langdon and Hettinger. All locations had very good growing conditions in 2022 showing the great potential in these areas of North Dakota. Planted between September 10-14, 2021 and harvested between August 2-11, 2022.



## FIND A DEALER NEAR YOU



Use the dealer locator map found at www.kws.com/us

# PENNSYLVANIA

2022 - 2024 Pennsy	vania Grain Trials	(shown in bushel/acre)
LOLL LOLTICHINGY		(3110/011111 0031161/2016)

Variety	Grain Type	2022	2023	2024 Rock Springs	2024 Landisville	2024 Average
KWS Serafino	Hybrid Rye	97.0	126.0	141.0	105.0	123.0
KWS Receptor	Hybrid Rye	103.0	120.0	136.0	108.0	122.0
KWS Tayo	Hybrid Rye	102.0	124.0	126.0	99.0	112.5
Aroostook	Rye	57.0	89.0	78.0	67.0	72.5
Surge	Triticale	79.0	-	-	-	-
Gunner	Triticale	58.0	-	-	-	-
Thor	Triticale	54.0	-	-	-	-

### Trial Highlights

Location: Penn State University, Rock Springs Research Farm & Landisville, PA

2024: Planted on October 24 & 26, 2023. Harvested on July 10 & 26, 2024. Rock Springs had uneven emergence and stand, but a mild winter and good rains improved the final yield. Landisville had a wet fall which delayed planting and caused uneven emergence. Rainfall early in April and warm dry weather later finished the drop in yield.

2023: Rock Springs location only. Planted on September 23, 2022. This trial was visited in early May. Rock Springs looked very nice and had received adequate moisture.

2022: Rock Springs location only. This was the first year planting a combination of species. Rock Springs hybrid rye/triticale/rye tillered very well in the fall and early winter. The winter was mild and there was very little spring green up impacts from freezing. There was timely rainfall in the spring. Weed pressure was very minimal. There was little to no lodging in plots. Overall, the results were very good and provided a good comparison between the species. Planting Date: October 15, 2021. Harvested: July 15, 2022.

# HELPFUL TOOLS FOR YOU



Seeding Rate Calculator

Use this quick and easy tool to calculate how many los of seed per acreyou should be planting and seeds / ft of row for planter calibration.



Stand Evaluation Calculator

Check your stand on your fields in fail and spring, and calculate the approximate plant population per acre and plant per square foot.



Yield Calculator Out an estimate of your yield potential. Take a first samples on your field and arrive the resulting numb

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# SOUTH DAKOTA

2022 - 2024 South Dakota Grain Trials (shown in bushel/acre)								
Variety	Grain Type	2022 Average	2023 Average	2024 Arlington	2024 Beresford	2024 Clear Lake	2024 Average	
KWS Receptor	Hybrid Rye	80.0	51.7	112.0	130.0	105.0	116.0	
KWS Tayo	Hybrid Rye	75.7	43.7	90.0	125.0	101.0	105.0	
KWS Serafino	Hybrid Rye	70.3	50.3	93.0	117.0	98.0	103.0	
SU Performer	Hybrid Rye	-	-	94.0	112.0	101.0	102.0	
Danko	Rye	-	43.7	83.0	95.0	74.0	84.0	
Aroostook	Rye	-	45.0	81.0	85.0	78.0	81.0	
Hazlet	Rye	52.7	38.7	74.0	91.0	78.0	81.0	
Gardner	Rye	53.0	40.0	56.0	84.0	35.0	58.0	
Elbon	Rye	50.0	-	-	-	-	-	
Rymin	Rye	47.3	-	-	-	-	-	
Overland	Wheat	45.0	-	-	-	-	-	

#### 2022 - 2024 South Dakota Grain Trials (shown in bushel/acre)

### Trial Highlights

Location: South Dakota State University - Southeast Research Farm

2024: Trials were planted on September 21, 2023, October 2, 2023 and October 11, 2023. They were harvested on July 22, 2024, August 9, 2024 and August 26, 2024. These trials were excellent with adequate moisture and uniform stands.

