MN Wheat On-Farm Research Network 2020 Report

ON-FARM RESEARCH NETWORK
MINNESOTA WHEAT

MINNESOTA WHEAT
RESEARCH & PROMOTION COUNCIL

DEPARTMENT OF AGRICULTURE

AFREC
Agricultural Fertilizer Research & Education Council

MINNESOTA SOYBEAN
RESEARCH & PROMOTION COUNCIL

ACKNOWLEDGEMENTS

The Minnesota Wheat Research and Promotion Council's On-Farm Research Network (OFRN) is supported largely by the Minnesota Wheat Check-off. Funding is also supplied through several research grants awarded by the Minnesota Department of Agriculture's Agricultural Growth, Research, and Innovation Program (MDA-AGRI), the Agriculture Fertilizer Research and Education Council (AFREC), and the Minnesota Soybean Research and Promotion Council.

The willingness and excitement of the growers and others who have been in the OFRN keeps the research moving forward. Without willing producers looking to improve production in their operations this Network would not continue. Thank you to all our past participants and others for your contributions!

The OFRN greatly appreciates the involvement of its advisory committee members Angie Peltier, Ben Genereux, Ethan Hulst, Tony Brateng, Tim Osowski, Kris Folland, and Ryan Casavan, who continue to be invaluable in providing direction to the OFRN.

We were very fortunate to have some of the products, services, and equipment needed for the research donated by industry companies. These donations helped to control variability among products used, improve our efficiency, and reduce the time and expense associated with conducting the research for the participants. We would like to thank:

BASF for their generous donation of the fungicide Priaxor™ for the Flag Leaf Fungicide trial.

Koch Agronomic Services and CHS Ag Services for their generous donations of Centuro™ for the N-stabilizer trial.

West Central Ag Services of Mahnomen, Gary Purath of Red Lake Falls, and the U of MN Magnusson Research Farm for donating the use of their weigh wagons during harvest.

Ben Genereux, Ethan Hulst, Ben Kettner, Shane Weller, and Josh Erbes - Centrol Ag Consulting, for their assistance conducting research trials.

CHS Ag Services, Elbow Lake Co-op, Northern Farmer's Co-op Exchange, Red Lake County Co-op, Northern Resources and Halstad Elevator Company for help with fertilizer prescription maps and fertilizer applications.

Kyle Jore for conducting the economic analyses on the seeding rate data, pp. 7-11.

Thanks also go to the many other agronomists, producers, and industry workers who have helped make this research possible!

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Seeding Rate

Objective

Determine the optimum seeding rates for various hard red spring wheat varieties currently grown in MN.

Years of Study

2016-2020

Treatments

In 2020, seeding rates were lowered to 0.75, 1.25, and 1.75 million live seeds per acre tested on the varieties WB 9590, SY Valda, and MN-Washburn.

In previous years, seeding rates were tested at 1.0, 1.5, and 2.0 mil live seeds per acre on various varieties.

Methods

- Trials included three replications of the three seeding rates at eight locations in 2020.
- Varieties used in 2020 were SY Valda, MN Washburn, and WB 9590. Previous years also studied Bolles, Lang-MN, Linkert, and Shelly. A total of 41 locations from 2016-2020 are included in the combined analysis.
- Plots were established and harvested with producer equipment. One plot is typically one to two passes of the planter wide by the full length of the field.
- At harvest, one combine pass from each plot is weighed in a weigh wagon or a grain cart at harvest and the grain is sampled to test moisture content, test weight, and protein content.
- The established stand and the number of spikes per acre were counted during the growing season to calculate in-season stand loss and tillering capacity of each variety.
- All statistical analyses were conducted at the 90% confidence level.

Results

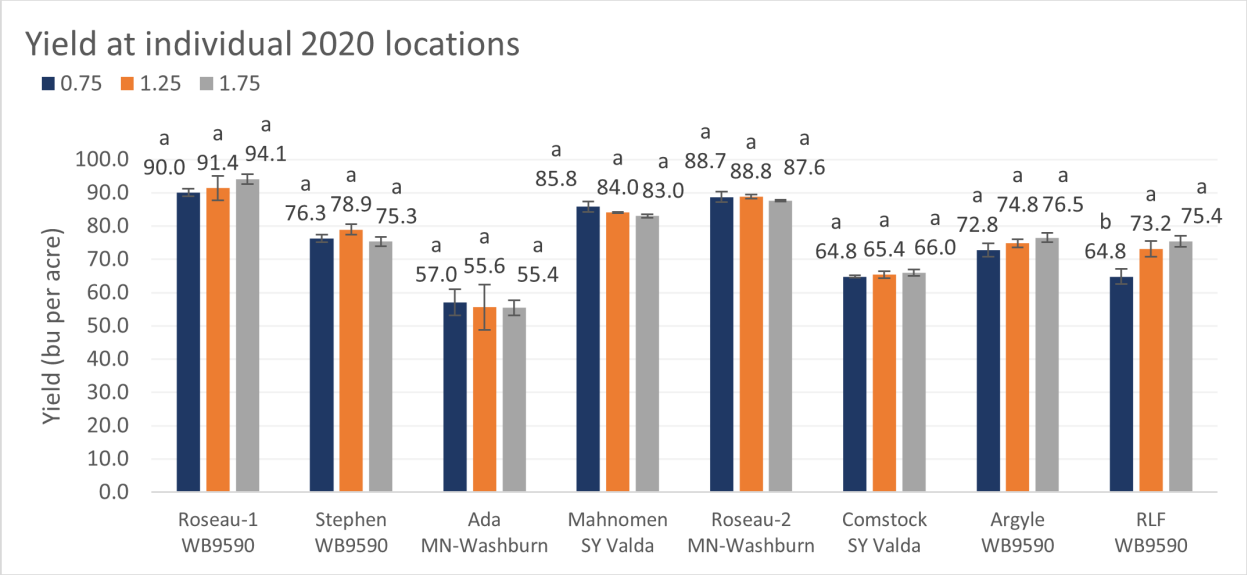

Figure 1. Yield at individual locations for three varieties in 2020. Differing letters indicate differences among treatments at the 90% confidence level.

- The Red Lake Falls (RLF) location showed significantly different yields among treatments at the 90% confidence level.
- RLF also had noticeably greater weed pressure in the 0.75 mil plots.

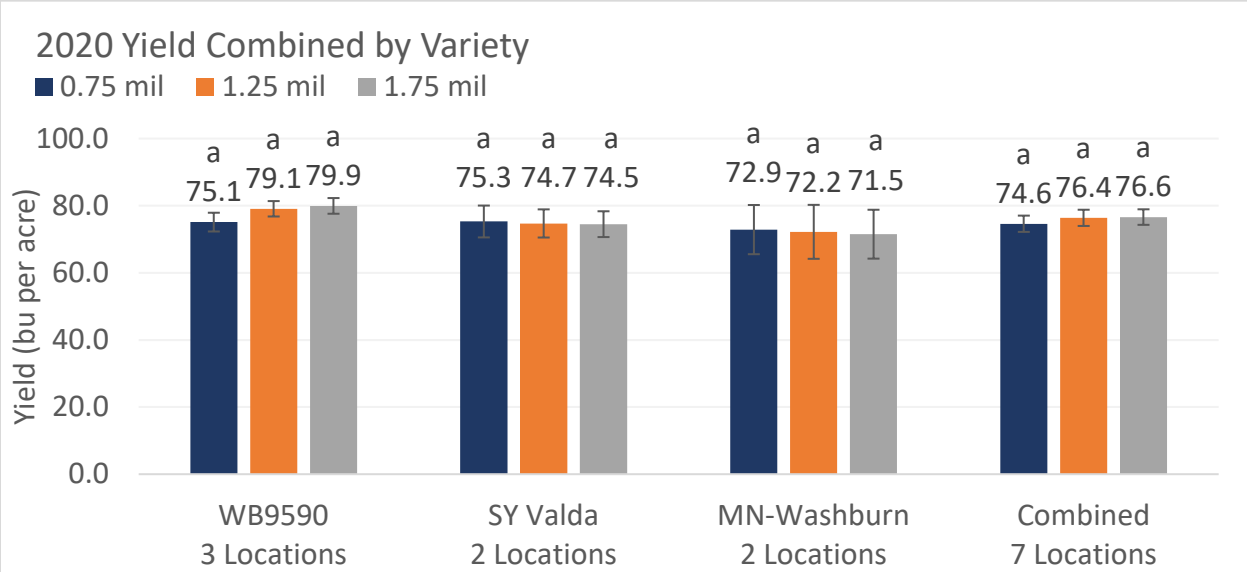

Figure 2. Yield combined by variety for the 2020 trial locations. Differing letters indicate differences among treatments at the 90% confidence level. ANOVA p-values were: WB9590 = 0.3601, SY Valda = 0.8513, MN-Washburn = 0.2449, Combined = 0.8204.

- When combined across locations, varieties did not show a significant difference in yield among treatments. However, since there are only 2-3 locations included under each variety at these seeding rates, adding additional locations in 2021 may show a stronger difference between seeding rates.

