

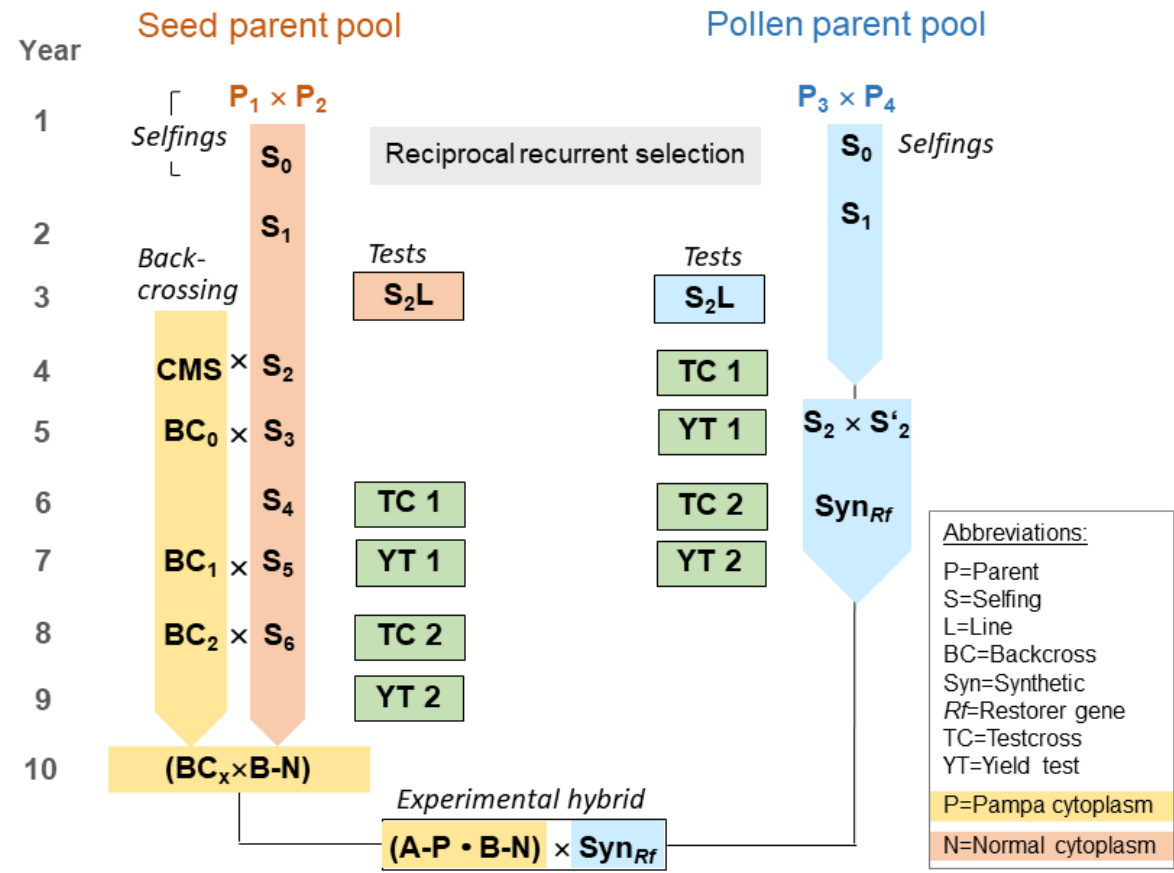


# How To Grow (Hybrid) Winter Rye

**Advanced Crop Advisors Workshop**  
**Jochum Wiersma**

# A Very Brief History

- Rye is the only outcrossing small grains:
  - Hybrid breeding efforts started by two German companies (KWS and Saaten Union) 30 years ago.
  - Naturally more suitable for production of hybrids (defined as the first generation offspring of two parent) when compared to wheat, barley, or oats.
  - Still not as easy as corn because male and female parts are combined in single spike compared to tassel and silk.