2023: Average includes: Arlington, Artesian and Beresford. Planted between October 2-11, 2022. Overall drought lowered yields and reduced differences between varieties. Tyndall and Wagner locations had extreme drought which led to poor stands and no yield data reported.

2022: 2022 average includes: Artesian, Beresford and Tyndall. Yields were lower than expected because of the very hot and dry weather that occurred from the middle of June and lasted until the end of July with little or no precipitation.

2022 - 2024 South Dakota Grain Breeder Trial (shown in bushel/acre)

Variety	Grain Type	2022	2023	2024
KWS Receptor	Hybrid Rye	82.0	50.0	122.0
KWS Tayo	Hybrid Rye	82.0	25.0	121.0
KWS Serafino	Hybrid Rye	77.0	34.0	116.0
Hazlet	Rye	66.0	30.0	93.0

### Trial Highlights

Location: South Dakota State University - Beresford, SD 2024: Planted on October 9, 2023 and harvested on August 7, 2024. Excellent trial with adequate moisture and uniform stands.

2023: Planted on October 3, 2022. South Dakota overall was extremely dry this year which reduced yields.

2022: Planted on September 22, 2022. Yields were lower than expected due to hot, dry weather.

# WASHINGTON

#### 2024 Washington Grain Trials (shown in bushel/acre)

Variety	Grain Type	2024
KWS Tayo	Hybrid Rye	109.0
KWS Serafino	Hybrid Rye	102.0
KWS Receptor	Hybrid Rye	94.0
LCS Shine	Wheat	95.0

### Trial Highlights

#### Location: Washington State University - Pullman, WA

2024: This is our first year for trials in Washington. Planted on October 17, 2023 and harvested on September 18, 2024. Later harvest in Washington resulted in some lodging. KWS Tayo stood well and did not lodge. KWS Serafino and LCS Shine winter wheat each had 1 plot lodged at a 90% level. KWS Receptor had 3 plots lodged at a 50-100% level.

## WISCONSIN

2022 - 2023 WISCONSIN Grain Trials (shown in bushel/acre)									
Variety	Grain Type	2022	2023						
KWS Serafino	Hybrid Rye	106.0	98.0						
KWS Tayo	Hybrid Rye	110.0	95.0						
KWS Receptor	Hybrid Rye	110.0	79.0						
P25R76	Wheat	101.0	104.0						
Hazlet	Rye	83.0	72.0						
P25R74	Wheat	96.0	-						

#### 2022 - 2023 Wisconsin Grain Trials (shown in bushel/acre)

### Trial Highlights

Location: University of Wisonsin - Arlington, WI 2024: No trial was planted.

2023: Planted on September 23, 2022. Harvested on July 21, 2023. There were some stand issues due to corn residue and clumpy soils followed by a season of limited moisture reduced yields, but still a very uniform stand and respectable yields.

2022: Plant date: September 28, 2021. Harvest Date: July 30, 2022. Excellent growing conditions.

# Agronomy Trial Results

Our KWS team takes great pride investing in research and development of our varieties so that we can offer the best recommendations and practices for our customers to be successful in their fields. The next few trials represent data collected in agronomy research trials funded by KWS in collaboration with universities and third party vendors.

### **TRIAL HIGHLIGHTS:**

Nitrogen Rate Study Multi Year Nitrogen Rate Study Seeding Rate Trial Water Use Long-Term Rotation and Tillage



## NITROGEN RATE STUDY

### Iowa State University (Hybrid Rye vs OP Rye) X Nitrogen Rate Study ISU Northeast Iowa Research Farm Funded by KWS Cereals, USA and Iowa State University

	2024 Yield Summary											
Variety	Nitrogen (Rate/Acre)	Yield (Bu/acre)	Harvest Moisture %	тw	% Lodge	Plant Height (in)	Straw Yield (Tons/acre)					
KWS Serafino	30 lbs N	100.1	14.4	54.6	1.1	48.7	2.7					
KWS Serafino	80 lbs N	130.3	14.4	54.2	2.8	51.1	3.0					
Hazlet	30 lbs N	76.2	14.5	54.3	5.0	56.0	2.9					
Hazlet	80 lbs N	90.5	14.4	53.6	5.0	55.5	3.0					