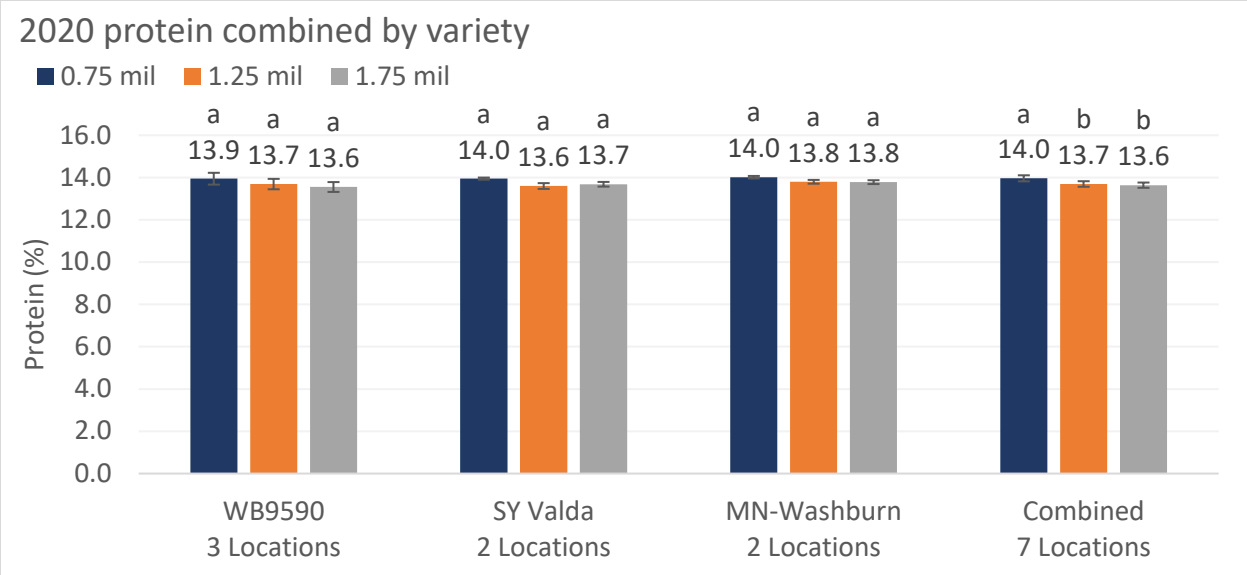

Figure 3. Protein combined by variety for the 2020 trial locations. Differing letters indicate differences among treatments at the 90% confidence level. ANOVA p-values were: WB9590 = 0.2859, SY Valda = 0.2780, MN-Washburn = 0.3601, Combined = 0.0082.

- When combined across all locations and varieties, it appears they may be a trend towards a slight increase in protein at the lower seeding rate. This could be a result from a trend towards lower yield at the 0.75 mil treatment at some locations, which would allow the plants to allocate more N to increase grain protein content.

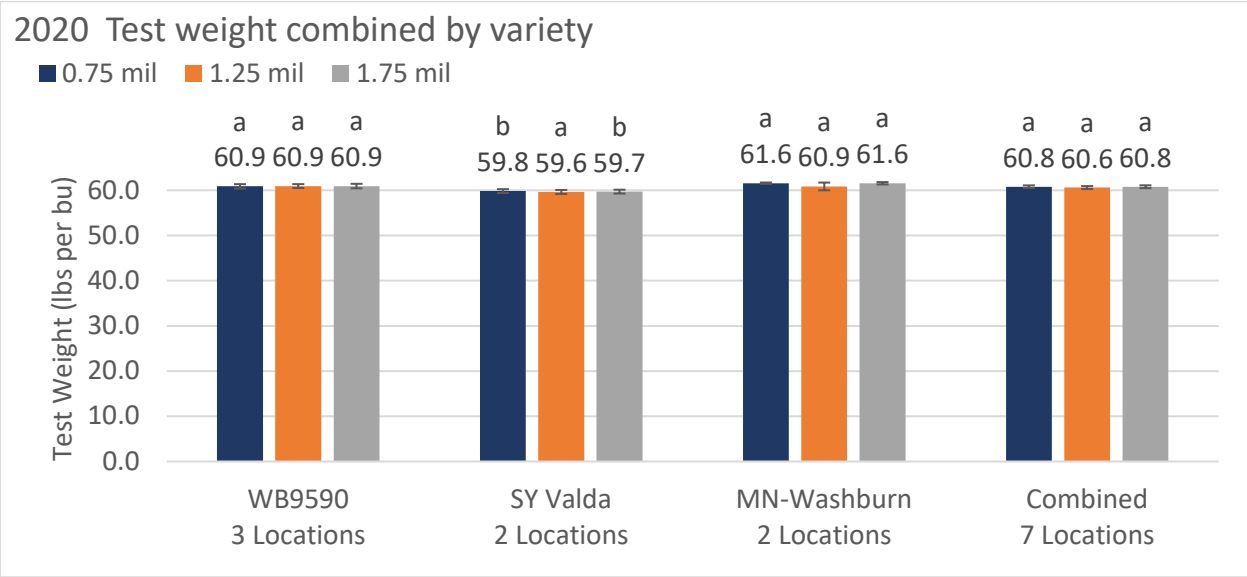

Figure 4. Test weight combined by variety for the 2020 trial locations. Differing letters indicate differences among treatments at the 90% confidence level. ANOVA p-values were: WB9590 = 0.1267, SY Valda = 0.0603, MN-Washburn = 0.6096, Combined = 0.1946.

- There was a 0.2 lb per bu difference in test weight for the combined SY Valda locations.

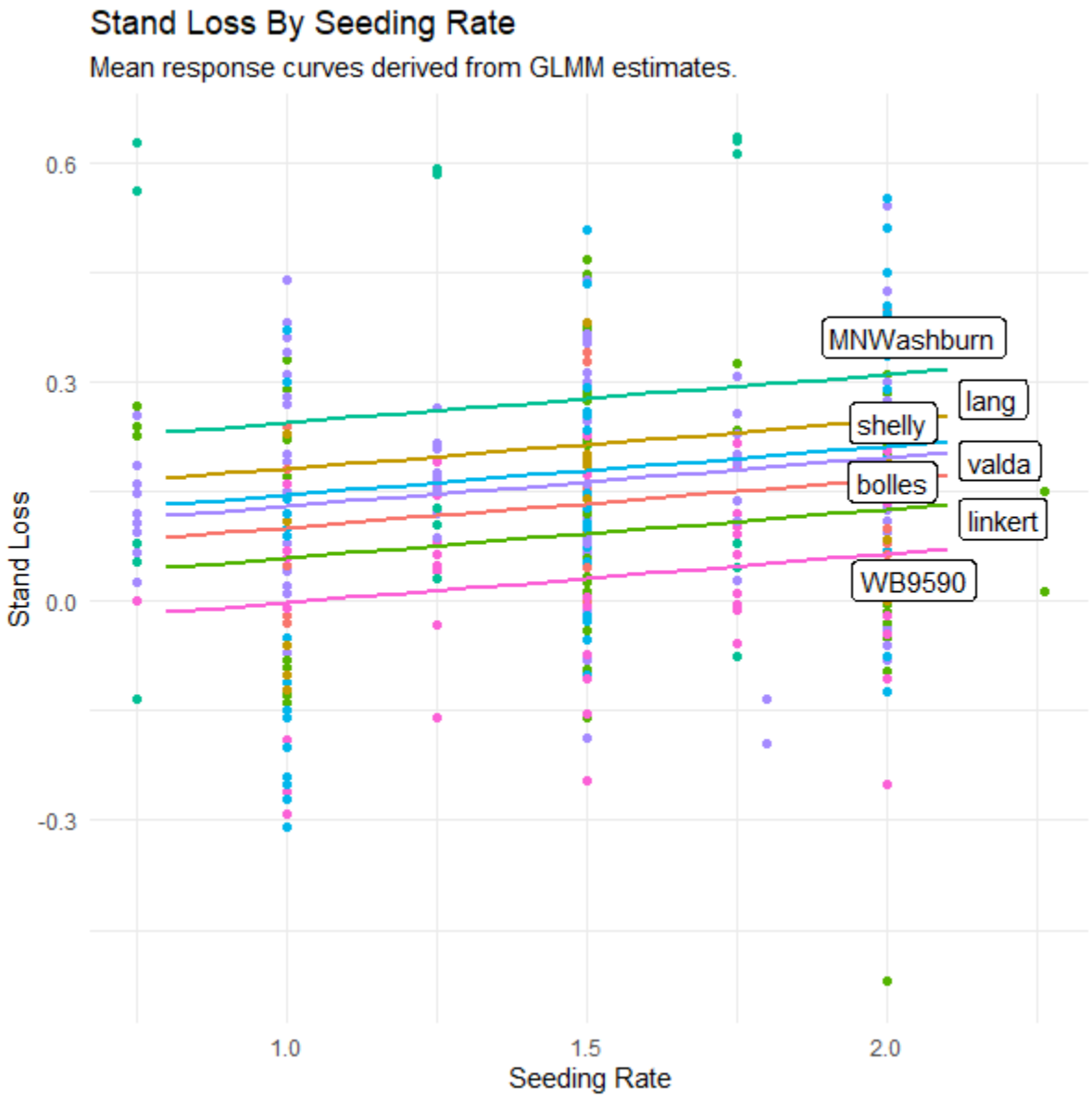

Figure 5. Influence of seeding rate on in-season stand loss using the combined location data from 2016-2020. The number of locations for each variety included in the analysis: Bolles = 4, Linkert = 10, Shelly = 5, Lang-MN = 3, WB9590 = 7, SY Valda = 10, MN-Washburn = 2.

- Estimates indicate on average, an increase of 100,000 seeds results in 7,000 fewer plants.