# Advantages Hybrid Rye

- Higher yield potential (30 – 40% commercial heterosis over OPV)
- More uniform (outflow of hybrid production system)
  - Less likely to develop ergot (better odds of pollination and seedset)
  - Easier to manage
- Better agronomics
  - Lodging resistance (still standard height but shorter despite heterosis)
  - Disease resistance

# Current Acreage

- 11000 acres under contract in NW Minnesota this year that will be shipped by rail to Indiana (Brooks Grain)
- Another 9000 acres across central and southern MN of which some is moved out of state (Grain Millers and Brooks Grain) and some that stays local (swine)

# Potential Acreage

- > 1.0 million acres in Minnesota
  - Assuming average yield of 100 bu/acre and 50% substitution of corn in rations
- Chicken and egg conundrum for the swine industry
  - Feed equivalency well documented
  - Risk /reward for growers vs risk/reward for feed mills
  - Lack of regional aggregator

# Field Selection

- Reasonable well drained
  - But with some water holding capacity
- Know previous crop:
  - Avoid corn (risk of FHB)
  - Avoid heavily manured (risk of lodging due to excess N)
- Know herbicide history
  - Check for potential carry-over problems

# Example Rotations

<i>Rotation</i>	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>	<i>Year 4</i>	<i>Year 5</i>
<b><i>One</i></b>	Winter Rye (III-C) <sup>1</sup>	Corn (IV-W)	Soybean (I-W)		
<b><i>Two</i></b>	Winter Rye (III-C)	Alfalfa (II-P)	Alfalfa (II-P)	Corn (IV-W)	Soybean (I-W)
<b><i>Three</i></b>	Winter Rye (III-C)+ Sorghum (IV-W)	Corn (IV-W)	Field Peas (I-C)		
<b><i>Four</i></b>	Winter Rye (III-C)+ Sorghum (IV-W)	Corn (IV-W)	Dry Beans (I-W)		

<sup>1</sup> Roman numerals refer to crop group, C= cool season, W = warm season, and P = perennial.



# Herbicide Carry-over

<i>Group</i>	<i>Product</i>	<i>Crop Rotation Restrictions</i>
		(months)
<i>Soil Applied</i>	Atrazine	24
	Triallate (Far Go)	18
	Triflurilan (Treflan)	18
	Sulfentrazone (Spartan)	12
<i>Post Applied</i>	Triasulfuron (Amber)	18
	Flucarbazone (Everest)	18
	Imazapic (Plateau)	24
	Imazamox (Pursuit)	18
	Aminopyralid (Milestone)	B
<i>Pre Mix</i>	Authority (sulfentrazone + imazethapyr)	18
	Boundary (S-metalachlor + metribuzin)	12
	Extreme (imazamox + glyphosate)	18

# The Green Bridge Conundrum

- Winter rye can be an alternate host for a number of pest and disease problems, with the biggest threat (for now) probably being Hessian Fly.
- Make sure you **do not create a bridge** that allows those problems to jump from last seasons crop to next season crop.

# Basic Fall Agronomics

- Seeding rate: 0.8 – 1.0 mln. plants/acre
- Seeding date: September 15 – October 7 (Fly-Free Date )
- Seeding depth: 1.5 to 2.5 inches deep
- Weed Management: burn down of winter annuals/volunteer grain

# Planting Depth

- Optimum planting depth is probably ~ 1.5 inches:
  - Quick emergence
  - Good likelihood for optimum seed to soil contact
  
- Rye is more tolerant to greater seeding depths than either wheat or barley:
  - Length of sub-crown internode
  - Length of coleoptile