### **DETAILS and FIELD OPERATIONS**

Hazlet was seeded at 93.9 lbs/acre and KWS Serafino at 53.9 lbs/acre. The previous crop was soybeans. Plots were planted on October 6, 2023. On October 17, 2023 all plots showed 95% emergence after a large rain event on Oct. 12 & 13. 31lbs P205/ac as DAP and 200 lbs of K20/ac as 0-0-60 applies on November 7, 2023. 150lbs S/acre of Supercal SO4, to get 25.5 Sulfur/acre applies on November 19, 2023. On March 7, 2024, 30lbs N per acre applied as urea to all plots. On April 1, 2024, 50 lbs N per acre applied as urea to all the 80 N/ac plots. Plant heights were gathered on July 12, 2024. Harvested on July 24, 2024 and individual grain samples from each rep were evaluated.

### **COST/PROFIT ANALYSIS**

Assumptions: Nitrogen Price/Ton - \$600.00 Nitrogen Price/Unit - \$0.65 Price/Acre of additional 50 Units of N - \$32.61

### SUMMARY

KWS Serafino with a 30 Bu/ac increase valued at \$5.00 per bushel with 50 units of additional N = Hybrid Rye Profit - \$117.39 more profit/acre

OP Rye with a 14 Bu/ac increase valued at \$5.00 per bushel with 50 units of additional N = OP Rye Profit - \$37.39

With the previous crop of soybeans supplying some nitrogen and the applied nitrogen at 120 units, the corresponding 130 Bu/Aac yield on Hybrid Rye, the KWS nitrogen recommendation of 1.2 lbs of Nitrogen/Bushel supports this recommendation with help of the tremendous standability of Hybrid Rye.

## MULTI-YEAR NITROGEN RATE TRIAL

### Magnusson Farms - Roseau, MN

Multi-Year Hybrid Rye Nitrogen Rate Trial

Funded by KWS Cereals, USA and University of Minnesota



DETAILS and FIELD OPERATIONS

Experimental Design=Randomized Complete Block design with 4 reps Nitrogen Fertilizer applications made May 10,

2022. Previous Crop -Canola

Soil Test - October 2021:										
0-6"	0-6" 6-24" (Soil test depth = 0-6")									
nitrate	nitrate	Ρ	К	%OM	PH					
13	13 na 4L 145M 3.4L 7.7									

### SUMMARY

Current KWS Cereals nitrogen recommendation is 1.2 units of N/bu. Treatment of 120 units aligns with current recommendations for 100 bu Hybrid Rye.

\*<sup>1</sup>Nitrogen Rate-All N rates are #N/acre- urea source. Trt#8 has 30# sulfur(AMS) added. \*Palisade 1EC 12 oz./ac + .25%NIS applied 5/27/2022 - Feekes 4-12" height \*Yield adjusted to 12% moisture.

Variety = KWS Tayo 2022; KWS Serafino 2021; KWS Brasetto 2020

### Magnusson Farms - Roseau, MN - 2020 Hybrid Rye Nitrogen Rate Trial Funded by KWS Cereals, USA and University of Minnesota

Nitrogen Rate <sup>1</sup>	Yield (Bu/acre)²	Test wt. #/Bu.	Frost <sup>2</sup>	Stem Breakage <sup>3</sup>	Harvest Ht (in.)	Heading Date		Tissue Sample - Early Heading 6-7-2021		
							%N	%P	%K	%S
0	131.0	57.8	10	0.5	44	June 3	3.9	0.23	1.27	0.30
40-0-0	138.0	57.9	13	1.0	44	June 3	4.1	0.23	1.25	0.31
80-0-0	141.0	57.7	20	0.5	43	June 4	4.5	0.24	1.25	0.33
120-0-0	138.0	57.9	17	0.8	42	June 4	4.5	0.25	1.26	0.33
160-0-0	148.0	58.0	10	0.0	43	June 4	4.6	0.25	1.50	0.34
200-0-0	132.0	58.0	15	0.0	44	June 4	4.8	0.26	1.44	0.35
LSD@5% level	10	NS	NS	NS	NS	-	0.3	0.02	NS	0.03
CV (%)	5	0.4	104	186	4	-	5	5	14	6