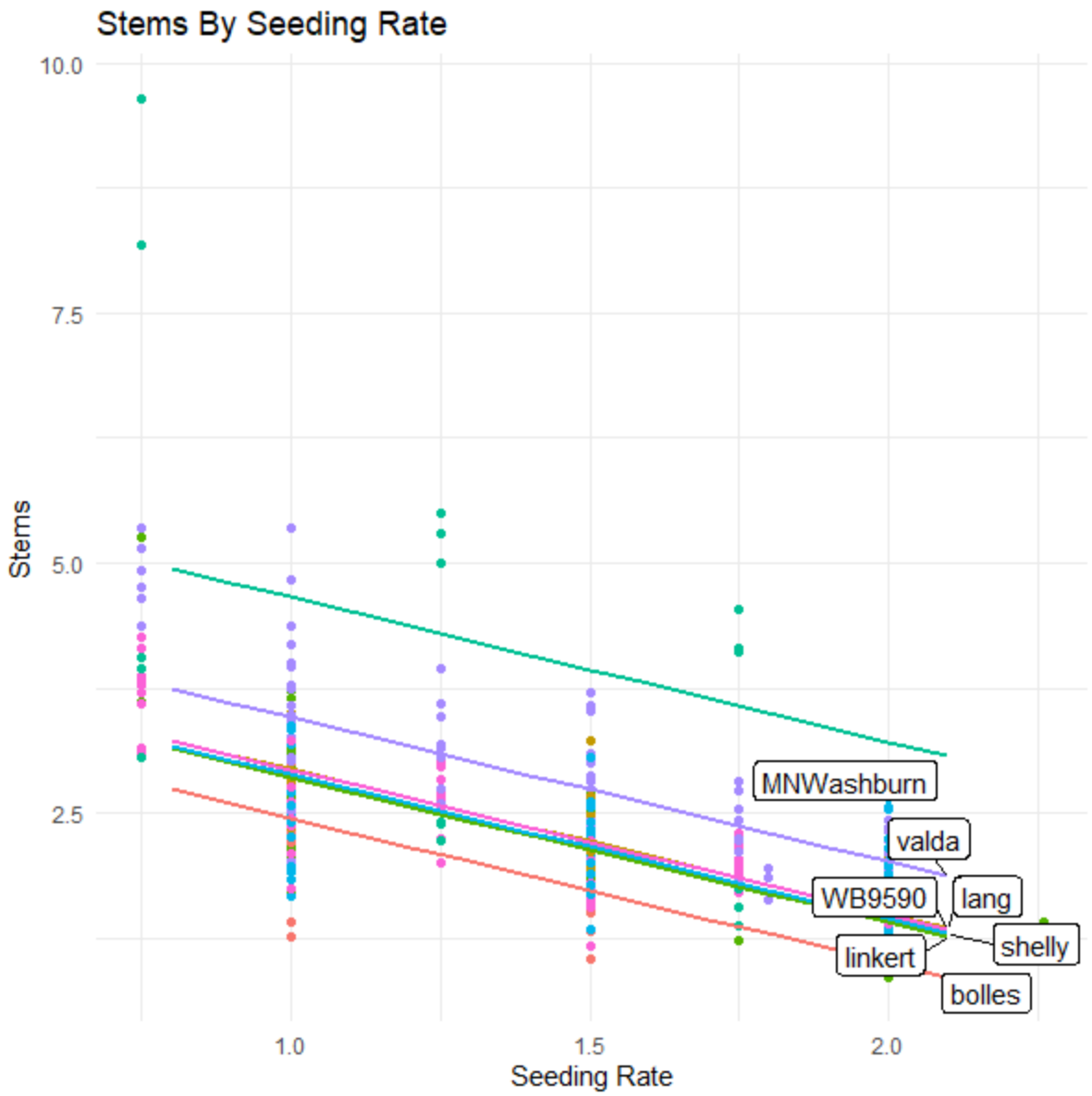

Figure 6. Influence of seeding rate on the total number of stems per acre using the combined location data from 2016-2020. The number of locations for each variety included in the analysis: Bolles = 4, Linkert = 10, Shelly = 5, Lang-MN = 3, WB9590 = 7, SY Valda = 10, MN-Washburn = 2.

- Estimates indicate on average, increasing the seeding rate by 100,000 seeds results in 144,000 fewer tillers.

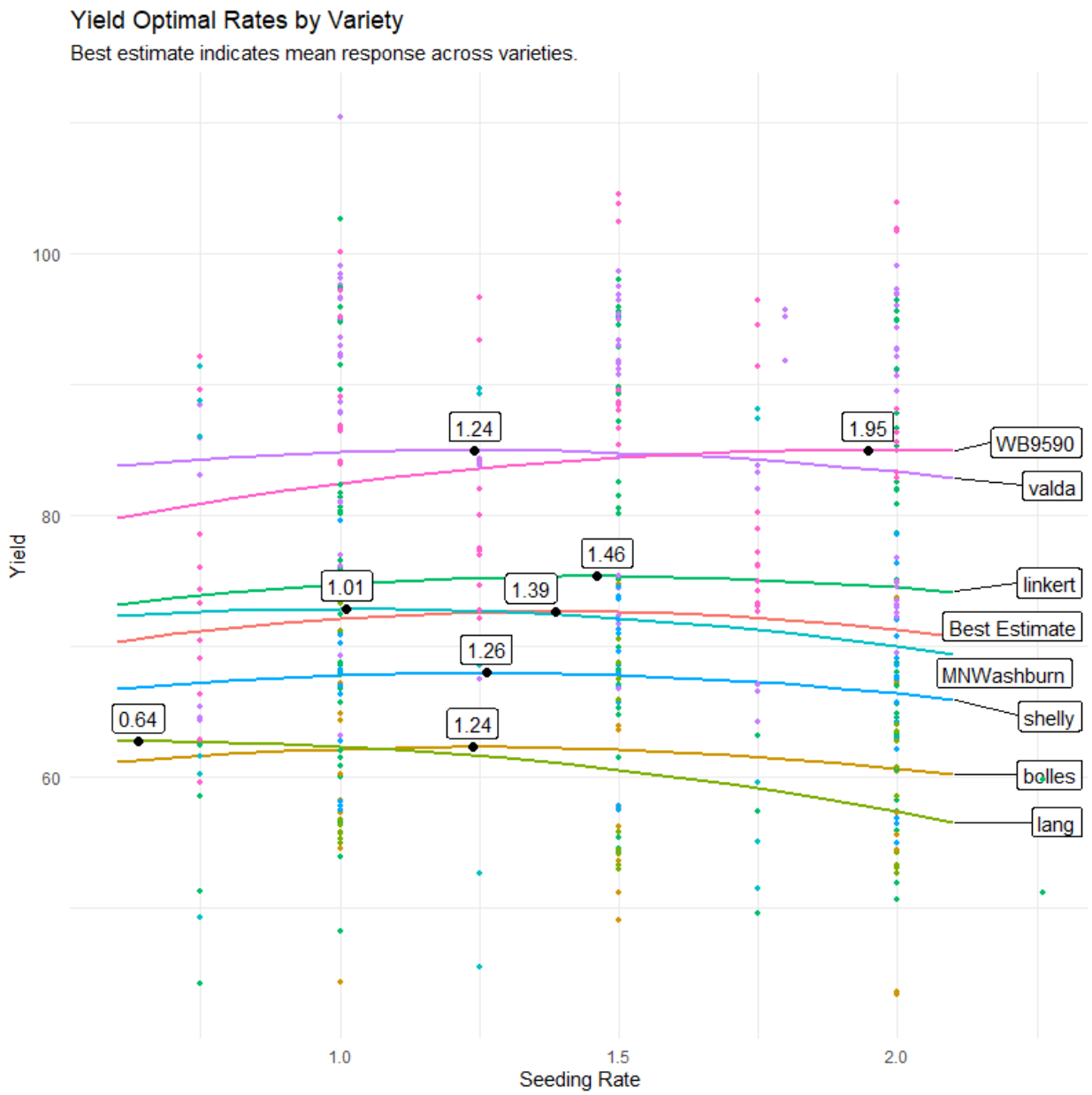

Figure 7. Optimal seeding rate to maximize yield for each variety, using the combined location data from 2016-2020. The number of locations for each variety included in the analysis: Bolles = 4, Linkert = 10, Shelly = 5, Lang-MN = 3, WB9590 = 7, SY Valda = 10, MN-Washburn = 2. Results for varieties with many locations of data will be more reliable than varieties that have only a few locations tested.

- The Best Estimate is the mean response across all varieties and indicates the most significant result.