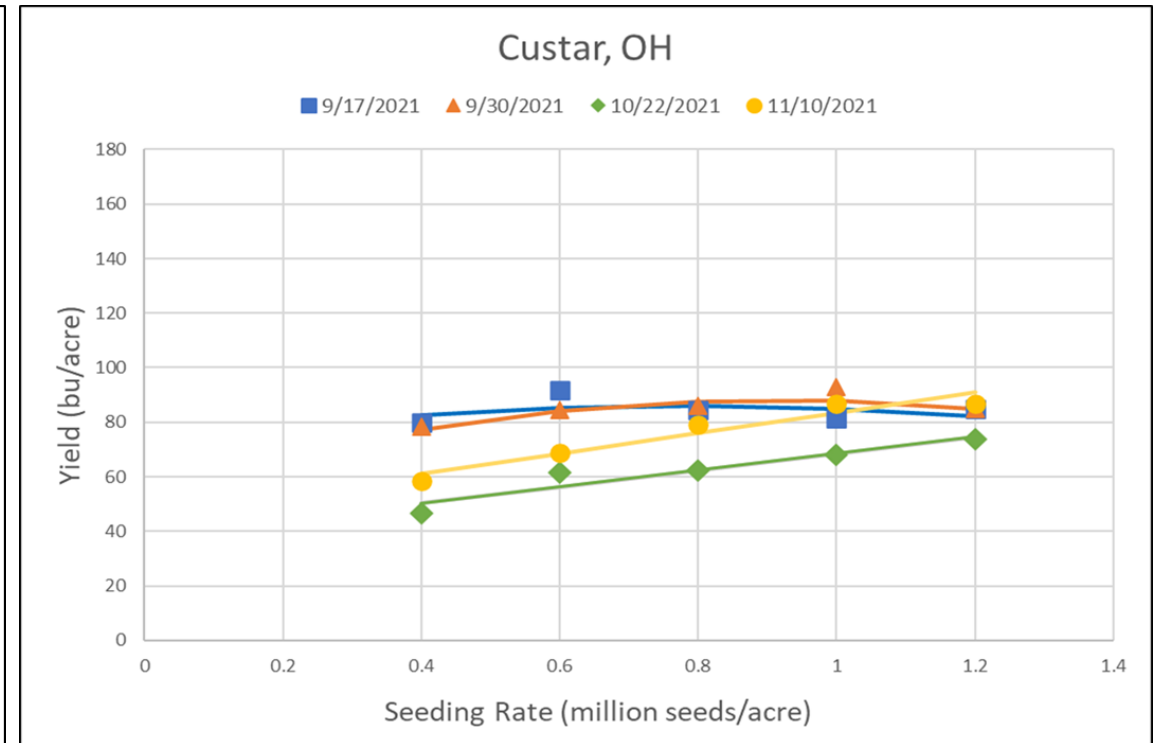
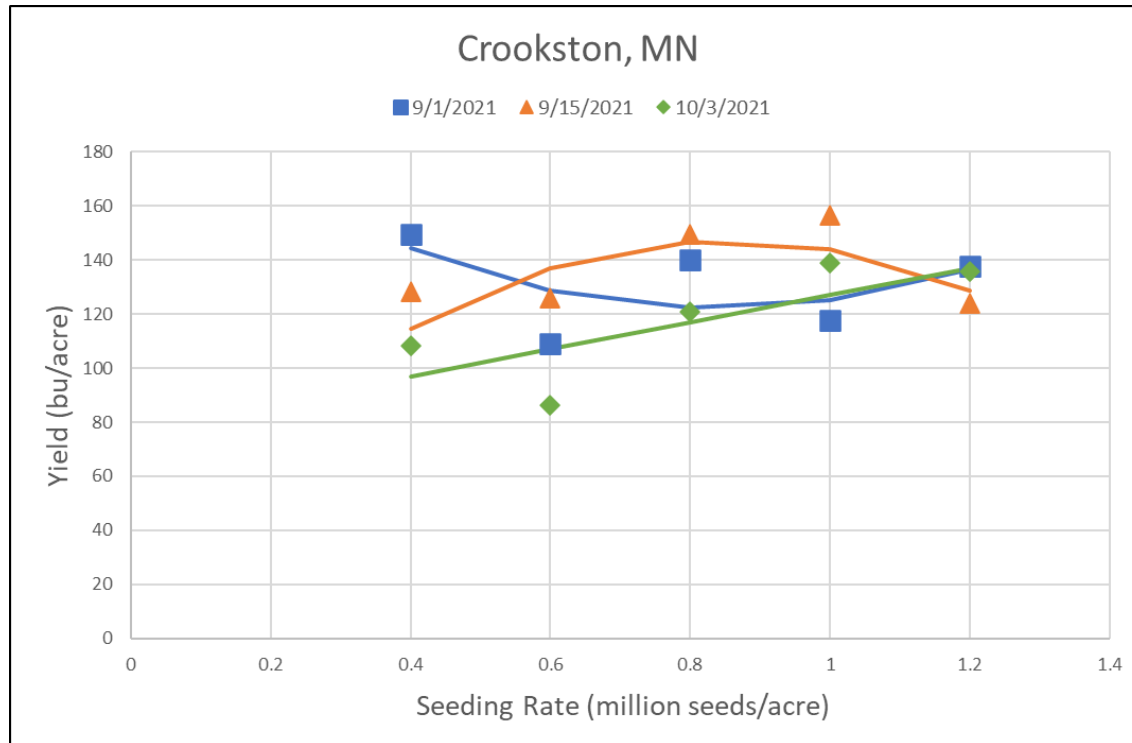
# Coleoptile Length OPV Rye Varieties