<sup>1</sup>Yield adjusted to 12% moisture

<sup>2</sup>Frost damage 6/10-(white heads)- % of total

<sup>3</sup>Stem breakage 7/12- 0=none; 5= >30% stem breakage. Broken stems may not be picked up with combine.

Variety = KWS Serafino 2020

### DETAILS and FIELD OPERATIONS

Planted September 15, 2021. Fertilizer applied April 25, 2021. Harvested July 29, 2021. Previous crop - soybeans in 2020.

### SUMMARY

This trial differs from the multi-year nitrogen trial *(above)* in that the KWS Serafino variety was planted and out yielded the KWS Brasetto planted at the location above. Treatment of 120 units applies to the current recommendation of 1.2 units of N/bushel.

-											
Soil Test											
0-6"	6-24" (Soil test depth = 0-6")										
nitrate	nitrate	Ρ	К	%OM	PH						
10	15	10M	128M	2.5L	8.2						



## SEEDING RATE TRIAL

### Colorado State Soil and Crop Sciences 2024 Seeding Rate Trial - Akron, CO - 1 year data

Funded by KWS Cereals, USA and Joel Schneekloth - Extension Crop Production

Variety	Seeding Rate	Yield (Bu/acre)	тw	Protein	Group*
KWS Tayo	1,100,000	93.3	53.8	11.3	А
KWS Tayo	800,000	86.5	53.8	11.6	AB
KWS Tayo	500,000	85.9	54.3	11.4	AB
KWS Serafino	1,100,000	84.3	54.2	11.4	AB
KWS Serafino	800,000	84.3	55.1	11.1	AB
KWS Serafino	500,000	82.8	54.6	11.4	AB
KWS Receptor	1,100,000	87.4	54.8	11.2	AB
KWS Receptor	800,000	81.4	54.3	11.6	В
KWS Receptor	500,000	78.9	54.7	11.8	BC
Hazlet	1,100,000	67.3	54.9	12.0	D
Hazlet	800,000	70.4	55.2	11.7	CD
Hazlet	500,000	69.5	55.2	11.8	CD

\*Similar letters are statistically the same

### TRIAL HIGHLIGHTS:

Precipitation from September 29 to July 25 was 11.9 inches. Irrigation total was 5 inches. Fertility was 70 lbs N and 40 lbs P. Planting date was September 29, 2023. Harvest was July 24, 2024.

### SUMMARY

This initial trial would suggest that KWS Serafino and OP rye Hazlet tend to have a lower response to higher seeding rates then KWS Receptor and KWS Tayo. This data further supports the KWS seeding rate recommendations of 800,000 seeds per acre as higher seeding rates offered only a minimal impact on yield and in most instances does not offset the additional cost of seed.



## WATER USE IN CEREAL CROPS

### Texas A&M AgriLife Research/Extesion

Crop Water Use to Boot and Soft-Dough Harvest Stages

Jourdan Bell, Carla Naylor, Kevin Heflin, Jessica Smith, Jason Baker, Shannon Baker, and Brandon Gerrish



### SUMMARY

Hybrid Rye requires less total water than wheat or triticale! This was most notable at the late cut, soft dough stage with Hybrid Rye needing almost 1.5 inches less water. This could result in a significant cost saving in water limiting regions.