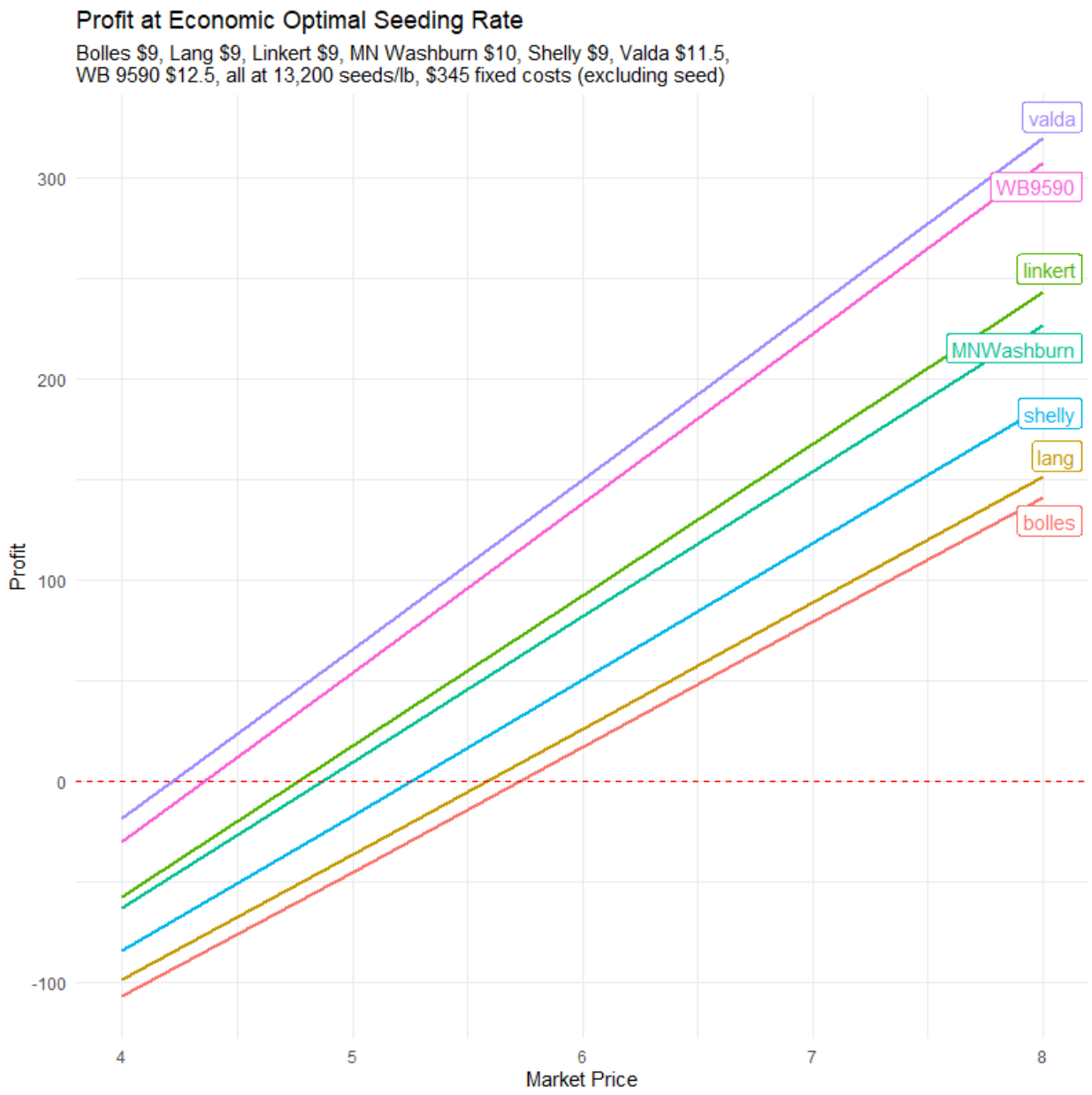

Figure 8. Profit varying by market price for each variety at the individual yield optimal seeding rates from the previous figure (Figure X). The number of locations for each variety included in the analysis: Bolles = 4, Linkert = 10, Shelly = 5, Lang-MN = 3, WB9590 = 7, SY Valda = 10, MN-Washburn = 2. Results for varieties with many locations of data will be more reliable than varieties that have only a few locations tested.

- These results assume a fixed cost for all expenses across all varieties with variability only in seed expense.
- Points of intersection with the dashed red line ($0) indicate break-even points.

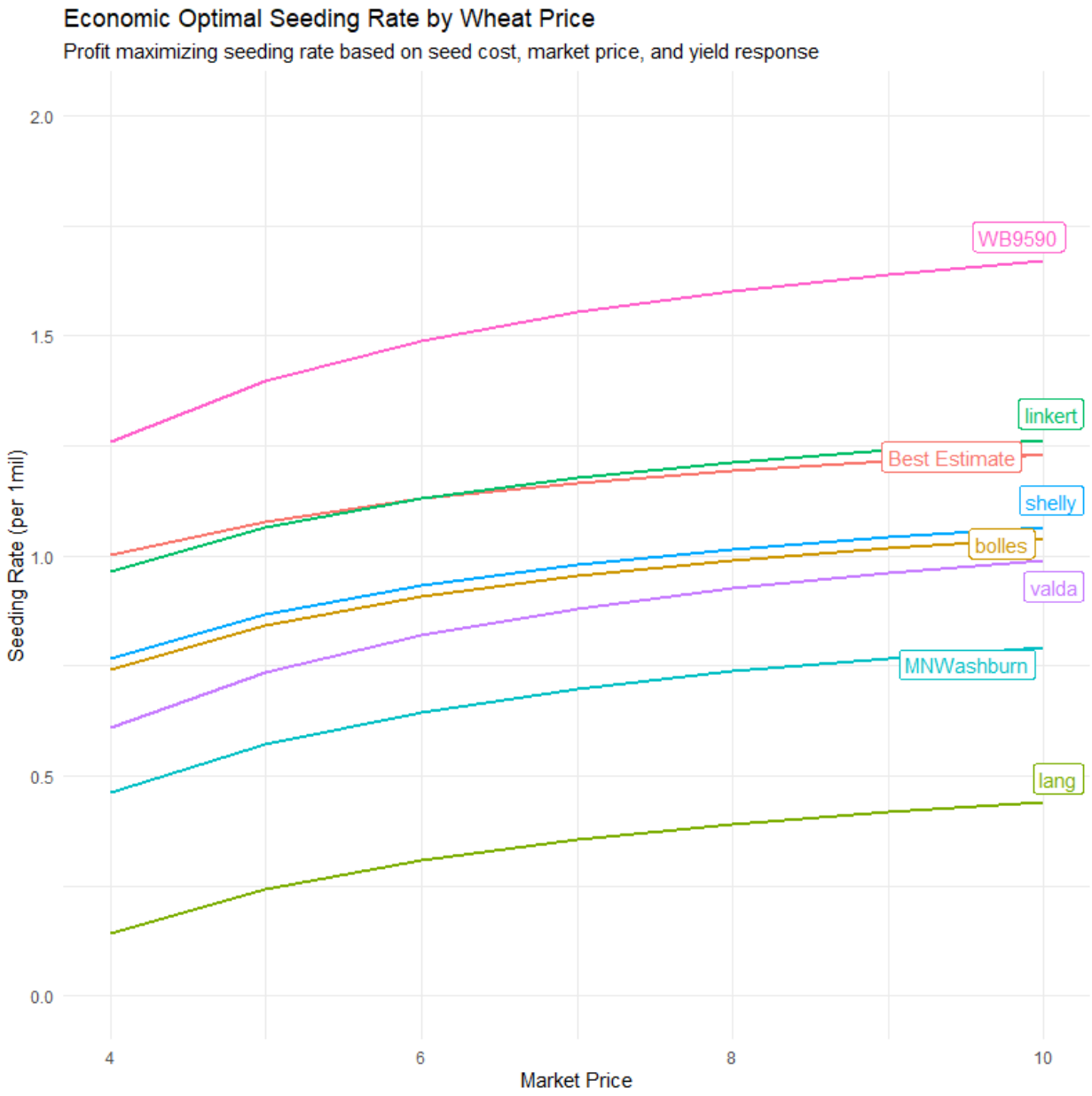

Figure 9. Economically optimum seeding rate varied over market price for each variety. The number of locations for each variety included in the analysis: Bolles = 4, Linkert = 10, Shelly = 5, Lang-MN = 3, WB9590 = 7, SY Valda = 10, MN-Washburn = 2. Results for varieties with many locations of data will be more reliable than varieties that have only a few locations tested.

- The Best Estimate is the mean response across all varieties and indicates the most significant result.

Flag Leaf Fungicide

Objective
Determine the effect of adding fungicide application at the flag leaf growth stage on yield and protein.

Years of Study
2018-2020

Treatments
See Table 1 below

Methods

- Treated plots included an additional fungicide application at the flag leaf growth stage, in addition to the control applications at the 4-5 leaf and flowering growth stages. Treatment details are outlined below in Table 2.
- Treatments were replicated four times at six locations in 2020. A total of 17 locations from 2018-2020 are included in the combined analysis.
- Varieties used in 2020 were WB 9590 and SY Valda
- Plots were established and harvested with producer equipment. One plot is typically one to two passes of the application equipment wide by the full length of the field.
- At harvest, one combine pass from each plot is weighed in a weigh wagon or a grain cart at harvest and the grain is sampled to test moisture content, test weight, and protein content.
- All statistical analyses were conducted at the 90% confidence level

Table 1. Treatments for the flag leaf fungicide trial.

Growth Stage	Treatment	Control
4-5 leaf	propiconazole 2 oz/acre	propiconazole 2 oz/acre
Flag leaf	Priaxor 2 oz/acre fluxapyroxad+pyraclostrobin	None
Early flowering	Prosaro 6.5 oz/acre (prothioconazole+tebuconazole)	Prosaro 6.5 oz/acre (prothioconazole+tebuconazole)

Results

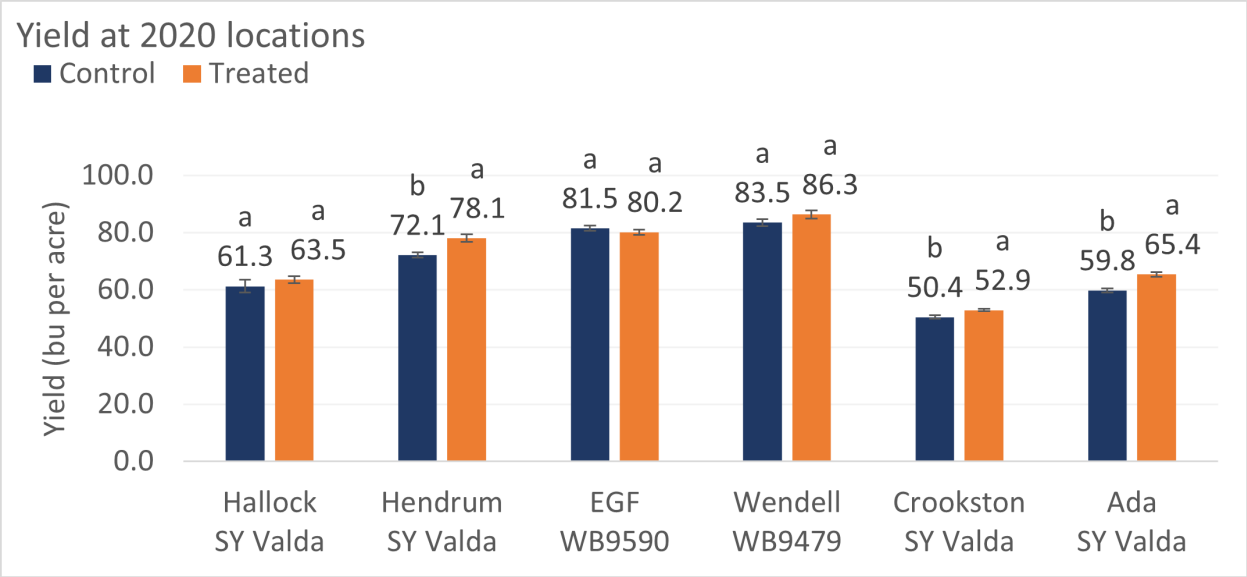

Figure 10. Yield at individual locations in 2020. Differing letters indicate differences among treatments at the 90% confidence level.