Variety	Coleoptile
	-- inches --
Wheeler	9.0
Prima	7.6
Elbon	7.0
Rymin	6.1
Danko	5.9
AC Remington	5.9
<b>LSD(0.05)</b>	<b>0.6</b>

# Seeding Rate x Planting Date

- Multistate (KY, OH, WI, MN) project underway that will look at seeding rate x planting date interaction.
  - Can we lower seeding rates when seeding 'early'?
  - How important are tillers that are initiated in the fall for final grain yield?

# Seeding Rate Response Curves (2022)



# N Fertility Management

- Large MDA funded project underway to update N recommendations for (hybrid) winter rye:
  - Amount of N needed to maximize grain yield (hybrids yield 30 to 40% more than the best OPV)
  - Timing of N to maximize grain yield (fall vs. split vs. spring applied)



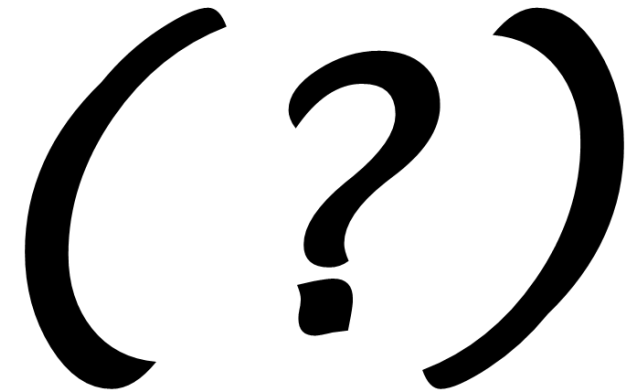
# Fertility Management

- Nitrogen N:
  - For now a top-dress application to in early spring is suggested.
  - MAP or DAP is more than adequate for starter
- Phosphate (P):
  - Aids in winter survival
  - Apply as starter (MAP, DAP)
- Potash (K)
  - Aids in winter survival
- Other nutrients
  - Not suggested



# N Guidelines

		Expected Yield (bu./acre)				
OM Level*		40-49	50-59	60-69	70-79	80 +
Alfalfa (4+ plants/ft <sup>2</sup> )	Low	0	0	35	60	95
	Med and high	0	0	0	40	75
Alfalfa (2 to 3 plants/ft <sup>2</sup> )	Low	0	0	40	65	90
	Med and high	0	0	20	45	70
Soybeans Alfalfa (1 or less plants/ft <sup>2</sup> )	Low	40	65	90	115	140
	Med and high	20	45	70	95	120
Edible beans, field peas	Low	50	75	100	125	150
	Med and high	30	55	80	105	130
Group 1 Crops	Low	0	35	60	85	110
	Med and high	0	0	40	65	90
Group 2 Crops	Low	60	85	110	135	160
	Med and high	40	65	90	115	140



# P Guidelines

Expected Yield	Phosphorus (P) Soil Test, ppm*					
	Bray:	0-5	6-10	11-15	16-20	21 +
	Olsen:	0-3	4-7	8-11	12-15	16 +
lb./acre		— P <sub>2</sub> O <sub>5</sub> to apply (lb./acre) —				
40-49		40	30	15	0	0
50-59		50	35	20	0	0
60-69		60	45	20	0	0
70-79		70	50	25	0	0
80 +		80	55	25	0	0

# K Guidelines

Expected Yield	Potassium (K) Soil Test, ppm*				
	0-40	41-80	81-120	121-160	161 +
lb./acre					
40-49	100	75	45	0	0
50-59	130	95	55	0	0
60-69	155	110	65	0	0
70-79	180	125	75	0	0
80 +	190	135	80	0	0

# Basic Summer Agronomics

- Weed Management:
  - Few options labeled (EPA risk-cup conundrum)
- Disease Management:
  - Early season - Check for powdery mildew
  - Heading – FHB, ergot, leaf rust, stem rust, and Septoria spp.)
- Harvest Management:
  - Rye can be combined when grain moisture <18 (and you have full floor air).