"Crop water use is an important consideration for Southern Great Plains producers, and to answer producer questions about differences in water use between forage types, seasonal crop water use was determined for three varieties representing wheat, rye, and triticale (Table 4). Data confimed significant differences in total crop water use between forage types, but producers should consider 1) greater water use is a function of a longer growing season and 2) greater water use efficiencies are a function of greater yields within the repsective forage type. To minimize yield losses and overcome potential heat stress, irrigation capacity is an important agronomic consideration"<sup>1</sup>

Variety	Forage Type	Harvest Date	Boot Soil Water Use (in)	Precip (in)	Irrig (in)	Total Water Use (in)	WUE (Ibs/ in.)
TAM 114	Wheat	4/26/24	2.5	4.6	9.5	16.6 b	571
KWS Aviator	Rye	4/26/24	1.9	4.6	9.5	16.0 c	520
Slick Trit II	Triticale	5/4/24	3.4	4.6	9.5	17.5 a	623
					Average	16.7	571
					CV (%)	4	11

**Tables:** Crop water use to boot and soft-dough harvest stages. Total crop water use represents the combined soil water, precipitation, and irrigation from planting to the reported harvest date. The water use efficiency represents the pounds of forage (DM basis) per inch of total water.

Soft-Dough												
Variety	Forage Type	Harvest Date	Soil Water Use (in)	Precip (in)	Irrig (in)	Total Water Use (in)	WUE (lbs/ in.)					
TAM 114	Wheat	6/3/24	6.4	5.7	12	24.2	621					
KWS Aviator	Rye	6/4/24	5.3	6.3	12	23.6	527					
Slick Trit II	Triticale	6/11/24	6.7	6.3	12	25.0	538					
					Average	24.3	562					
					CV (%)	3	12					

<sup>1</sup>Bell, J., C. Naylor, K. Heflin, et al. 2023-2024 Texas A&M AgriLife Small Grain Silage Trial at Bushland. Texas A&M University, Department of Soil and Crop Sciences. SCSC-2024-11 \*numbers with different superscript letters differ significantly, P<0.05

## LONG-TERM ROTATION & TILLAGE STUDY



### South Dakota State University Long-Term Rotation and Tillage Study: Observations on Corn and Soybean Yields Peter Sexton\*, Brad Rops, Ruth Stevens, Garold Williamson, and Chelsea Sweeter

### INTRODUCTION

"In 1991 Dale Sorensen initiated a long-term rotation study at the Southeast Farm including comparison of no-till and conventional till under two year (corn-soybean), three year (corn-soybean-small grain) and a 4-year rotation (currently corn-soybean-oat-winter rye); note the three and four-year rotations have not been consistent over the years. In previous years, sometimes field pea was substituted for small grain, and sometimes soybeans were raised twice within the four-year rotation. Corn has consistently only been raised once per cycle in a given rotation. Therefore, the rotation length has been consistent for corn, but not for soybean." (Station, South Dakota Agricultural Experiment, "Southeast South Dakota Experiment Farm Annual Progress Report, 2023" (2023). Agricultural Experiment Station and Research Farm Annual Reports. 284. https://openprairie.sdstate.edu/agexperimentsta\_rsp/284)

#### SUMMARY

"Corn yields showed a strong response to rotation length, yielding about (22 bu/ac) more going from a two year to a three year rotation. Soybean in a two year corn/soybean rotation showed a significant yield increase (3 bu/ac) with

addition of a rye to the system." (Research Farm, Southeast South Dakota and South Dakota Agricultural Experiment Station, "Southeast South Dakota Experiment Farm Annual Progress Report, 2019" (2019). Agricultural Experiment Station and Research Farm Annual Reports. 280. https://openprairie.sdstate.edu/agexperimentsta\_rsp/280)

		Corn		
Rotation	Moisture %	Test Wt (Ibs/bu)	Stand (plts/ac)	Yield (bu/ac)
2	15.8	57.3	27,769	173.3
3	16.0	56.1	27,987	195.9
4	16.8	56.9	28,859	195.8

Soybeans									
Rotation	otation Moisture Test Wt Stand Height 100- % (Ibs/bu) (plts/ac) (in.) (g)								
2	12.7	54.9	81,893	31.7	15.8	45.8			
3	12.6	55.0	85,378	32.1	16.3	47.7			
4	12.7	54.7	90,387	31.7	16.4	47.9			

Research Farm, Southeast South Dakota and South Dakota Agricultural Experiment Station, "Southeast South Dakota Experiment Farm Annual Progress Report, 2019" (2019). Agricultural Experiment Station and Research Farm Annual Reports. 280. https://openprairie.sdstate.edu/agexperimentsta\_rsp/280

## Forage Results

Our forage varieties, KWS Progas, KWS Propower, and KWS Aviator are known for their unique combination of tonnage and quality. If you are looking for the ultimate forage solution then look no further than KWS Hybrid Rye!