- Yield was significantly different between treatments at Hendrum, Crookston, and Ada, in 2020.

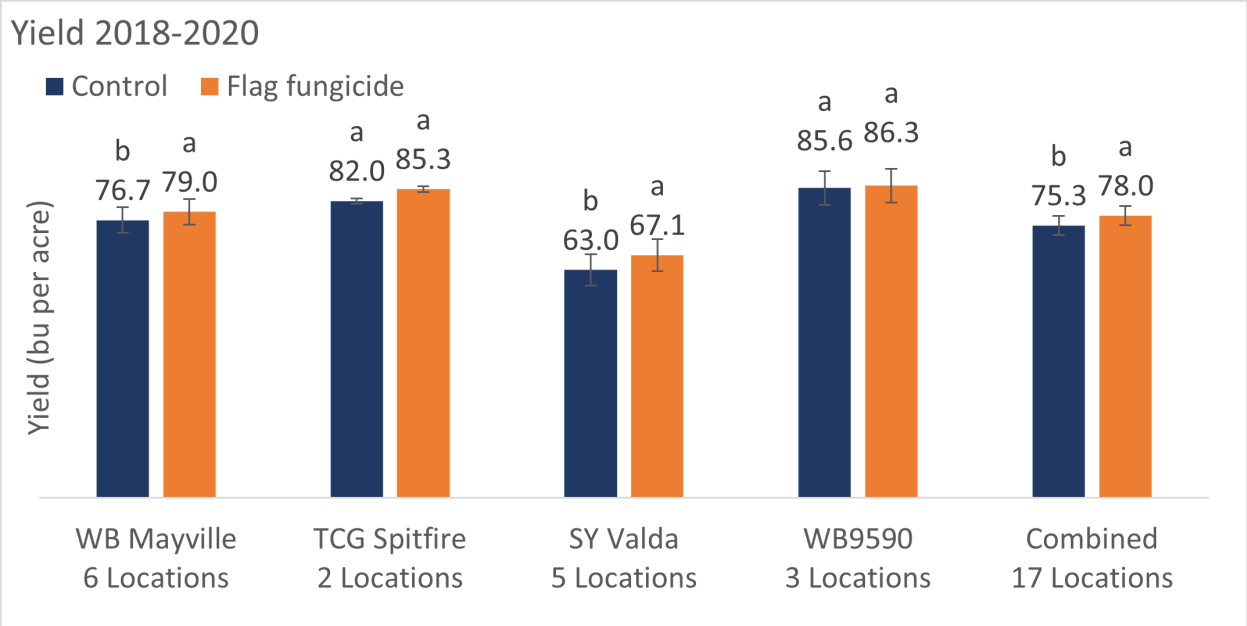

Figure 11. Yield combined across locations from 2018-2020. Differing letters indicate differences among treatments at the 90% confidence level.

- When combining locations by variety, the flag-leaf fungicide application significantly increased yield for WB-Mayville, SY Valda, and when combined across all varieties.

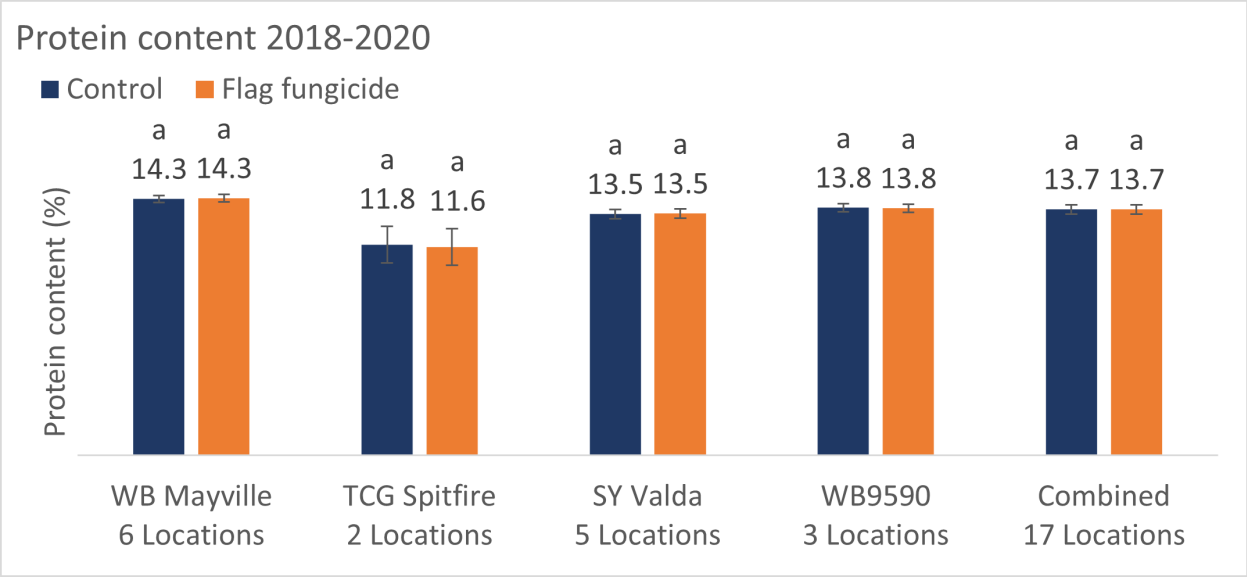

Figure 12. Protein content combined across locations from 2018-2020. Differing letters indicate differences among treatments at the 90% confidence level.

- Adding a flag leaf fungicide did not affect grain protein content.

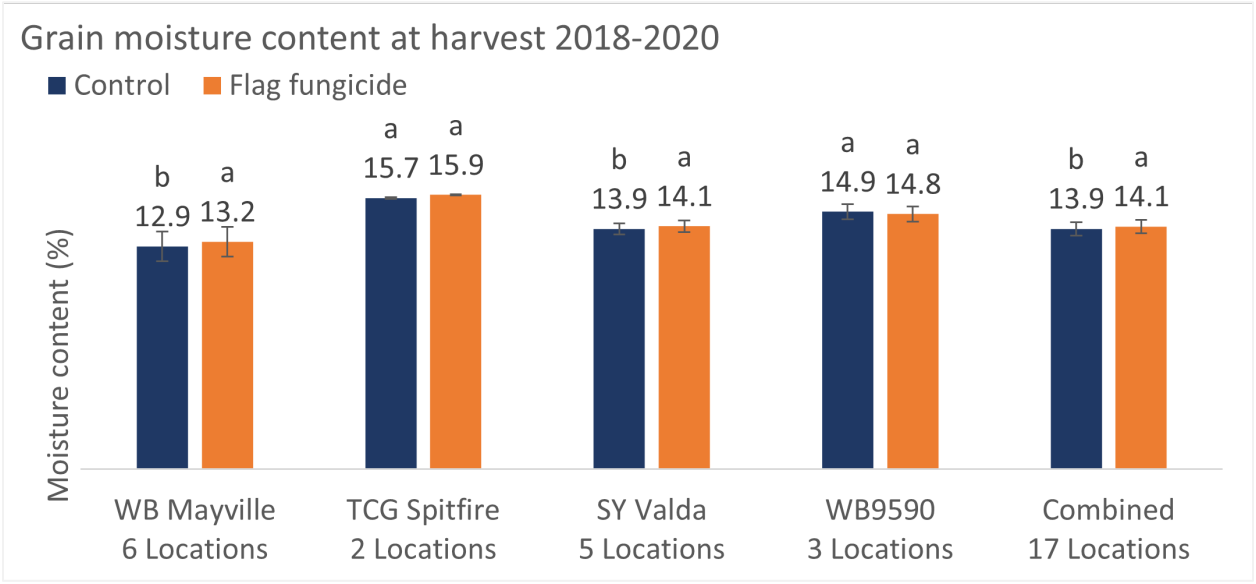

Figure 13. Grain moisture content at harvest combined across locations from 2018-2020. Differing letters indicate differences among treatments at the 90% confidence level.

- Grain moisture at harvest was 0.3-0.4% higher for the flag leaf fungicide treatment compared to the control for WB-Mayville, SY Valda, and when combined across all varieties.
- It appears that an increase in grain yield was also associated with a slight increase in grain moisture at harvest.