# Crop Safety Screening (2021)

One-sided Dunnett's Multiple Comparisons with a Control ( $p < 0.05$ )

Treatment	Herbicide	Rate	Crop Injury (0-100)		
			7DAP	14DAP	21DAP
1	Untreated Check		0.0	0.0	0.0
2	Discovery NG	16 fl oz/a	3.3	0.0	0.0
3	Varro	6.85 fl oz/a	0.0	0.0	0.0
4	Osprey	4.75 oz wt/a	3.3	23.3	15.0
5	Osprey Xtra	4.75 oz wt/a	10.0	36.7	16.7
6	Elevore	1 fl oz/a	0.0	0.0	3.3
7	Defendor	0.0045 lb ai/a	0.0	13.3	0.0
8	Escort	0.1 oz wt/a	0.0	0.0	0.0
9	Autumn	0.3 oz wt/a	8.3	28.3	18.3
10	Orion	17 fl oz/a	1.7	6.7	3.3
11	Quelex	0.75 oz wt/a	0.0	0.0	0.0

# Spring Disease & Pest Management

- Scout actively for powdery mildew early in the season (late April)
  - Consider early season systemic fungicide application at half labeled rate
- Consider all hybrid winter rye varieties to be:
  - **Susceptible to FHB** (but escape is a good management 'tactic')
  - Somewhat susceptible to ergot (hybrids are less prone and crop rotation helps greatly)
  - **Watch risk model/disease updates** to determine need for fungicide at Feekes 10.51

# Fungicides and Winter Rye

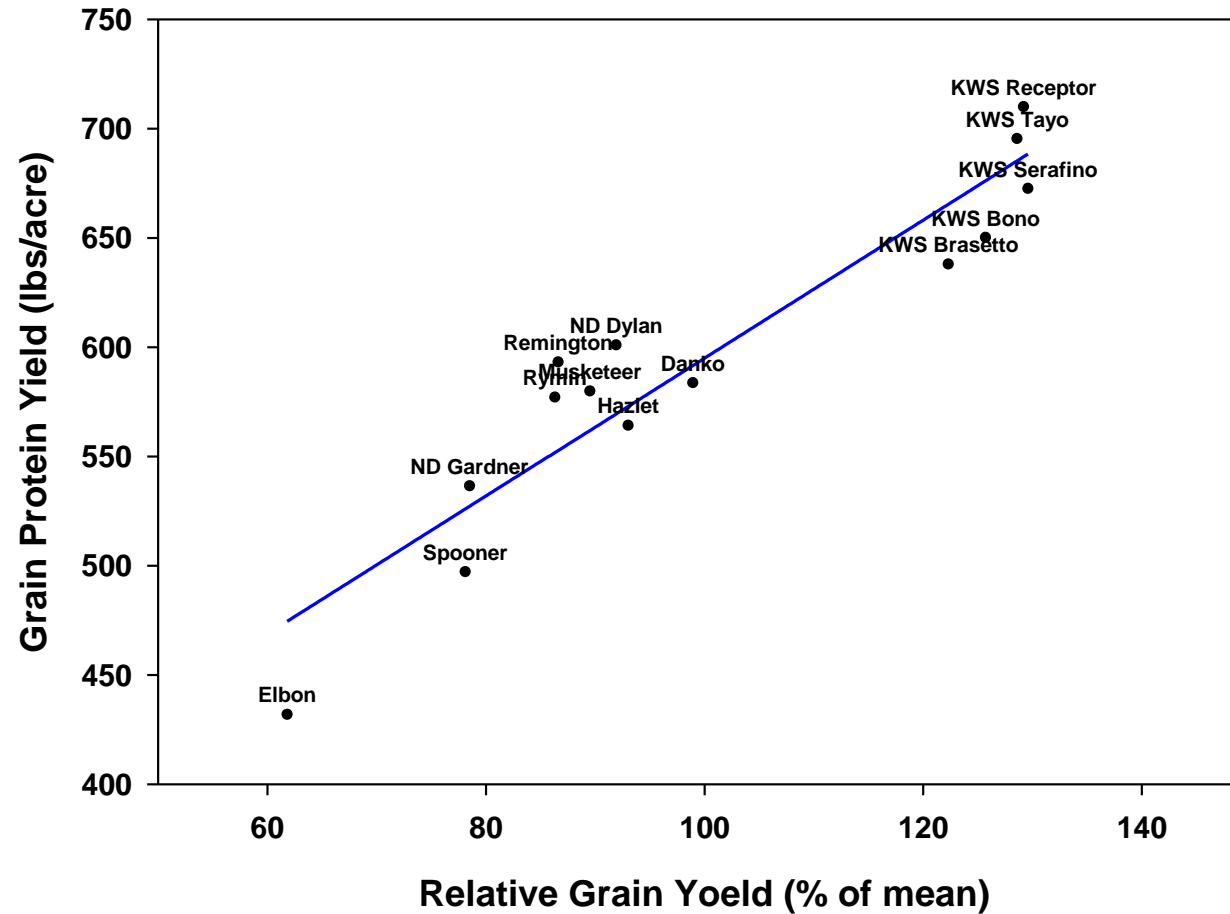
- Both FHB and ergot are serious impediments to winter rye's suitability for food and feed use.
- Some triazole (DMI or Group 3) chemistries reportedly worsen incidence and severity of ergot.
- KWS is worried about poorer seed set with use of fungicides at Feekes 10.51.