- Eastern US Forage Results 6 locations over 3 years Central US Forage Results 5 locations over 2 years
- Western US Forage Results 1 location over 2 years

## HYBRID RYE - EASTERN US FORAGE RESULTS

\*Summary from 6 locations over 3 years showing consistent high yields and quality

### Forage Yield, Tons/Acre



**KWS** 

Eastern US Forage - Tons/Acre shown at 35% DM and harvested at boot and milk stage. Left bar of each variety is boot stage, right bar is milk stage. Chart represents a three year data (2022, 2023 & 2024) average across the following locations: Lansing and Mason City, MI, Caldwell, NY, Pennsylvania Furnace and University Park, PA and Orange, VA. \*\*KWS Aviator and KWS Progas are hybrid rye, Surge and Thor are triticale, Hazlet and Danko are cereal rye.

Forage Qua								ruanty	
СР	ADF	aNDF	aNDFom	Lignin	NDFd, 30	NDFd, 48	NFC	TDN	RFV
%DM					%aNI	DFom			
16.20	33.93	56.63	55.07	3.35	61.75	71.30	19.59	63.10	104.62
15.11	33.60	57.12	55.56	3.76	62.30	71.66	20.50	63.90	104.26
15.73	31.09	52.28	50.89	1.98	65.00	72.85	23.20	65.38	115.67
17.34	32.95	55.03	53.45	2.38	66.35	71.95	19.76	64.24	107.47
16.28	32.75	55.86	54.54	2.45	66.06	71.79	19.78	64.28	105.72
15.40	34.31	58.57	57.24	3.30	63.88	70.55	18.46	63.46	98.60
11.06	38.87	62.71	60.94	6.99	43.00	50.71	18.83	62.71	87.40
8.47	39.08	63.30	61.79	7.07	43.16	50.73	20.20	64.28	86.39
9.15	36.32	61.85	59.90	6.03	47.74	53.68	23.12	62.77	91.14
9.54	38.60	64.67	63.13	6.73	47.92	56.90	18.97	61.85	84.87
8.32	38.90	64.56	62.58	6.09	43.02	53.76	21.38	60.82	84.60
8.24	39.66	64.19	62.05	6.93	40.85	49.12	21.57	60.59	84.13
	16.20 15.11 15.73 17.34 16.28 15.40 11.06 8.47 9.15 9.54 8.32	I6.20         33.93           16.20         33.93           15.11         33.60           15.73         31.09           17.34         32.95           16.28         32.75           15.40         34.31           11.06         38.87           8.47         39.08           9.15         36.32           9.54         38.60           8.32         38.90	%DM           16.20         33.93         56.63           15.11         33.60         57.12           15.73         31.09         52.28           17.34         32.95         55.03           16.28         32.75         55.86           15.40         34.31         58.57           11.06         38.87         62.71           8.47         39.08         63.30           9.15         36.32         61.85           9.54         38.60         64.67           8.32         38.90         64.56	%DM           16.20         33.93         56.63         55.07           15.11         33.60         57.12         55.56           15.73         31.09         52.28         50.89           17.34         32.95         55.03         53.45           16.28         32.75         55.86         54.54           15.40         34.31         58.57         57.24           11.06         38.87         62.71         60.94           8.47         39.08         63.30         61.79           9.15         36.32         61.85         59.900           9.54         38.90         64.56         62.58	%DM           %DM           %DM           %DM           16.20         33.93         56.63         55.07         3.35           15.11         33.60         57.12         55.56         3.76           15.73         31.09         52.28         50.89         1.98           17.34         32.95         55.03         53.45         2.38           16.28         32.75         55.86         54.54         2.45           15.40         34.31         58.57         57.24         3.30           11.06         38.87         62.71         60.94         6.99           8.47         39.08         63.30         61.79         7.07           9.15         36.32         61.85         59.90         6.03           9.54         38.60         64.67         63.13         6.73           8.32         38.90         64.56         