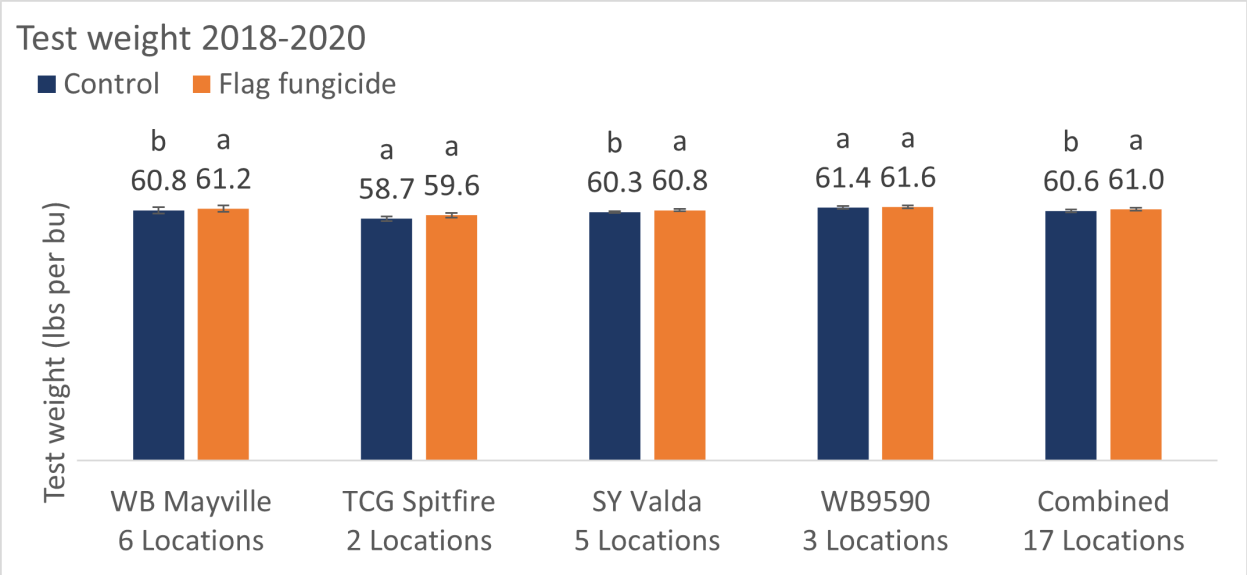

Figure 14. Grain test weight across locations from 2018-2020. Differing letters indicate differences among treatments at the 90% confidence level.

- There was a 0.4 lb increase in grain test weight for the flag leaf fungicide treatment for WB-Mayville, and when combined across all varieties.

Table 2. Partial profit analysis of flag leaf fungicide application for individual varieties and combined locations from 2018-2020.

Variety	SY Valda	TCG Spitfire	WB9590	WB Mayville	Combined
	(bu/acre)	(bu/acre)	(bu/acre)	(bu/acre)	(bu/acre)
Control	63	82	87.6	76.7	75.3
Flag Fungicide	67.1	85.3	89.4	79	78
Yield difference	4.1	NS	NS	2.3	2.7
Application Cost[2]	$14.50	$14.50	$14.50	$14.50	$14.50
Net Revenue (per acre)[3]	$6.00	$ (14.50)	$ (14.50)	$ (3.00)	$ (1.00)

1 Application cost based on $6.50/acre Priaxor + $8.00/acre application cost

2 Revenue based on cash price of $5.00/bu wheat

3 Net Revenue = Yield difference*Cash price – Application cost

- When using an application cost of $14.50/acre and a market price of $5.00/bu wheat, only SY Valda appeared to have an average positive return on investment for the flag leaf fungicide application.
- A positive return on investment for individual producers will depend on the magnitude of yield response within a field, the producer's individual cost of application, and the grain market price.

Long-term Elevated P and K Fertility

Objective
Compare the effects of elevated P and K fertility over four years of a wheat-soybean rotation

Years of Study
2019-2022

Treatments
Control - Farmer practice (FP) rate of P and K fertility
Treatment - FP rate of P and K, + 50 units P + 50 units K

Methods
The large on-farm large trials were conducted in conjunction with small-plot research conducted at the U of MN Magnusson Research Farm near Roseau, MN. The small plot treatment rates included 0, 20, 40, 60, 80 and 100 units of P and K and combination of P and K in both wheat and soybeans. The total number of treatments will be 15 plus an untreated for a total of 16 in wheat and soybeans. The results from the small plot P&K trial can be used to help interpret findings in the large-plot on-farm trials as we continue with this project.

- Five large on-farm research sites, one wheat and four soybeans, were harvested near Baudette, Elbow Lake, Roseau, and Ross in 2020.
- Fertilizer was applied by the producer's co-op, and plots were harvested by the producer. Individual plots were replicated four to five times and the treatments were one to two passes of the application equipment by the full length of the field.
- At harvest, one combine pass from each plot was weighed in a weigh wagon or a grain cart at harvest and the grain was sampled to test moisture content, test weight, and protein content.

Table 3. Agronomic information for the 2020 locations

Location	Elbow Lake	Baudette	Roseau-1	Roseau-2	Roseau-3
Year of trial	2	2	1	1	1
Crop	Wheat	Soybean	Soybean	Soybean	Soybean
Variety	SY Valda	Proseed 50-08	P005A83X	P007A08X	Proseed 50-08
Date Fertilized	4/20/2020	5/19/2020	5/22/2020	6/1/2020	
Planting Date	20-Apr	21-May		6/2/2020	5/18/2020
Harvest Date	16-Aug	3-Oct	9/29/2020	9/26/2020	9/28/2020
Organic Matter %	4.7	2.9	5.7	3.9	4.4
Soil Type	Clay Loam	Sandy Loam	Loam	Sandy Loam	Clay Loam
Pre-trial P ppm	13	7	10	6	13
Pre-trial K ppm	171	109	155	148	323

Large-plot Results

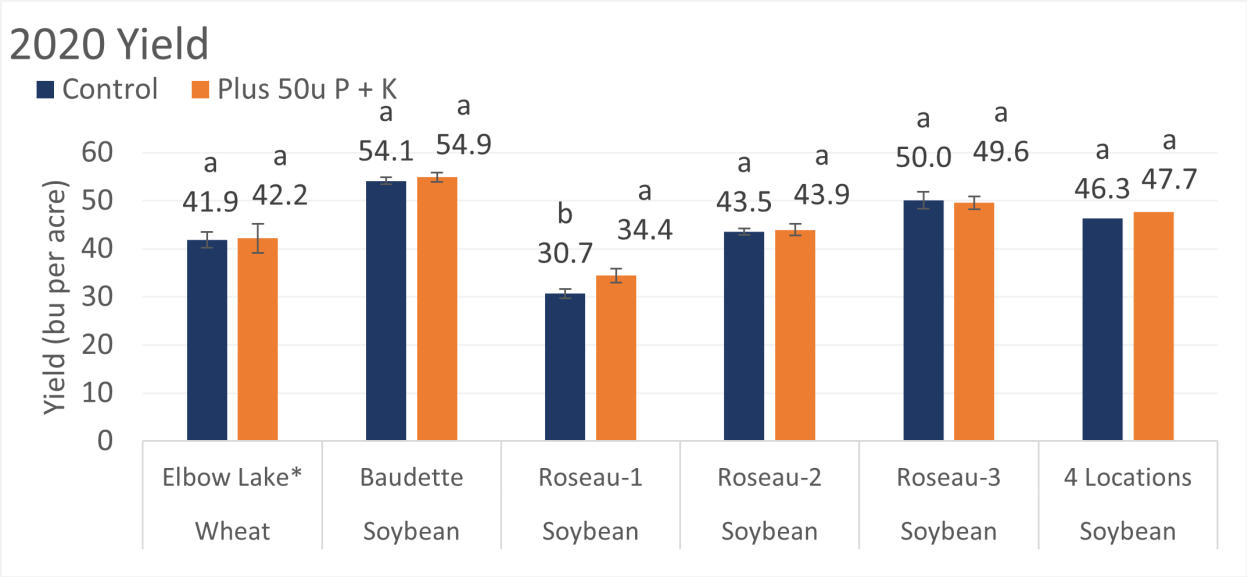

Figure 15. Yield (bu/acre) for the five individual locations harvested in 2020. Differing letters indicate differences among treatments at the 90% confidence level. The ANOVA p-values for each location were: Elbow Lake = 0.8361, Baudette = 0.6575, Roseau-1 = 0.0641, Roseau-2 = 0.7958, Roseau-3 = 0.7726.

- The Elbow Lake location suffered from significant chemical damage early in the season, and fertility at this location was likely not a yield limiting factor this year. Data from this location will not be combined with the wheat data.
- The Roseau-1 location showed a 3.7 bu yield increase in the elevated P and K treatment over the control.

Small plot results

2020 Wheat Small Plot Results

					Soil Test Results		Tissue Test Results	
	Added[1]	Yield[2]	Test		P	K	P	K
Trt#	P & K	Bu/Acre	Wt./Bu	Protein[3]	ppm	ppm	%	%
1	0-20-0	73.0	63.0	14.7	16.5	123	0.28	1.6
2	0-40-0	75.8	62.3	14.6	16.3	118	0.28	1.6
3	0-60-0	72.8	62.3	14.5	24.5	121	0.28	1.6
4	0-80-0	69.8	62.7	14.3	27.0	123	0.28	1.6
5	0-100-0	67.8	62.7	14.0	32.3	122	0.28	1.5
6	0-0-20	70.5	62.1	14.4	12.8	135	0.28	1.7
7	0-0-40	69.3	62.9	14.6	14.5	135	0.27	1.8
8	0-0-60	69.5	63.1	14.5	12.8	130	0.27	1.8
9	0-0-80	70.3	62.4	14.9	14.0	139	0.28	1.9
10	0-0-100	71.3	63.1	14.5	14.5	135	0.26	1.8
11	0-20-20	70.5	63.0	14.5	17.5	126	0.25	1.6
12	0-40-40	74.8	62.1	14.2	20.5	129	0.27	1.7
13	0-60-60	73.3	61.7	14.4	24.8	135	0.27	1.6
14	0-80-80	76.0	62.8	14.6	25.0	126	0.28	1.7
15	0-100-100	74.0	62.6	14.4	37.0	138	0.29	1.8
16	0-0-0	67.0	62.6	14.7	16.3	116	0.26	1.5
LSD @95% conf. level		7.4	1.3	0.7	8.1	16	0.03	0.2
LSD @90% conf. level		6.2	1.1	0.5	6.7	13	0.02	0.1
CV(%)		7.2	1.5	3.2	28	8	5	4

Experimental Design: RCB with 4 reps

Linkert wheat seeded at 120#/ac on 5/21/20

Added[1] - P source 0-46-0 and K source 0-0-60

Yield[2] - Yields correct to 12% moisture

Protein[3] - dry matter basis

Plot size= 6' x 15' Harvest area= 5' x 12'

160 pounds of nitrogen applied and incorporated prior to planting

Table 4. P & K Long Term Fertility Rotation Trial in spring wheat in 2020, located at the U of MN Magnusson Research Farm near Roseau, MN.