# Fungicide Screening (2022)

Treatment	Product	Timing	FHB Field Severity (%)	Grain Yield (bu/acre)
1	Untreated Check	Feekes 10.51	6.8	107.2
2	Miravis Ace	Feekes 10.51	2.0	112.4
3	Prosaro	Feekes 10.51	2.5	108.5
4	Prosaro Pro	Feekes 10.51	3.5	105.7
5	Sphaerex	Feekes 10.51	3.6	111.0
6	Miravis Ace	Feekes 10.54	2.3	110.8
7	Prosaro	Feekes 10.54	2.3	118.3
8	Prosaro Pro	Feekes 10.54	3.4	116.4
9	Sphaerex	Feekes 10.54	3.2	124.5
<b>p-value</b>			0.25	NS

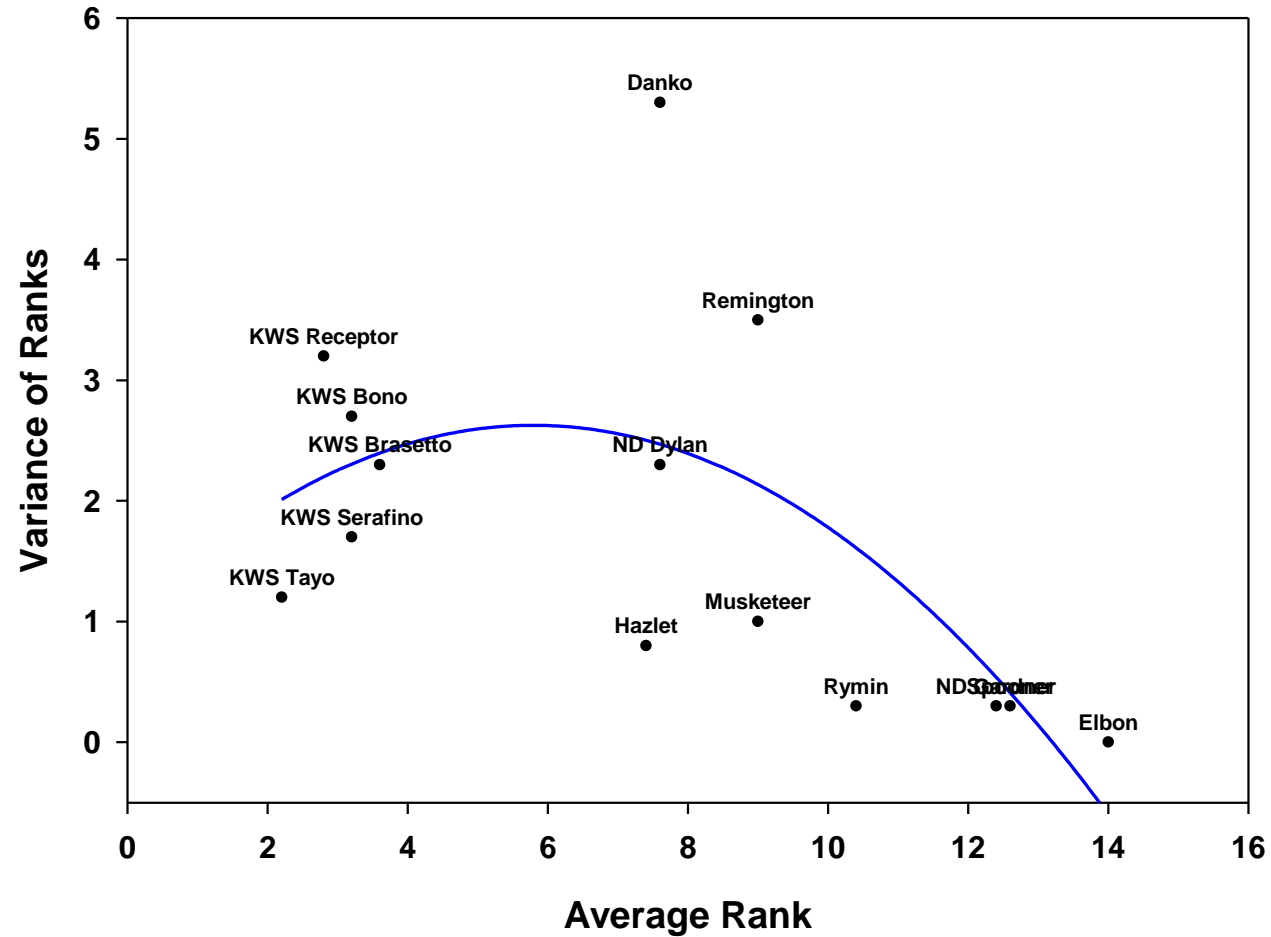
# GY and GPY (2019-2021)