62.58         6.09	%DM         %aNI           16.20         33.93         56.63         55.07         3.35         61.75           15.11         33.60         57.12         55.56         3.76         62.30           15.73         31.09         52.28         50.89         1.98         65.00           17.34         32.95         55.03         53.45         2.38         66.35           16.28         32.75         55.86         54.54         2.45         66.06           15.40         34.31         58.57         57.24         3.30         63.88           11.06         38.87         62.71         60.94         6.99         43.00           8.47         39.08         63.30         61.79         7.07         43.16           9.15         36.32         61.85         59.90         6.03         47.74           9.54         38.60         64.67         63.13         6.73         47.92           8.32         38.90         64.56         62.58         6.09         43.02	%DM         %aNDFom           16.20         33.93         56.63         55.07         3.35         61.75         71.30           15.11         33.60         57.12         55.56         3.76         62.30         71.66           15.73         31.09         52.28         50.89         1.98         65.00         72.85           17.34         32.95         55.03         53.45         2.38         66.35         71.95           16.28         32.75         55.86         54.54         2.45         66.06         71.79           15.40         34.31         58.57         57.24         3.30         63.88         70.55           11.06         38.87         62.71         60.94         6.99         43.00         50.71           8.47         39.08         63.30         61.79         7.07         43.16         50.73           9.15         36.32         61.85         59.90         6.03         47.74         53.68           9.54         38.60         64.67         63.13         6.73         47.92         56.90           8.32         38.90         64.56         62.58         6.09         43.02         53.76	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	CP         ADF         aNDF         aNDFom         Lignin         NDFd, 30         NDFd, 48         NFC         TDN           %DM         %DM         %aNDFom         %aNDFom         %aNDFom         %a         %a           16.20         33.93         56.63         55.07         3.35         61.75         71.30         19.59         63.10           15.11         33.60         57.12         55.56         3.76         62.30         71.66         20.50         63.90           15.73         31.09         52.28         50.89         1.98         65.00         72.85         23.20         65.38           17.34         32.95         55.03         53.45         2.38         66.35         71.95         19.76         64.24           16.28         32.75         55.86         54.54         2.45         66.06         71.79         19.78         64.28           15.40         34.31         58.57         57.24         3.30         63.88         70.55         18.46         63.46           11.06         38.87         62.71         60.94         6.99         43.00         50.71         18.83         62.71           8.47         39.08         63.

Forage quality data from Caldwell, NY in Cornell University Trials in 2023 and 2024. Samples were analyzed at Dairyland Labs, Arcadia, WI.

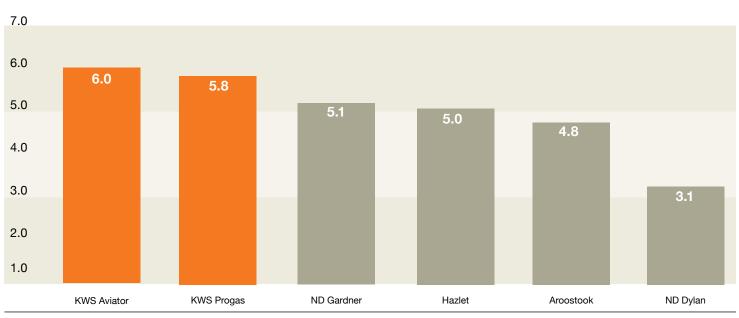
### Experience the KWS Hybrid Rye difference. The forage choice preferred by livestock across the globe.

By pairing the KWS Hybrid Rye breeding process with top tier genetics, consistent and stable performance can be expected year over year. From hybrid vigor, to greater water use efficiency, and everything in-between; All benefits align to generate optimal ROI for your operation by utilizing KWS Hybrid Rye as a forage source.