2020 Soybean Small Plot Results

						Soil Test Results		Tissue Test Results	
	Added[1]	Yield[2]	Test			P	K	P	K
Trt#	P & K	Bu/Acre	Wt./Bu	Protein[3]	Oil[3]	ppm	ppm	%	%
1	0-20-0	64.8	57.7	38.7	20.9	4.5	120	0.54	2.4
2	0-40-0	69.0	57.7	38.9	20.7	4.5	113	0.55	2.2
3	0-60-0	65.0	57.8	38.8	20.9	8.0	117	0.59	2.6
4	0-80-0	65.5	57.8	38.2	21.2	10.3	123	0.58	2.4
5	0-100-0	69.0	57.8	38.6	20.9	13.8	113	0.62	2.5
6	0-0-20	61.0	57.7	38.5	20.9	4.5	111	0.57	2.6
7	0-0-40	69.0	57.7	38.5	20.9	3.3	114	0.53	2.3
8	0-0-60	63.2	57.8	38.5	21	2.5	125	0.59	2.5
9	0-0-80	66.3	57.7	38.3	21.0	3.0	134	0.52	2.3
10	0-0-100	66.5	57.6	38.6	20.9	2.8	131	0.62	2.7
11	0-20-20	69.8	57.6	38.6	20.9	4.0	126	0.57	2.5
12	0-40-40	68.3	57.9	38.5	20.9	6.3	118	0.59	2.5
13	0-60-60	69.3	57.8	38.6	21.0	7.0	123	0.59	2.5
14	0-80-80	63.5	57.7	38.5	21.0	9.5	126	0.60	2.5
15	0-100-100	63.8	57.6	39.0	21.0	9.0	132	0.61	2.5
16	0-0-0	61.0	57.7	39.1	20.7	3.3	109	0.60	2.5
LSD @95% conf. level		8.3	NS	0.4	0.4	3.2	17	0.07	0.32
LSD @90% conf. level		6.5	0.3	0.4	0.3	2.6	14	0.06	0.26
CV (%)		7.8	0.4	0.8	1.3	37	10	6	6

Experimental Design: RCB with 4 reps

All plots followed best management practices (BPM)

Asgrow AG005X8 soybeans seeded @ 225,000/acre (final stand 181,000) on 5/21/2020

Added[1] - P source 0-46-0 and K source 0-0-60

Yield[2] - Yields corrected to 13% moisture

Protein and Oil[3] -on dry matter basis

Plot size= 6' x 15' and harvested area 5' x 12'

Table 5. P & K Long Term Fertility Rotation Trial in soybean in 2020, located at the U of MN Magnusson Research Farm near Roseau, MN.

Initial Background Soil Test Values

0-6" sample	Site 1	Site 2
	2020 soybean plots	2020 wheat plots
OM %	2.8	2.8
PH - 8.2	8.2	7.8
P (Olsen) ppm	6 ppm	23 ppm
K ppm	154 ppm	166 ppm
S ppm	14 lbs/ac	34 lbs/ac
Soluble salts (mmho/cm)	0.23	0.4

Table 6. Background soil test values for the small plot experiments prior to treatment applications in 2019.

Wheat Small Plot Summary

- Yields ranged from 67 to 76 bu/a
- Yields higher from the combination of 40, 60, 80, and 100 of P&K vs untreated
- No treatment differences in yield from K
- No treatment difference in test weight and protein vs untreated
- P applied alone or in combination at 60, 80 and 100 increased soil test P
- K soil test levels tended to increase with all K rates
- No treatment effect in P tissue test levels vs untreated
- All K rates tended to or increased K tissue test levels

Soybean Small Plot Summary

- Yields ranged from 61.0 to 69.8 bu/a
- Yields higher from the combination of 20, 40, and 60 of P&K vs untreated
- No treatment difference in test weight and protein vs untreated
- All treatments tended to increase oil content
- P applied alone or in combination at 60, 80 and 100 increased soil test P
- P soil test levels increased with rate
- K soil test levels tended to or increased with all K rates
- No treatment effect in P or K tissue test levels vs untreated

Large Plot Observations

- There was a significant difference between treatments at the Roseau-1 location. The initial soil P at this location was 10 ppm (medium). In 2020 one of four soybean sites (25%) gave a positive response to additional P&K.
- The combined analysis did not show significant differences between treatments.
- This trial will be conducted for two more years. Several more years of research in various environments at additional locations are needed before any conclusions can be drawn from this elevated P&K fertility trial.

Green-seeding Soybean into Rye Cover Crop

Objective

Determine if planting soybean into a rye cover crop established in the previous fall can reduce the effects of IDC in soybean and observe any differences the cover crop makes.

Years of Study

2019

Treatments

Control – No rye fall cover crop

Treatment – Rye cover crop following wheat harvest, soybean planted into living rye in the spring

Methods

- Treatment were replicated four times at two locations in fall 2019-2020.
- Plots were established and harvested with producer equipment. One plot is typically one to two passes of the application equipment wide by the full length of the field.
- Rye biomass and soil nitrate was measured at soybean planting and prior to chemical termination in late June
- Soil moisture and temperature, soybean stand, height, and IDC score, and weed pressure were measured at 0, 2, and 4 weeks after soybean planting
- At harvest, one combine pass from each plot was weighed in a weigh wagon or a grain cart and the grain was sampled to test moisture content and grain quality.
- All statistical analyses were conducted at the 90% confidence level

Table 7. Equipment and field details for the rye cover crop trials at Dorothy and Warren, MN.

	Dorothy	Warren
Fall 2019		
Tillage	1 pass harrow + chisel	1 pass supercoulter
Planter	Hoe drill	Hoe drill
Rye seeding rate	20 lbs/ac	20 lbs/ac
Rye planting date	9/6/2019	9/8/2019
Spring 2020		
Tillage	1 pass Salford vertical tillage	None
Variety	Pioneer P0184X	Asgrow 03X7
Planting date	5-24-20	5-24-20
Planter	Hoe drill	Row planter
	12 in sweeps	Disc openers
Row spacing	10 in	22 in
Rye termination date	6/20/2020	6/16/2020
Termination tank mix	Roundup + dicamba + Zidua	Roundup + Engenia
SSURGO soil type	Loamy fine sand	Loamy fine sand

Results

Table 8. Soil NO3-N at soybean planting and rye termination at Dorothy and Warren, MN in 2020.

		At planting			At rye termination		
		0-6 in	6-24 in	0-24 in	0-6 in	6-24 in	0-24 in
		--lbs per ac--			--lbs/ac--		
Dorothy	Control	9	24	33	18	34	52
5/20/20	Rye	7	22	29	13	26	38
	Sig. Difference	**2**	--	**5**	**5**	--	**13**
	CV (%)	31.4	22.1	23.4	25.0	36.1	29.9
	p-value	0.058	0.319	0.073	0.001	0.195	0.085

		At planting			At rye termination		
		0-6 in	6-24 in	0-24 in	0-6 in	6-24 in	0-24 in
		--lbs per ac--			--lbs/ac--		
Warren	Control	9	18	27	24	29	53
5/22/20	Rye	7	15	22	7	8	15
	Sig. Difference	--	--	--	**17**	**22**	**39**
	CV (%)	32.9	37.6	33.6	59.5	70.1	63.0
	p-value	0.250	0.423	0.296	0.000	0.003	0.001

Significant Differences calculated at the 90% confidence level.

- The rye cover crop took up a significant amount of soil NO3-N in the 3-4 weeks after planting.

Table 9. Soil moisture at 0, 2, and 4 weeks after planting at Dorothy and Warren, MN in 2020.

		Pre-plant	2 WAP	4 WAP
			-- % v/v --	
Dorothy	Control	23.2	23.5	22.8
	Rye	22.2	24.0	21.7
	Sig. Difference			
	CV (%)	23.6	20.0	22.1
	p-value	0.483	0.778	0.458

		Pre-plant	2 WAP	4 WAP
			-- % v/v --	
Warren	**Control**	26.2	**20.3**	27.2
	Rye	27.2	17.6	27.9
	Sig. Difference		**2.7**	
	CV (%)	11.8	27.0	9.4
	p-value	0.332	0.031	0.438

Significant Differences calculated at the 90% confidence level.