# Some Yield Trial Data

Cultivar	Lamberton		LeCenter		Becker		Crookston		Roseau		State	
	2022	3yr.	2022	3yr.	2022	3yr.	2022	3yr.	2022	3yr.	2022	3yr.
Danko	80.0	78.5	86.3	102.8	80.0	78.5	67.0	60.8	87.1	88.5	83.0	80.3
Elbon	67.9	55.1	68.4	68.3	67.9	55.1	53.9	46.4	62.3	56.1	62.4	52.5
Hazlet	87.0	75.4	85.5	93.7	87.0	75.4	82.2	70.1	102.9	99.0	85.2	78.6
KWS Receptor	116.3	110.1	130.8	127.6	116.3	110.1	92.0	93.2	130.4	133.9	115.9	108.2
KWS Serafino	113.8	105.9	120.8	133.9	113.8	105.9	110.3	95.1	127.7	134.6	115.5	110.9
KWS Tayo	107.1	100.7	136.0	140.9	107.1	100.7	84.7	83.4	120.6	133.9	118.8	110.5
Musketeer	59.9	66.1	74.0	80.5	59.9	66.1	86.0	73.4	95.1	92.8	75.4	72.1
ND Dylan	55.9	63.7	78.4	81.6	55.9	63.7	91.6	82.0	93.9	95.7	72.1	71.7
ND Gardner	67.6	61.4	77.1	81.3	67.6	61.4	69.6	58.1	88.3	78.4	74.1	64.6
Remington	71.1	63.1	73.3	82.2	71.1	63.1	69.4	67.9	90.3	90.6	70.5	67.3
Rymin	60.0	65.1	79.2	83.8	60.0	65.1	71.8	62.4	85.3	87.0	69.8	68.4
Spooner	70.5	63.9	82.1	82.3	70.5	63.9	67.9	53.1	95.6	80.5	78.2	66.3
Mean (bu/acre)	87.9	75.7	101.3	96.6	88.7	75.7	83.0	70.5	103.0	97.6	92.9	79.3
LSD(0.1)	8.8	6.3	8.3	7.3	8.8	6.3	13.6	8.3	9.8	8.2	5.5	3.7

# Rank Stability (2019 - 2021)



# A Word of Caution

- Rye is a long-day species:
  - The literature suggests that rye has about an 18 hr. plus optimum photoperiod (= really adapted to northern latitudes)
- Late springs reduces the vegetative growth period and appears to reduce yield potential at MN latitudes

# QUESTIONS<sup>1,2?</sup>

Just e-mail me ([wiers002@umn.edu](mailto:wiers002@umn.edu))

- <sup>1</sup> Social psychologists have determined that most people will refrain from asking questions once the group is larger than twelve
- <sup>2</sup> Social psychologists also determined that you have to give your audience at least twelve seconds to formulate a question and/or react the claims made by the speaker