Eorogo Quality



### Forage Yield, Tons/Acre



Central US Forage - Tons/Acre shown at 35% DM and harvested at boot stage

Chart represents a two year data (2023 & 2024) average across the following locations: Beresford, SD, Carrington, ND, Garden City, Hays and Scandia, KS and Sidney, NE. \*\*KWS Aviator and KWS Progas are hybrid rye, ND Gardner, Hazlet, Aroostook and Danko are cereal rye.

### **Forage Quality**

		СР	ADF	aNDFom	Lignin	NDFd, 30	NDFd, 48	NFC	TDN	RFV
- -				%DM		%NE				
-	KWS Aviator	16.11	34.94	54.37	4.91	52.23	62.23	18.12	62.43	106.84
ear	KWS Progas	15.62	35.18	56.82	4.05	55.11	62.44	16.72	61.95	111.70
ts	ND Gardner	16.45	35.55	57.52	4.60	37.67	56.58	10.89	57.79	95.53
	Hazlet	17.72	33.13	56.39	3.67	36.60	59.71	8.32	58.93	103.07
	Aroostook	18.46	31.88	55.46	3.91	40.59	64.79	13.02	60.73	103.75

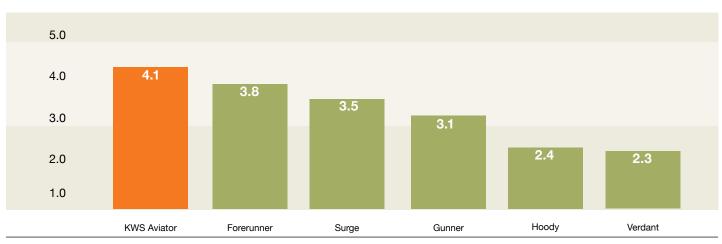
Forage quality data from University Trials at Beresford, SD, Carrington, ND, Garden City, Hays and Scandia, KS and Sidney, NE. Samples were analyzed at Dairyland Labs, Arcadia, WI.

Experience the KWS Hybrid Rye difference. The forage choice preferred by livestock across the globe.

By pairing the KWS Hybrid Rye breeding process with top tier genetics, consistent and stable performance can be expected year over year. From hybrid vigor, to greater water use efficiency, and everything in-between; All benefits align to generate optimal ROI for your operation by utilizing KWS Hybrid Rye as a forage source.



### Forage Yield, Tons/Acre



Western US Forage - Tons/Acre shown at 35% DM and harvested at boot stage

Chart represents a two year data (2023 & 2024) average for Aberdeen, ID location \*\*KWS Aviator is hybrid rye, Forerunner, Surge and Gunner are triticale, Hoody and Verdant are barley.



#### Experience the KWS Hybrid Rye difference. The forage choice preferred by livestock across the globe.

By pairing the KWS Hybrid Rye breeding process with top tier genetics, consistent and stable performance can be expected year over year. From hybrid vigor, to greater water use efficiency, and everything in-between; All benefits align to generate optimal ROI for your operation by utilizing KWS Hybrid Rye as a forage source.

	Forage							
	СР	ADF	aNDF	Lignin	NDFd, 30	NDFd, 48	TDN	
	%DM			%al				
KWS Aviator	14.18	22.72	47.98	2.60	41.13	71.91	78.36	
Forerunner	17.33	27.53	56.91	3.37	41.90	70.83	68.83	
Surge	10.33	31.21	59.21	3.88	25.17	56.72	64.21	
Gunner	17.55	29.48	59.22	3.60	38.49	64.12	65.37	
Hoody	14.61	29.86	52.23	2.19	42.85	73.54	67.64	
Verdant	12.06	19.53	39.79	1.58	44.63	78.76	80.44	

Forage quality data from Aberdeen, ID locations. Samples were analyzed by NIR at the University of Idaho.



## Want to learn more about Hybrid Rye? Contact the KWS team or visit our website at: www.kws.com/us

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