- The control treatment had 2.7% more soil moisture than the cover crop treatment 2 weeks after planting
- At the other timings, there was no difference in soil moisture between the control and cover crop treatments

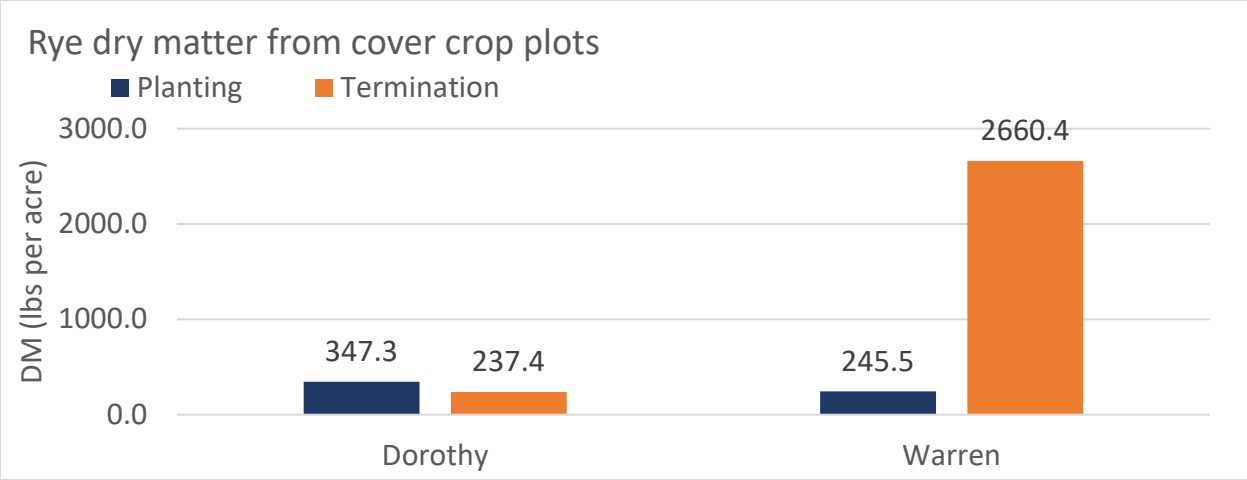

Figure 16. Dried rye biomass sampled at planting and prior to termination at Dorothy and Warren, MN in 2020. Differing letters indicate differences among treatments at the 90% confidence level.

- Dorothy was vertical tilled (cover crop and control plots) prior to planting, significantly reducing the rye stand
- Rye at Warren was at or past pollination by the time the rye was terminated

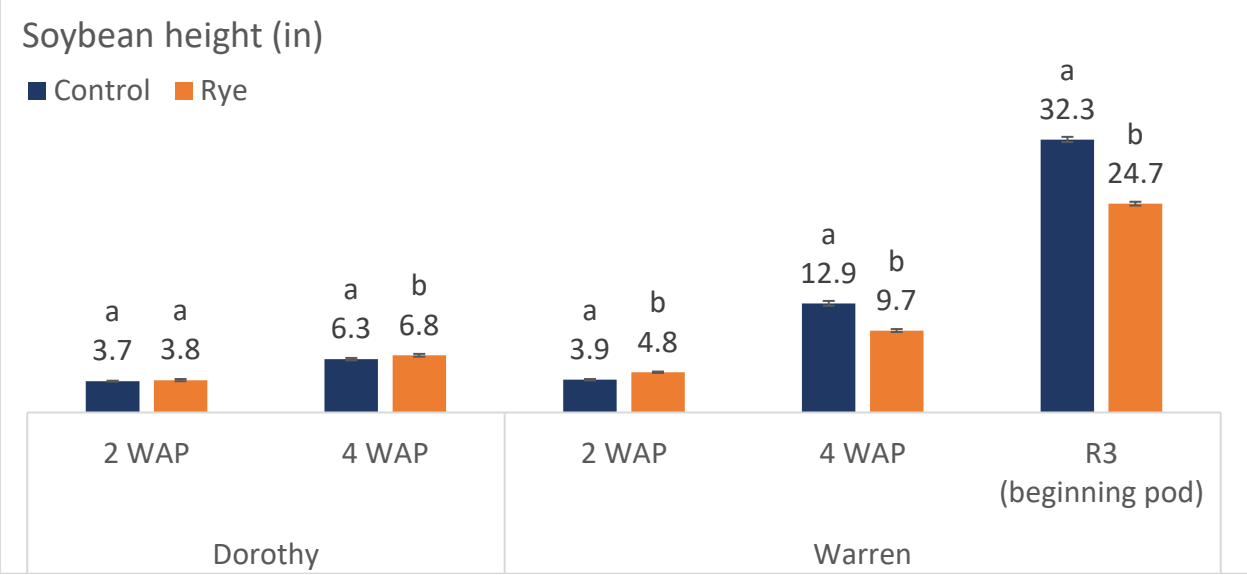

Figure 17. Soybean height to terminal node at 2 and 4 weeks after planting (WAP). Differing letters indicate differences among treatments at the 90% confidence level.

- An additional sampling date in Warren at the R3 growth stage was included because of the severity of stunting in the cover crop plots.
- Stunting and chlorosis early on at Warren was related to the rye cover crop, but the exact cause is uncertain.

Table 10. Mean weed count per square yard at Dorothy and Warren, MN in 2020.

		Soybean planting	2 WAP	4 WAP
		-- weeds per sq. yard --		
Dorothy	Control	22.4	241.7	
	Rye	6.7	149.4	
	Sig. Difference	15.8	92.3	
	CV (%)	122.6	56.0	
	p-value	0.021	0.074	

		Soybean planting	2 WAP	4 WAP
			-- weeds per sq. yard --	
Warren	Control	3.3	12.1	1.7
	Rye	0.8	2.0	1.5
	Sig. Difference	ns	10.2	ns
	CV (%)	137.6	94.2	79.5
	p-value	0.169	0.031	0.851

Significant Differences calculated at the 90% confidence level.

- There were significantly fewer weeds in Dorothy in the rye cover crop plots
- The weeds at Dorothy were smaller and farther behind in growth in the cover crop plots
- The main weed species present at Dorothy was barnyardgrass
- There was very low weed pressure at Warren

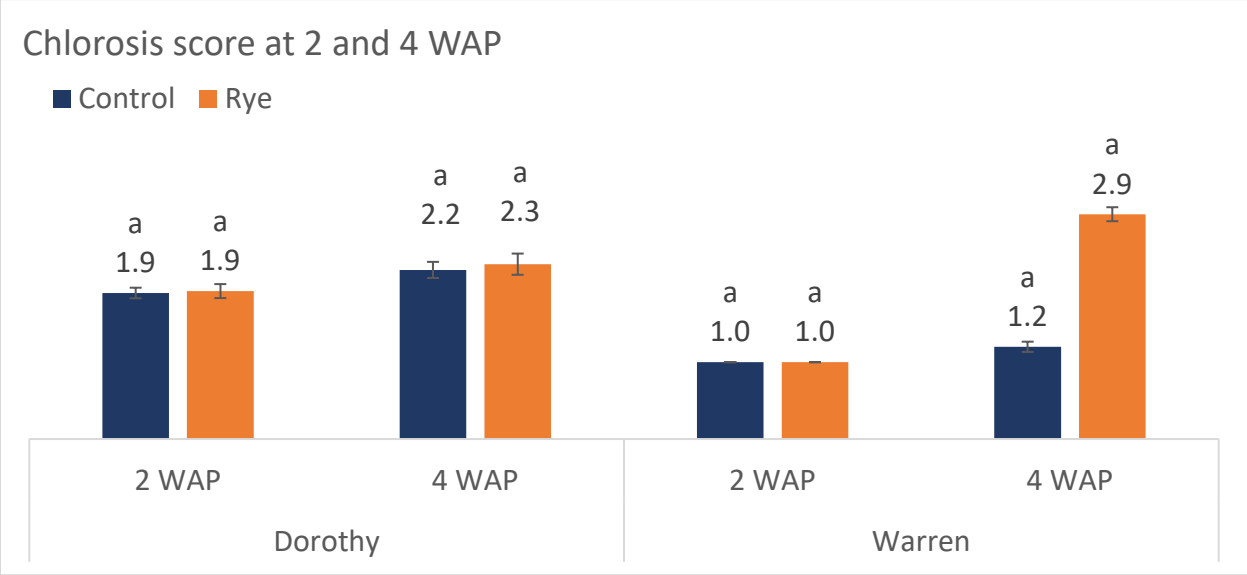

Figure 18. Soybean IDC score rated according to NDSU's 1-5 scale for severity of IDC, with 1=normal, 5=dead. Differing letters indicate differences among treatments at the 90% confidence level.

- At the time of rating, it was thought that the severe yellowing in the cover crop plots was due to IDC. However, we currently have no suitable explanation for why they rye may have induced IDC in the soybeans.

Figure 19. Photos taken of Control and cover crop treatments on July 9, 2020 at Warren, MN. Left) chlorosis evident in Rye plots in late June into early July. Right) Height and root growth differences between the stunted rye soybeans and normal control soybeans.

Table 11. Yield and soybean quality at Dorothy and Warren, MN in 2020.

		Yield	Protein	Oil	Moisture	TW
		-- bu /ac --	-- % --	-- % --	-- % --	-- lb /bu --
Dorothy	Control	14.7	33.7	18.8	15.7	54.9
	Rye	18.2	33.5	18.9	14.3	56.9
	Sig. Difference	--	--	-0.1	--	-2.0
	CV (%)	18.4	0.6	0.5	9.6	2.9
	p-value	0.219	0.293	<.0001	0.175	0.086

		Yield	Protein	Oil	Moisture	TW
		-- bu /ac --	-- % --	-- % --	-- % --	-- lb /bu --
Warren	Control	55.6	34.2	17.9	9.4	57.4
	Rye	48.6	34.0	17.6	9.4	57.8
	Sig. Difference	6.9	0.2	0.3	--	-0.3
	CV (%)	7.7	0.4	1.1	0.7	0.4
	p-value	0.004	0.092	0.049	0.638	0.041

Significant Differences calculated at the 90% confidence level.

- Yield was not different between treatments at Dorothy, where there was less cover crop competition with soybean.
- Test weight was 2.0 lbs greater in the rye cover crop vs the control plots at Dorothy, and 0.3 lbs greater in the rye plots at Warren
- The rye cover crop treatment yielded 6.9 bu less than the control treatment due to the chlorosis and stunting from earlier in the season

ON-FARM RESEARCH NETWORK LEADERSHIP TEAM

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Minnesota Wheat's On-Farm Research Network (OFRN) conducts producer-funded, producer-driven research that investigates producer-selected research topics in a large plot environment.

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